SUZUKI

SWIFT

SERVICE MANUAL

RS415

IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words **WARNING, CAUTION** and **NOTE** have special meanings. Pay special attention to the messages highlighted by these signal words.

WARNING:

Indicates a potential hazard that could result in death or injury.

CAUTION:

Indicates a potential hazard that could result in vehicle damage.

NOTE:

Indicates special information to make maintenance easier or instructions clearer.

WARNING:

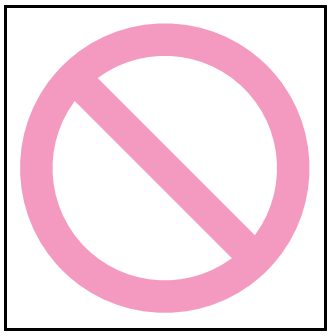
This service manual is intended for authorized Suzuki dealers and qualified service technicians only. Inexperienced technicians or technicians without the proper tools and equipment may not be able to properly perform the services described in this manual.
Improper repair may result in injury to the technician and may render the vehicle unsafe for the driver and passengers.

WARNING:

For vehicles equipped with a Supplemental Restraint or Air Bag System:

- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components and Wiring Location View" under "General Description" in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and "Service Precautions" under "On-Vehicle Service" in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **If the air bag system and another vehicle system both need repair, Suzuki recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.**
- **Do not modify the steering wheel, instrument panel or any other air bag system component on or around air bag system components or wiring. Modifications can adversely affect air bag system performance and lead to injury.**
- **If the vehicle will be exposed to temperatures over 93°C (200°F), for example, during a paint baking process, remove the air bag system components, that is air bag or inflator modules, SDM and/or seat belt with pretensioner, beforehand to avoid component damage or unintended activation.**

The circle with a slash in this manual means "Don't do this" or "Don't let this happen".



FOREWORD

This manual (Volumes 1 and 2) contains procedures for diagnosis, maintenance, adjustments, minor service operations, replacement of components (Service) and for disassembly and assembly of major components (Unit Repair-Overhaul).

VOLUME 1 contains General information, Engine, Suspension, Drive/Axle and Brakes sections (Sections 0 – 4).
VOLUME 2 contains Transmmision/Transaxle, Steering, HVAC, Restraint, Body/Cab/Accessories and Control Systems sections (Sections 5 – 10).

Applicable model:
SWIFT (RS415) vehicles on and after following vehicle identification numbers (VINs).

JSAEZC21S00100001

The contents are classified into sections each of which is given a section number as indicated in the Table of Contents on following page. And on the first page of each individual section is an index of that section.
This manual should be kept in a handy place for ready reference of the service work.
Strict observance of the so specified items will enable one to obtain the full performance of the vehicle.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others.
Therefore, note that illustrations may differ from the vehicle being actually serviced.
The right is reserved to make changes at any time without notice.

SUZUKI MOTOR CORPORATION

© COPYRIGHT SUZUKI MOTOR CORPORATION 2004

TABLE OF CONTENTS

Volume 1

Precautions 00-i
Precautions 00-1

General Information 0-i
General Information 0A-1
Maintenance and Lubrication 0B-1

Engine 1-i
Precautions 1-1
Engine General Information and Diagnosis 1A-1
Aux. Emission Control Devices 1B-1
Engine Electrical Devices 1C-1
Engine Mechanical 1D-1
Engine Lubrication System 1E-1
Engine Cooling System 1F-1
Fuel System 1G-1
Ignition System 1H-1
Starting System 1I-1
Charging System 1J-1
Exhaust System 1K-1

Suspension 2-i
Precautions 2-1
Suspension General Diagnosis 2A-1
Front Suspension 2B-1
Rear Suspension 2C-1
Wheels and Tires 2D-1

Driveline / Axle 3-i
Drive Shaft / Axle 3A-1

Brakes 4-i
Precautions 4-1
Brake Control System and Diagnosis 4A-1
Front Brakes 4B-1
Rear Brakes 4C-1
Parking Brake 4D-1
ABS 4E-1

Volume 2

Precautions 00-i
Precautions 00-1

Transmission / Transaxle 5-i
Precautions 5-1
Automatic Transmission 5A-1
Manual Transmission 5B-1
Clutch 5C-1

Steering 6-i
Precautions 6-1
Steering General Diagnosis 6A-1
Steering Wheel and Column 6B-1
Power Assisted Steering System 6C-1

HVAC 7-i
Precautions 7-1
Heater and Ventilation 7A-1
Air Conditioning System 7B-1

Restraint 8-i
Precautions 8-1
Seat Belts 8A-1
Air Bag System 8B-1

Body, Cab and Accessories 9-i
Precautions 9-1
Wiring Systems 9A-1
Lighting Systems 9B-1
Instrumentation / Driver Info. / Horn 9C-1
Wipers / Washers 9D-1
Glass / Windows / Mirrors 9E-1
Security and Locks 9F-1
Seats 9G-1
Interior Trim 9H-1
Hood / Fenders / Doors 9J-1
Body Structure 9K-1
Paint / Coatings 9L-1
Exterior Trim 9M-1

Control systems 10-i
Precautions 10-1
Body Electrical Control System 10B-1
Immobilizer Control System 10C-1

Section 00

Precautions

CONTENTS

Precautions 00-1
Precautions 00-1
Precautions for Vehicles Equipped with a Supplemental Restraint (Air Bag) System 00-1
General Precautions 00-3
Precautions for Catalytic Converter 00-6
Precautions for Installing Mobile Communication Equipment 00-6
Precaution for CAN Communication System 00-7
Precautions for Electrical Circuit Service 00-7
Air Bag Warning 00-9
Air Bag System Service Warning 00-9
Fastener Caution 00-9
Suspension Caution 00-9
Wheels and Tires Caution 00-9
Brake Caution 00-10
Repair Instructions 00-10
Electrical Circuit Inspection Procedure 00-10
Intermittent and Poor Connection Inspection 00-12

Precautions

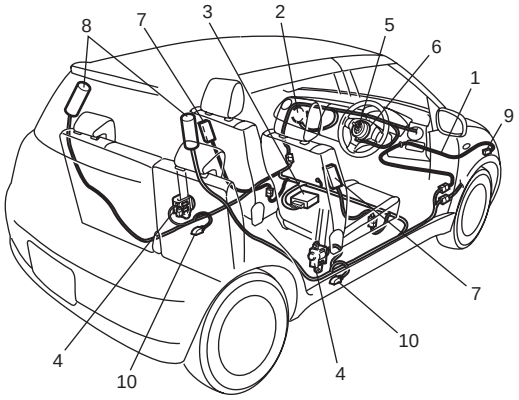
Precautions

Precautions for Vehicles Equipped with a Supplemental Restraint (Air Bag) System

S4RS0A0000001

WARNING:

- **The configuration of air bag system parts are as shown in the figure. When it is necessary to service (remove, reinstall and inspect) these parts, be sure to follow procedures described in Air Bag System section. Failure to follow proper procedures could result in possible air bag system activation, personal injury, damage to parts or air bag system being unable to activate when necessary.**
- **If the air bag system and another vehicle system both need repair, SUZUKI recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.**
- **Do not modify the steering wheel, dashboard, or any other air bag system components. Modifications can adversely affect air bag system performance and lead to injury.**
- **If the vehicle will be exposed to temperatures over 93 °C (200 °F) (for example, during a paint baking process), remove the air bag system components beforehand to avoid component damage or unintended air bag system activation.**



I4RS0A000001-

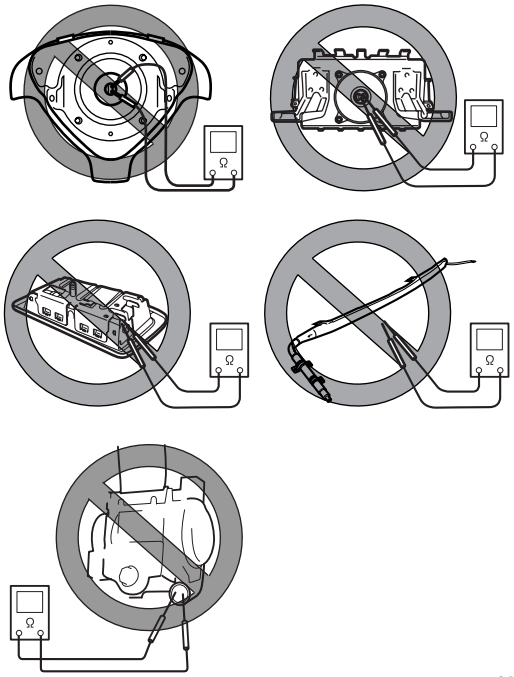
1. Air bag wire harness (in floor, main and instrument panel harness)	6. Driver air bag (inflator) module
2. Passenger air bag (inflator) module	7. Side air bag (inflator) module (if equipped)
3. SDM	8. Curtain air bag (inflator) module (if equipped)
4. Seat belt pretensioner	9. Forward sensor
5. Contact coil	10. Side sensor (if equipped)

Diagnosis

- When troubleshooting air bag system, be sure to follow “Diagnosis” in Air Bag System section. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacement.
- Never use electrical test equipment other than that specified.

WARNING:

Never attempt to measure the resistance of the air bag (inflator) modules (driver, passenger, side and curtain) and seat belt pretensioners (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag or activate the pretensioner.



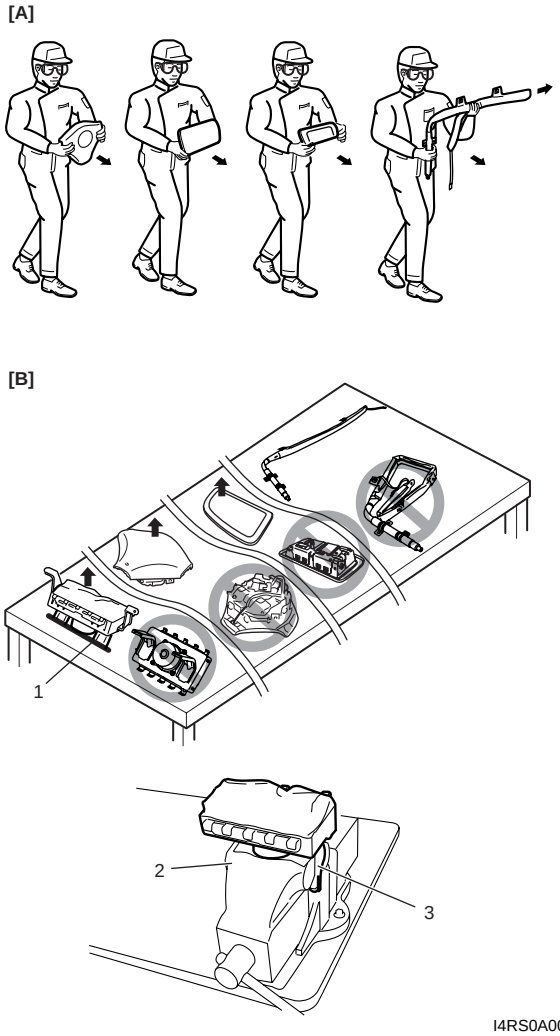
I4RS0A000002-

Servicing and Handling

WARNING:

Many of service procedures require disconnection of "A/BAG" fuse and all air bag (inflator) module(s) from initiator circuit to avoid an accidental deployment.
Driver, Passenger, Side and Curtain Air Bag (Inflator) Modules

- **For handling and storage of a live air bag (inflator) module, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. Never carry the air bag (inflator) module by the wires or connector on the underside of the module. When placing a live air bag (inflator) module on a bench or other surface, always face the bag up, away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit (1) or use the workbench vise (2) to hold it securely at its lower mounting bracket (3). It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment. Otherwise, personal injury may result.**
- **Never dispose of live (undeployed) air bag (inflator) modules (driver, passenger, side and curtain). If disposal is necessary, be sure to deploy them according to deployment procedures described in "Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal: in Section 8B" before disposal.**
- **The air bag (inflator) module immediately after deployment is very hot. Wait for at least half an hour to cool it off before proceeding the work.**
- **After an air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and by-products of the chemical reaction. As with many service procedures, gloves and safety glasses should be worn.**



I4RS0A000003-

[A]:	Always carry air bag (inflator) module with trim cover (air bag opening) away from body.
[B]:	Always place air bag (inflator) module on workbench with trim cover (air bag opening) up, away from loose objects.

WARNING:

SDM

- **For handling and storage of a SDM, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM). Never strike or jar the SDM.**
- **Never power up the air bag system when the SDM is not rigidly attached to the vehicle. All SDM and mounting bracket fasteners must be carefully torqued and the arrow must be pointing toward the front of the vehicle to ensure proper operation of the air bag system.**
  The SDM could be activated when powered while not rigidly attached to the vehicle which could cause deployment and result in personal injury.

WARNING:

Driver and Passenger Seat Belt Pretensioners

- **For handling and storage of a live seat belt pretensioner, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Never carry seat belt pretensioner by wire or connector of pretensioner. When placing a live seat belt pretensioner on the workbench or some place like that, never put something on seat belt pretensioner. Otherwise, personal injury may result.**
- **Never dispose of live (inactivated) seat belt pretensioners (drive and passenger). If disposal is necessary, be sure to activate them according to activation procedures described in "Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal: in Section 8B" before disposal.**
- **The seat belt pretensioner immediately after activation is very hot. Wait for at least half an hour to cool it off before proceeding the work.**
- **With many service procedures, gloves and safety glasses should be worn to prevent any possible irritation of the skin or eyes.**

- Even when the accident was light enough not to cause air bags to activate, be sure to inspect system parts and other related parts according to instructions under "Repair and Inspection Required after Accident: in Section 8B".
- When servicing parts other than air bag system, if shocks may be applied to air bag system component parts, remove those parts beforehand.
- When handling the air bag (inflator) modules (driver, passenger, side and curtain), seat belt pretensioners (driver and passenger), forward sensor, side sensors or SDM, be careful not to drop it or apply an impact to it. If an excessive impact was applied, never attempt disassembly or repair but replace it with a new one.
- When grease, cleaning agent, oil, water, etc. has got onto air bag (inflator) modules (driver, passenger, side and curtain) or seat belt pretensioners (drive and passenger), wipe off immediately with a dry cloth.
- Air bag wire harness is included in floor and instrument panel wire harnesses. Air bag wire harness branched off from floor and instrument panel wire harnesses can be identified easily as it is covered with a yellow protection tube and it has yellow connectors. Be very careful when handling it.
- When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.
- Do not apply power to the air bag system unless all components are connected or a diagnostic flow requests it, as this will set a DTC.
- Never use air bag system component parts from another vehicle.
- When using electric welding, be sure to disconnect all air bag (inflator) module connectors and pretensioner connectors from air bag wire harness respectively.
- Never expose air bag system component parts directly to hot air (drying or baking the vehicle after painting) or flames.
- WARNING / CAUTION labels are attached on each part of air bag system components. Be sure to follow the instructions.
- After vehicle is completely repaired, perform "Air Bag Diagnostic System Check: in Section 8B".

General Precautions

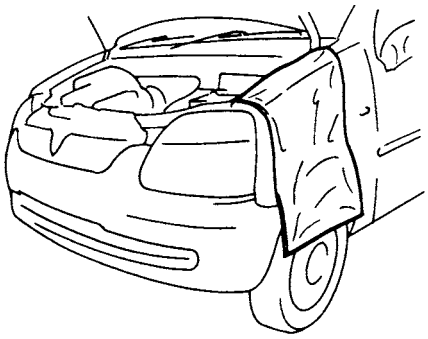
S4RS0A0000002

The WARNING and CAUTION describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures, and they will not necessarily be repeated with each procedure to which they apply.

WARNING:

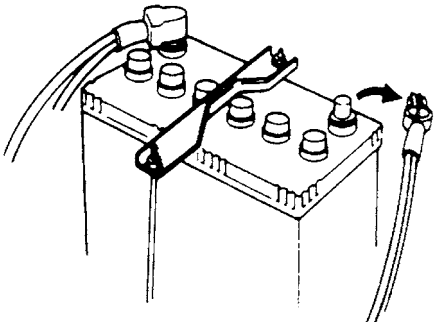
- **Whenever raising a vehicle for service, be sure to follow the instructions under "Vehicle Lifting Points: in Section 0A".**
- **When it is necessary to do service work with the engine running, make sure that the parking brake is set fully and the transmission is in Neutral (for manual transmission vehicles) or Park (for automatic transmission vehicles), Keep hands, hair, clothing, tools, etc. away from the fan and belts when the engine is running.**
- **When it is necessary to run the engine indoors, make sure that the exhaust gas is forced outdoors.**
- **Do not perform service work in areas where combustible materials can come in contact with a hot exhaust system. When working with toxic or flammable materials (such as gasoline and refrigerant), make sure that the area you work in is well-ventilated.**
- **To avoid getting burned, keep away from hot metal parts such as the radiator, exhaust manifold, tail pipe, muffler, etc.**
- **New and used engine oil can be hazardous. Children and pets may be harmed by swallowing new or used oil. Keep new and used oil and used engine oil filters away from children and pets. Continuous contact with used engine oil has been found to cause [skin] cancer in laboratory animals. Brief contact with used oil may irritate skin. To minimize your exposure to used engine oil, wear a long-sleeve shirt and moisture-proof gloves (such as dish washing gloves) when changing engine oil. If engine oil contacts your skin, wash thoroughly with soap and water. Launder any clothing or rags if wet with oil, recycle or properly dispose of used oil and filters.**
- **Be sure to observe following instructions when handling service materials such as fuel, oil, fluid, coolant, grease, sealant, thread lock cement, etc. Otherwise, your health may be ruined.**
  - **– Whenever handling any of these service materials, wear safety glasses to protect your eyes. If it gets into your eye, it may cause inflammation.**
  - **– Whenever handling any of these service materials, wear moisture-proof gloves to protect your skin. If it adheres to your skin, it may cause inflammation.**
  - **– Do not swallow any of these service materials. It would cause diarrhea or nausea.**
  - **– Keep all these materials out of children's reach.**
- **Make sure the bonnet is fully closed and latched before driving. If it is not, it can fly up unexpectedly during driving, obstructing your view and resulting in an accident.**

- Before starting any service work, cover fenders, seats and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g., buttons) may cause damage to the vehicle's finish.



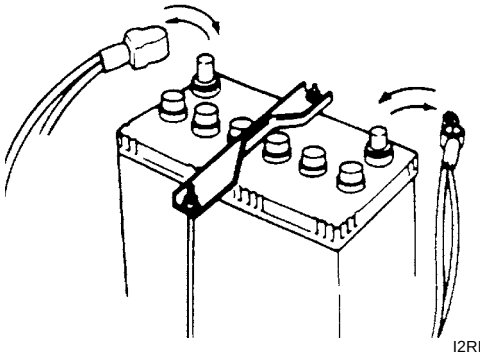
I2RH01010025-

- When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.
- When disconnecting the negative cable from the battery, record displayed contents of the clock and/or audio system before disconnecting and reset it as before after connecting.



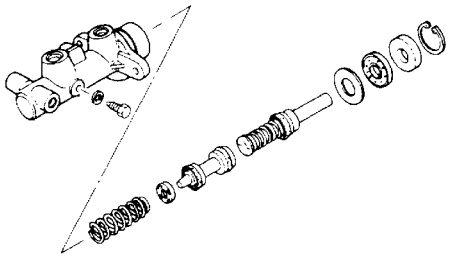
I2RH01010026-

- When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover.



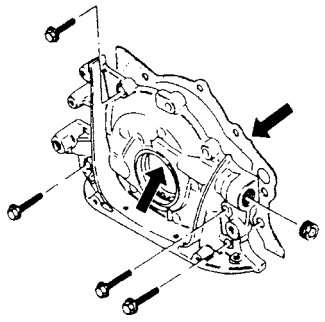
I2RH01010027-

- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.



I2RH01010028-

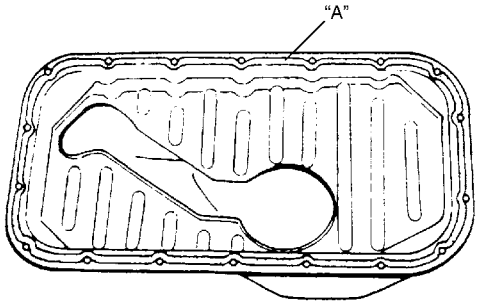
- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.



I2RH01010029-

- Make sure that all parts used in reassembly are perfectly clean.
  When use of a certain type of lubricant, bond or sealant is specified, be sure to use the specified type.

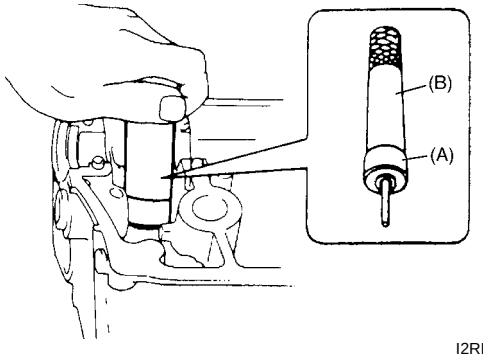
  "A": Water tight sealant 99000–31250



I2RH01010030-

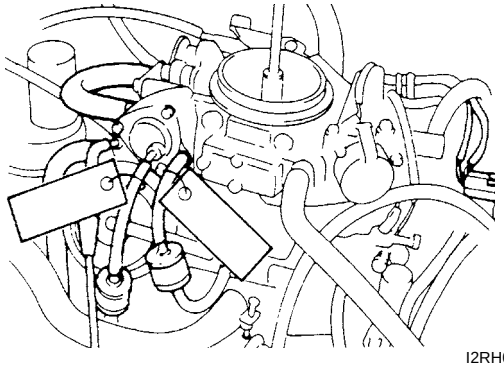
- Be sure to use special tools when instructed.

  Special tool
  (A): 09917-98221
  (B): 09916-58210



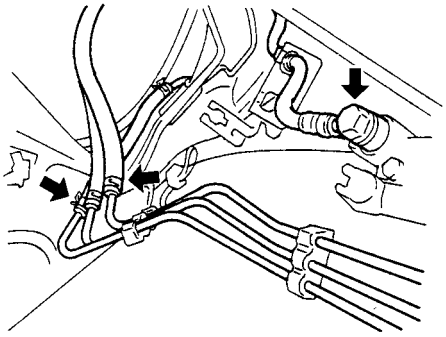
I2RH01010031-

- When disconnecting vacuum hoses, attach a tag describing the correct installation positions so that the hoses can be reinstalled correctly.



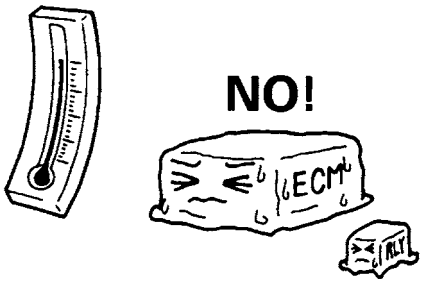
I2RH01010032-

- After servicing fuel, oil, coolant, vacuum, exhaust or brake systems, check all lines related to the system for leaks.



I2RH01010033-

- For vehicles equipped with fuel injection systems, never disconnect the fuel line between the fuel pump and injector without first releasing the fuel pressure, or fuel can be sprayed out under pressure.
- When performing a work that produces a heat exceeding 80 °C (176 °F) in the vicinity of the electrical parts, remove the heat sensitive electrical part(s) beforehand.

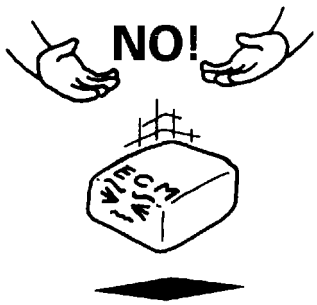


I2RH01010034-

- Use care not to expose connectors and electrical parts to water which will be a cause of a trouble.

I2RH01010035-

- Always be careful not to handle electrical parts (computer, relay, etc.) in a rough manner or drop them.



I2RH01010036-

Precautions for Catalytic Converter

S4RS0A0000003

For vehicles equipped with a catalytic converter, use only unleaded gasoline and be careful not to let a large amount of unburned gasoline enter the converter or it can be damaged.

- Conduct a spark jump test only when necessary, make it as short as possible, and do not open the throttle.
- Conduct engine compression checks within the shortest possible time.
- Avoid situations which can result in engine misfire (e.g. starting the engine when the fuel tank is nearly empty.)

Precautions for Installing Mobile Communication Equipment

S4RS0A0000004

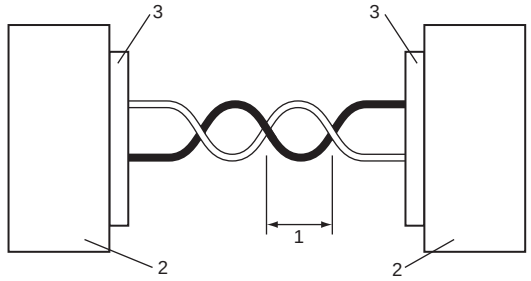
When installing mobile communication equipment such as CB (Citizens-Band)-radio or cellular-telephone, be sure to observe the following precautions.
Failure to follow cautions may adversely affect electronic control system.

- Keep the antenna as far away as possible from the vehicle's electronic control unit.
- Keep the antenna feeder more than 20 cm (7.9 in.) away from electronic control unit and its wire harnesses.
- Do not run the antenna feeder parallel with other wire harnesses.
- Confirm that the antenna and feeder are correctly adjusted.

Precaution for CAN Communication System

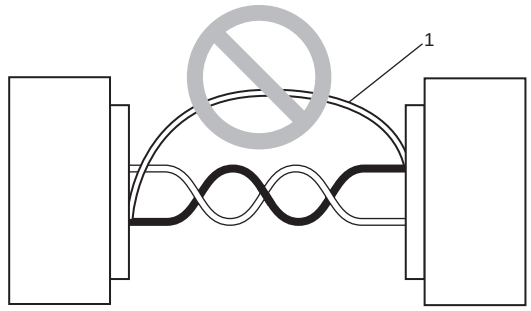
S4RS0A0000014

- The loose (1) in the wire harnesses twist of the CAN lines except around the connector (3) should be within 100 mm (3.9 in.). Refer to the wiring diagram for the CAN lines discrimination. Excessively-loosed lines may be influenced by the electric noise.



I4JA01000002-

- Do not connect terminals of the CAN line using a bypass wire (1). Otherwise, the CAN line may be influenced by the electric noise.

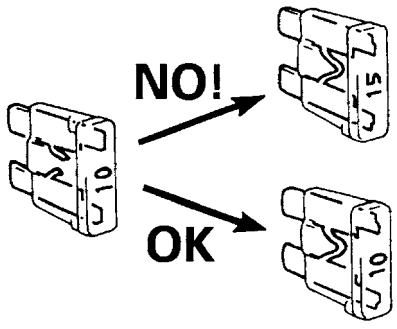


I4JA01000003-

Precautions for Electrical Circuit Service

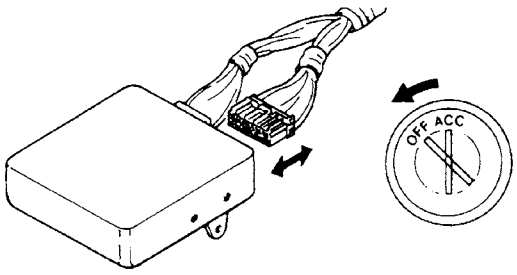
S4RS0A0000007

- When replacing a fuse, make sure to use a fuse of the specified capacity. Use of a fuse with a larger capacity will cause a damage to the electrical parts and a fire.



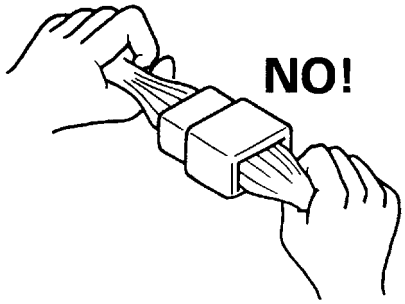
I2RH01010038-

- When disconnecting and connecting coupler, make sure to turn ignition switch OFF, or electronic parts may get damaged.



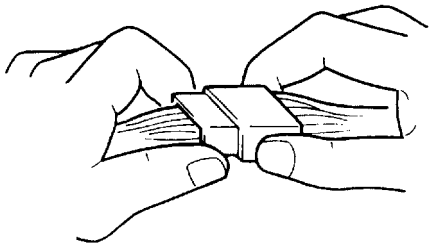
I2RH01010039-

- When disconnecting connectors, never pull the wiring harness. Unlock the connector lock first and then pull them apart by holding connectors themselves.



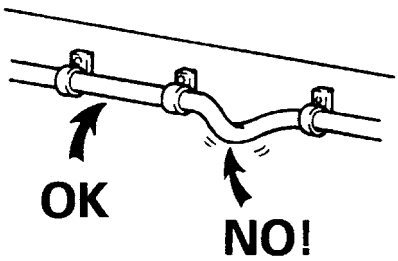
I2RH01010040-

- When connecting connectors, also hold connectors and put them together until they lock securely (a click is heard).



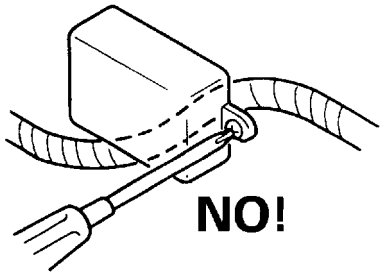
I2RH01010041-

- When installing the wiring harness, fix it with clamps so that no slack is left.



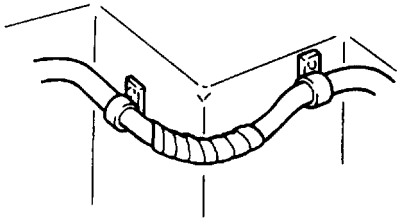
I2RH01010042-

- When installing vehicle parts, be careful so that the wiring harness is not interfered with or caught by any other part.



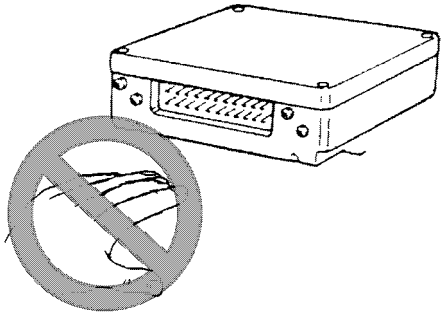
I2RH01010043-

- To avoid damage to the harness, protect its part which may contact against a part forming a sharp angle by winding tape or the like around it.



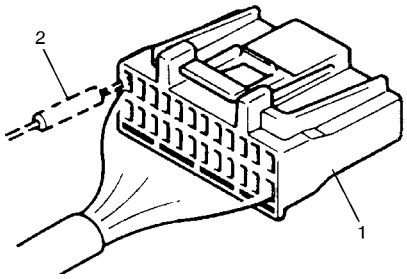
I2RH01010044-

- Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit like as ECM, PCM, P/S controller, etc.). The static electricity from your body can damage these parts.



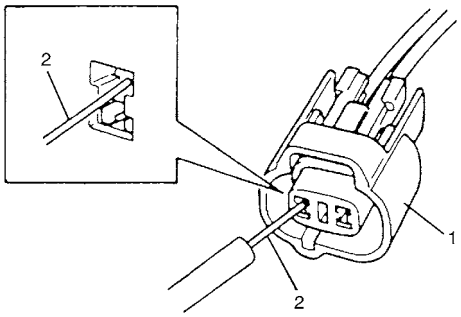
I3RM0A000004-

- Never connect any tester (voltmeter, ohmmeter, or whatever) to electronic control unit when its coupler is disconnected. Attempt to do it may cause damage to it.
- Never connect an ohmmeter to electronic control unit with its coupler connected to it. Attempt to do it may cause damage to electronic control unit and sensors.
- Be sure to use a specified voltmeter / ohmmeter. Otherwise, accurate measurements may not be obtained or personal injury may result. If not specified, use a voltmeter with high impedance (M Ω/V minimum) or a digital type voltmeter.
- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe (2) from the wire harness side (backside) of the connector (1).



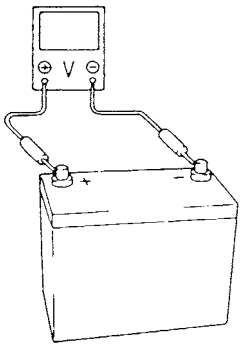
I2RH01010046-

- When connecting meter probe (2) from terminal side of coupler (1) because it can't be connected from harness side, use extra care not to bend male terminal of coupler of force its female terminal open for connection.
  In case of such coupler as shown connect probe as shown to avoid opening female terminal.
  Never connect probe where male terminal is supposed to fit.



I2RH01010047-

- When checking connection of terminals, check its male half for bend and female half for excessive opening and both for locking (looseness), corrosion, dust, etc.
- Before measuring voltage at each terminal, check to make sure that battery voltage is 11 V or higher. Such terminal voltage check at low battery voltage will lead to erroneous diagnosis.



I2RH01010048-

Air Bag Warning

S4RS0A0000008

WARNING:

For vehicles equipped with Supplemental Restraint (Air Bag) System:

- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components, Wiring and Connectors Location: in Section 8B" in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and "Precautions on Service and Diagnosis of Air Bag System: in Section 8B" before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the LOCK position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

Air Bag System Service Warning

S4RS0A0000009

WARNING:

- **Service on or around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Please observe all WARNINGS in Air Bag System and "Precautions on Service and Diagnosis of Air Bag System: in Section 8B" before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintended activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **The procedures in the air bag system section must be followed in the order listed to disable the air bag system temporarily and prevent false DTCs from setting. Failure to follow procedures could result in possible activation of the air bag system, personal injury or otherwise unneeded air bag system repairs.**

Fastener Caution

S4RS0A0000010

CAUTION:

When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread-locking compound, will be called out. The correct torque value must be used when installing fasteners that require it. If the conditions are not followed, parts or system damage could result.

Suspension Caution

S4RS0A0000011

CAUTION:

- **All suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.**
- **Never attempt to heat, quench or straighten any suspension part. Replace it with a new part or damage to the part may result.**

Wheels and Tires Caution

S4RS0A0000012

CAUTION:

All wheel fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts.
There is to be no welding as it may result in extensive damage and weakening of the metal.

Brake Caution

S4RS0A0000013

CAUTION:

All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.

Repair Instructions

Electrical Circuit Inspection Procedure

S4RS0A0006001

While there are various electrical circuit inspection methods, described here is a general method to check its open and short circuit by using an ohmmeter and a voltmeter.

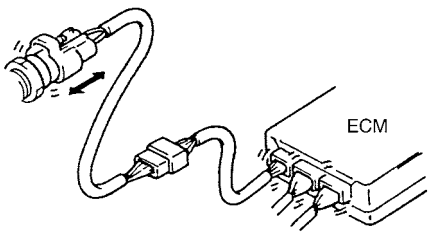
Open Circuit Check

Possible causes for the open circuit are as follows. As the cause is in the connector or terminal in many cases, they need to be checked particularly carefully.

- Loose connection of connector
- Poor contact of terminal (due to dirt, corrosion or rust on it, poor contact tension, entry of foreign object etc.)
- Wire harness being open

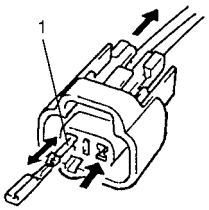
When checking system circuits including an electronic control unit such as ECM, TCM, ABS control module, etc., it is important to perform careful check, starting with items which are easier to check.

1) Disconnect negative (–) cable from battery
2) Check each connector at both ends of the circuit being checked for loose connection. Also check lock condition of connector if equipped with connector lock.



I2RH01010049-

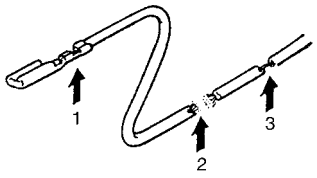
3) Using a test male terminal, check both terminals of the circuit being checked for contact tension of its female terminal. Check each terminal visually for poor contact (possibly caused by dirt, corrosion, rust entry of foreign object, etc.). At the same time, check to make sure that each terminal is locked in the connector fully.



I2RH01010050-

1. Check contact tension by inserting and removing just for once.

4) Using continuity check or voltage check the following procedure, check the wire harness for open circuit and poor connection with its terminals. Locate abnormality, if any.

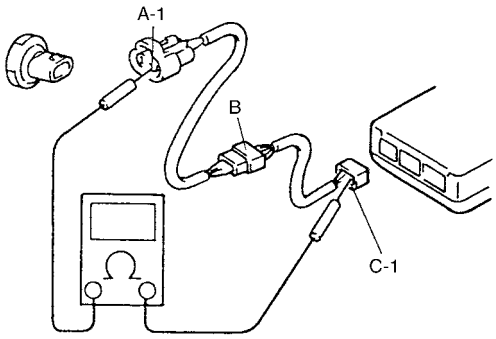


I2RH01010051-

1. Looseness of crimping
2. Open
3. Thin wire (single strand of wire)

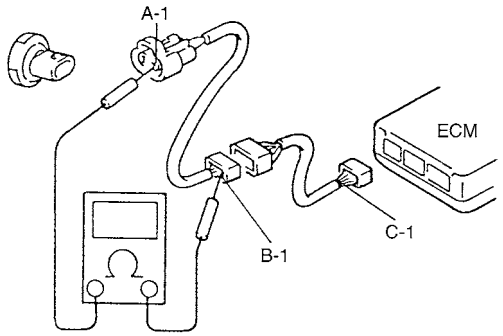
Continuity Check

1) Measure resistance between connector terminals at both ends of the circuit being checked (between “A-1” and “C-1” in the figure). If no continuity is indicated (infinity or over limit), that means that the circuit is open between terminals “A-1” and “C-1”.



I2RH01010052-

2) Disconnect the connector included in the circuit (connector-B in the figure) and measure resistance between terminals “A-1” and “B-1”.
If no continuity is indicated, that means that the circuit is open between terminals “A-1” and “B-1”. If continuity is indicated, there is an open circuit between terminals “B-1” and “C-1” or an abnormality in connector-B.



I2RH01010053-

Voltage Check

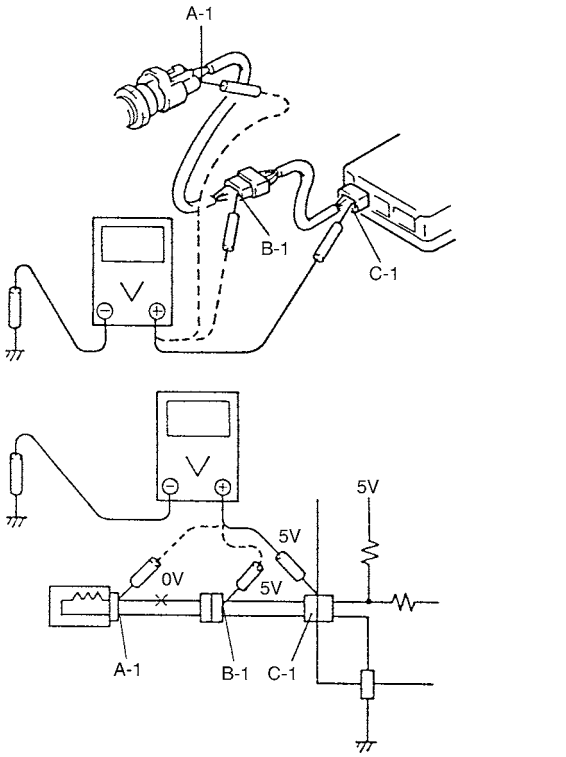
If voltage is supplied to the circuit being checked, voltage check can be used as circuit check.

1) With all connectors connected and voltage applied to the circuit being checked, measure voltage between each terminal and body ground.
   a) If measurements were taken as shown in the figure and results were as listed in the following, it means that the circuit is open between terminals “B-1” and “A-1”.

      Voltage between
      “C-1” and body ground: Approx. 5 V
      “B-1” and body ground: Approx. 5 V
      “A-1” and body ground: 0 V

   b) Also, if measured values were as listed in the following, it means that there is a resistance (abnormality) of such level that corresponds to the voltage drop in the circuit between terminals “A-1” and “B-1”.

      Voltage between
      “C-1” and body ground: Approx. 5 V
      “B-1” and body ground: Approx. 5 V
      “A-1” and body ground: Approx. 3 V



I5RH01000005-

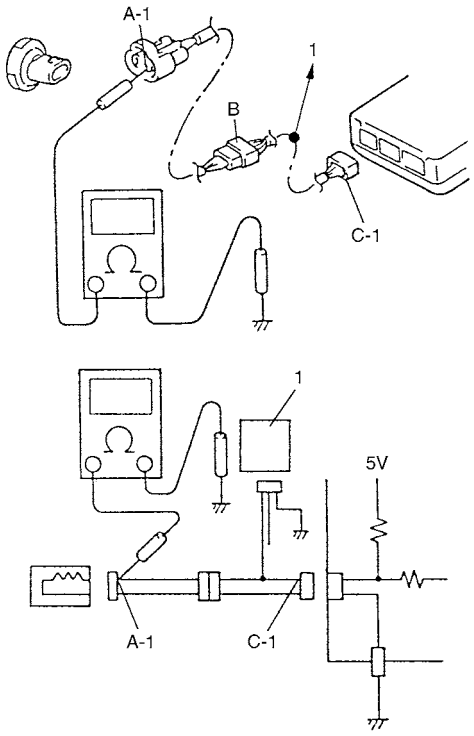
Short Circuit Check (Wire Harness to Ground)

1) Disconnect negative (–) cable at battery.
2) Disconnect connectors at both ends of the circuit to be checked.

   NOTE:

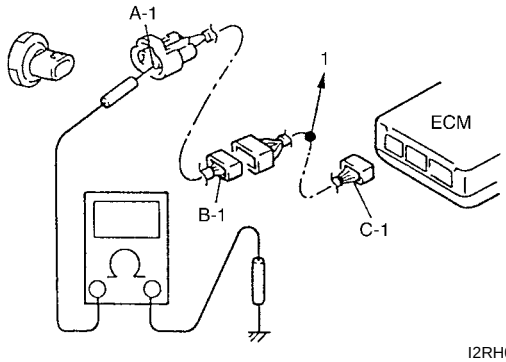
   If the circuit to be checked is connected to other parts (1), disconnect all connectors of those parts.
   Otherwise, diagnosis will be misled.

3) Measure resistance between terminal at one end of circuit (“A-1” terminal in the figure) and body ground. If continuity is indicated, it means that there is a short to ground between terminals “A-1” and “C-1” of the circuit.



I5RH01000006-

4) Disconnect the connector included in circuit (connector-B) and measure resistance between “A-1” and body ground. If continuity is indicated, it means that the circuit is shorted to the ground between terminals “A-1” and “B-1”.



I2RH01010056-

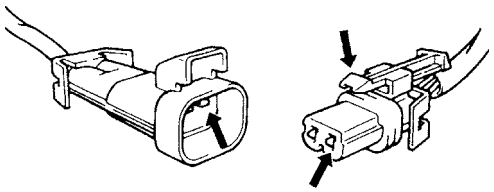
1.	To other parts

Intermittent and Poor Connection Inspection

S4RS0A0006002

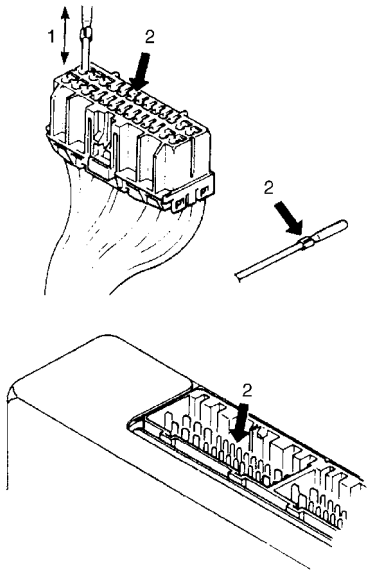
Most intermittent are caused by faulty electrical connections or wiring, although a sticking relay or solenoid can occasionally be at fault. When checking it for proper connection, perform careful check of suspect circuits for:

- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact. However, cleaning the terminal with a sand paper or the like is prohibited.
- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.



I2RH01010057-

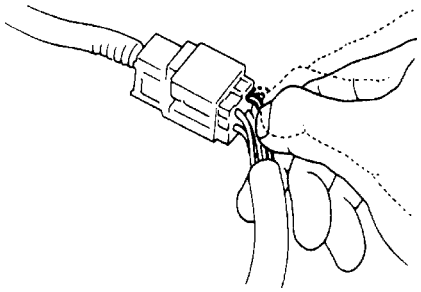
- Improperly formed or damaged terminals.
  Check each connector terminal in problem circuits carefully to ensure good contact tension by using the corresponding mating terminal.
  If contact tension is not enough, reform it to increase contact tension or replace.



I5RH01000007-

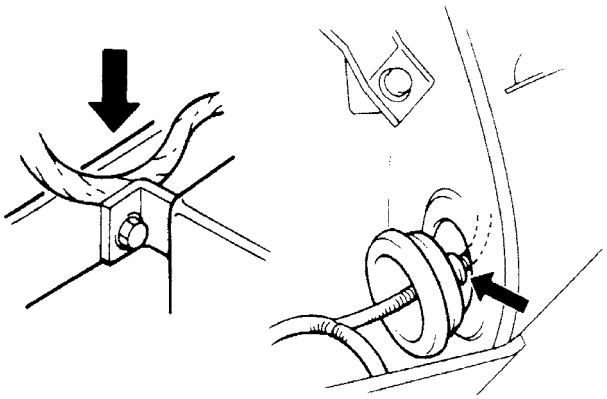
1.	Check contact tension by inserting and removing just once.
2.	Check each terminal for bend and proper alignment.

- Poor terminal-to-wire connection.
  Check each wire harness in problem circuits for poor connection by shaking it by hand lightly. If any abnormal condition is found, repair or replace.



I2RH01010059-

- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are intact, resistance could be far too high.
  If any abnormality is found, repair or replace.



I2RH01010060-

Section 0

General Information

0

CONTENTS

General Information 0A-1
General Description 0A-1
Abbreviations 0A-1
Symbols 0A-2
Wire Color Symbols 0A-2
Fasteners Information 0A-3
Vehicle Lifting Points 0A-4
Engine Supporting Points 0A-6
Vehicle Identification Number 0A-7
Engine Identification Number 0A-7
Transmission Identification Number 0A-7
Component Location 0A-7
Warning, Caution and Information Labels Location 0A-7

Maintenance and Lubrication 0B-1
Precautions 0B-1
Precautions for Maintenance and Lubrication 0B-1
Scheduled Maintenance 0B-1
Maintenance Schedule under Normal Driving Conditions 0B-1
Maintenance Recommended under Severe Driving Conditions 0B-2
Repair Instructions 0B-3
Accessory Drive Belt Inspection 0B-3
Accessory Drive Belt Replacement 0B-4
Valve Lash (Clearance) Inspection 0B-4
Engine Oil and Filter Change 0B-4
Engine Coolant Change 0B-5
Exhaust System Inspection 0B-6
Spark Plugs Replacement 0B-6
Air Cleaner Filter Inspection 0B-6
Air Cleaner Filter Replacement 0B-6
Fuel Lines and Connections Inspection 0B-6
Fuel Filter Replacement 0B-7
Fuel Tank Inspection 0B-7
PCV Valve Inspection 0B-7
Fuel Evaporative Emission Control System Inspection 0B-7
Brake Discs and Pads (Front) Inspection 0B-7
Brake Drums and Shoes (Rear) Inspection 0B-7
Brake Hoses and Pipes Inspection 0B-8
Brake Fluid Replacement 0B-8
Brake Lever and Cable Inspection 0B-8
Clutch fluid Inspection 0B-8
Tires Inspection 0B-9
Wheel Discs Inspection 0B-9
Wheel Bearing Inspection 0B-9
Suspension System Inspection 0B-9
Steering System Inspection 0B-9
Drive Shaft (Axle) Boots Inspection 0B-10
Manual Transaxle Oil Inspection 0B-10
Manual Transaxle Oil Replacement 0B-10
Automatic Transaxle Fluid Level Inspection 0B-11
Automatic Transaxle Fluid Replacement 0B-11
Automatic Transaxle Fluid Cooler Hose Inspection 0B-11
All Latches, Hinges and Locks Inspection 0B-11
Air Conditioning Filter (If Equipped) Inspection 0B-12
Air Conditioning Filter (If Equipped) Replacement 0B-12
Final Inspection for Maintenance Service 0B-12
Specifications 0B-13
Tightening Torque Specifications 0B-13
Special Tools and Equipment 0B-13
Recommended Fluids and Lubricants 0B-13
Special Tool 0B-13

General Information

General Description

Abbreviations

S4RS0A0101001

A:
ABS: Anti-lock Brake System
ATDC: After Top Dead Center
API: American Petroleum Institute
ATF: Automatic Transmission Fluid, Automatic Transaxle Fluid
ALR: Automatic Locking Retractor
AC: Alternating Current
A/T: Automatic Transmission, Automatic Transaxle
A/C: Air Conditioning
ABDC: After Bottom Dead Center
A/F: Air Fuel Mixture Ratio
A-ELR: Automatic-Emergency Locking Retractor
B:
B+: Battery Positive Voltage
BTDC: Before Top Dead Center
BBDC: Before Bottom Dead Center
BCM: Body Electrical Control Module
C:
CAN: Controller Area Network
CKT: Circuit
CKP Sensor: Crankshaft Position Sensor
CMP Sensor: Camshaft Position Sensor
CO: Carbon Monoxide
CPP Switch: Clutch Pedal Position Switch (Clutch Switch, Clutch Start Switch)
CPU: Central Processing Unit
CRS: Child Restraint System
D:
DC: Direct Current
DLC: Data Link Connector (Assembly Line Diag. Link, ALDL, Serial Data Link, SDL)
DOHC: Double Over Head Camshaft
DOJ: Double Offset Joint
DRL: Daytime Running Light
DTC: Diagnostic Trouble Code (Diagnostic Code)
E:
EBCM: Electronic Brake Control Module, ABS Control Module
EBD: Electronic Brake Force Distribution
ECM: Engine Control Module
ECT Sensor: Engine Coolant Temperature Sensor (Water Temp. Sensor, WTS)
EGR: Exhaust Gas Recirculation
EGRT Sensor: EGR Temperature Sensor (Recirculated Exhaust Gas Temp. Sensor, REGTS)
EFE Heater: Early Fuel Evaporation Heater (Positive Temperature Coefficient, PTC Heater)
EPS: Electronic Power Steering
EVAP: Evaporative Emission
EVAP Canister: Evaporative Emission Canister (Charcoal Canister)
F:
4WD: 4 Wheel Drive
G:
GEN: Generator
GND: Ground
H:
HC: Hydrocarbons
HO2S: Heated Oxygen Sensor
HAVC: Heating, Ventilating and Air Conditioning
I:
IAC Valve: Idle Air Control Valve (Idle Speed Control Solenoid Valve, ISC Solenoid Valve)
IAT Sensor: Intake Air Temperature Sensor (Air temperature Sensor, ATS)
ICM: Immobilizer Control Module
IG: Ignition
ISC Actuator: Idle Speed Control Actuator
L:
LH: Left Hand
LSPV: Load Sensing Proportioning Valve
M:
MAF Sensor: Mass Air Flow Sensor (Air Flow Sensor, AFS, Air Flow Meter, AFM)
MAP Sensor: Manifold Absolute Pressure Sensor (Pressure Sensor, PS)
Max: Maximum
MFI: Multiport Fuel Injection (Multipoint Fuel Injection)
Min: Minimum
MIL: Malfunction Indicator Lamp (“SERVICE ENGINE SOON” Light)
M/T: Manual Transmission, Manual Transaxle
N:
NOx: Nitrogen Oxides
O:
OBD: On-Board Diagnostic System (Self-Diagnosis Function)
O/D: Overdrive
OHC: Over Head Camshaft
O2S: Oxygen Sensor
P:
PNP: Park / Neutral Position
P/S: Power Steering
PSP Switch: Power Steering Pressure Switch (P/S Pressure Switch)
PCM: Powertrain Control Module
PCV: Positive Crankcase Ventilation
R:
RH: Right Hand
S:
SAE: Society of Automotive Engineers
SDM: Sensing and Diagnostic Module (Air Bag Controller, Air bag Control Module)
SFI: Sequential Multiport Fuel Injection
SOHC: Single Over Head Camshaft
T:
TBI: Throttle Body Fuel Injection (Single-Point Fuel Injection, SPI)

TCC: Torque Converter Clutch
TCM: Transmission Control Module (A/T Controller, A/T Control Module)
TP Sensor: Throttle Position Sensor
TVV: Thermal Vacuum Valve (Thermal Vacuum Switching Valve, TVSV, Bimetal Vacuum Switching Valve, BVSV)
TWC: Three Way Catalytic Converter (Three Way Catalyst)
2WD: 2 Wheel Drive
V:
VIN: Vehicle Identification Number
VSS: Vehicle Speed Sensor
VVT: Variable Valve Timing
W:
WU-OC: Warm Up Oxidation Catalytic Converter
WU-TWC: Warm Up Three Way Catalytic Converter

Symbols

S4RS0A0101002

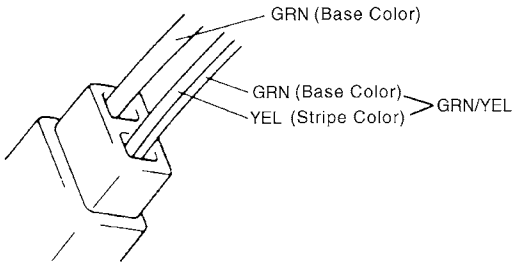
Symbol	Definition	Symbol	Definition
	Tightening torque	1216B	Apply SUZUKI BOND NO. 1216B 99000-31230
OIL	Apply oil (engine, transmission, transfer, differential)	Si	Apply SILICONE SEALANT 99000-31120
FLD	Apply fluid (brake, power steering or automatic transmission fluid)	366E	Apply SEALING COMPOUND 366E 99000-31090
A	Apply SUZUKI SUPER GREASE A 99000-25010		
C	Apply SUZUKI SUPER GREASE C 99000-25030	1322	Apply THREAD LOCK 1322 99000-32110
E	Apply SUZUKI SUPER GREASE E 99000-25050	1333B	Apply THREAD LOCK 1333B 99000-32020
H	Apply SUZUKI SUPER GREASE H 99000-25120	1342	Apply THREAD LOCK 1342 99000-32050
I	Apply SUZUKI SUPER GREASE I 99000-25210		
1215	Apply SUZUKI BOND NO. 1215 99000-31110		Do not reuse
1207F	Apply SUZUKI BOND NO. 1207F 99000-31250		Note on reassembly
1217G	Apply SUZUKI BOND NO. 1217G 99000-31260		

Wire Color Symbols

S4RS0A0101003

Symbol		Wire Color	Symbol		Wire Color
B	BLK	Black	O, Or	ORN	Orange
Bl	BLU	Blue	R	RED	Red
Br	BRN	Brown	W	WHT	White
G	GRN	Green	Y	YEL	Yellow
Gr	GRY	Gray	P	PNK	Pink
Lbl	LT BLU	Light blue	V	PPL	Violet
Lg	LT GRN	Light green			

There are two kinds of colored wire used in this vehicle. One is single-colored wire and the other is dual-colored (striped) wire.
The single-colored wire uses only one color symbol (i.e. “GRN”).
The dual-colored wire uses two color symbols (i.e. “GRN/YEL”). The first symbol represents the base color of the wire (“GRN” in the figure) and the second symbol represents the color of the stripe (“YEL” in the figure).



I2RH01010010-

Fasteners Information

S4RS0A0101004

Metric Fasteners

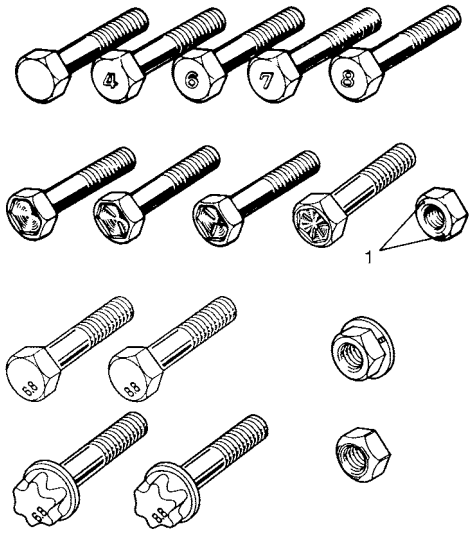
Most of the fasteners used for this vehicle are metric. When replacing any fasteners, it is most important that replacement fasteners be the correct diameter, thread pitch and strength.

Fastener Strength Identification

Most commonly used metric fastener strength property classes are 4T, 6.8, 7T, 8.8 and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch, 6 or 8 mark strength identification on the nut face. Figure shows the different strength markings.

When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct diameter and thread pitch. Correct replacement bolts and nuts are available through the parts division.

Metric bolts: Identification class numbers or marks correspond to bolt strength (increasing numbers represent increasing strength).



I5RH01010001-

1. Nut strength identification

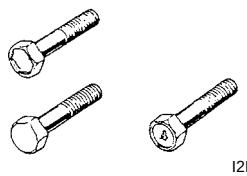
Standard Tightening Torque

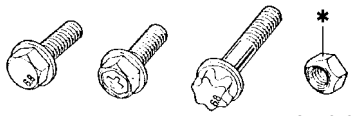
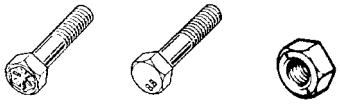
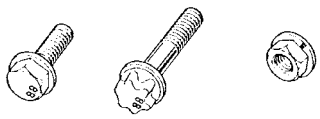
Each fastener should be tightened to the torque specified in each section. If no description or specification is provided, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, however, use the torque specified for the original fastener.

NOTE:

- **For the flanged bolt, flanged nut and self-lock nut of 4T and 7T strength, add 10% to the tightening torque given in the following chart.**
- **The following chart is applicable only where the fastened parts are made of steel light alloy.**

Tightening torque chart

Strength	Unit	Thread diameter (Nominal diameter) (mm)								
		4	5	6	8	10	12	14	16	18
A equivalent of 4T strength fastener	N·m	1.5	3.0	5.5	13	29	45	65	105	160
	kg-m	0.15	0.30	0.55	1.3	2.9	4.5	6.5	10.5	16
	lb-ft	1.0	2.5	4.0	9.5	21.0	32.5	47.0	76.0	116.0
 I2RH01010012-01										

Strength	Unit	Thread diameter (Nominal diameter) (mm)								
		4	5	6	8	10	12	14	16	18
A equivalent of 6.8 strength fastener without flange	N·m	2.4	4.7	8.4	20	42	80	125	193	280
	kg-m	0.24	0.47	0.84	2.0	4.2	8.0	12.5	19.3	28
	lb-ft	2.0	3.5	6.0	14.5	30.5	58.0	90.5	139.5	202.5
I2RH01010013-01										
A equivalent of 6.8 strength fastener with flange *: Self-lock nut	N·m	2.4	4.9	8.8	21	44	84	133	203	298
	kg-m	0.24	0.49	0.88	2.1	4.4	8.4	13.3	20.3	29.8
	lb-ft	2.0	3.5	6.5	15.5	32.0	61.0	96.5	147.0	215.5
 I2RH01010014-01										
A equivalent of 7T strength fastener	N·m	2.3	4.5	10	23	50	85	135	210	240
	kg-m	0.23	0.45	1.0	2.3	5.0	8.5	13.5	21	24
	lb-ft	2.0	3.5	7.5	17.0	36.5	61.5	98.0	152.0	174.0
I2RH01010015-01										
A equivalent of 8.8 strength fastener without flange	N·m	3.1	6.3	11	27	56	105	168	258	373
	kg-m	0.31	0.63	1.1	2.7	5.6	10.5	16.8	25.8	37.3
	lb-ft	2.5	4.5	8.0	19.5	40.5	76.0	121.5	187.0	270.0
 I2RH01010016-01										
A equivalent of 8.8 strength fastener with flange	N·m	3.2	6.5	12	29	59	113	175	270	395
	kg-m	0.32	0.65	1.2	2.9	5.9	11.3	17.5	27	39.5
	lb-ft	2.5	5.0	9.0	21.0	43.0	82.0	126.5	195.5	286.0
 I2RH01010017-01										

***:Self-lock nut**

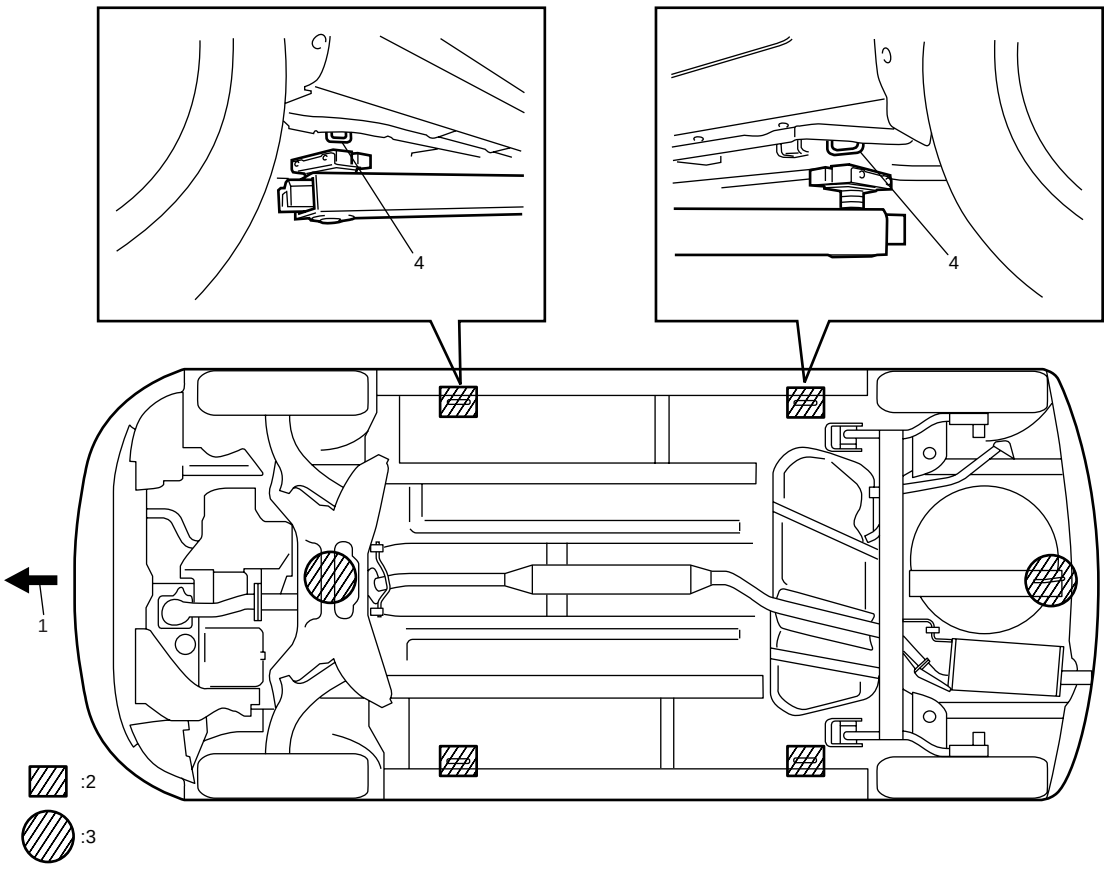
Vehicle Lifting Points

S4RS0A0101005

WARNING:

- **Before applying hoist to underbody, always take vehicle balance throughout service into consideration. Vehicle balance on hoist may change depending on what part to be removed.**
- **Before lifting up the vehicle, check to be sure that end of hoist arm is not in contact with brake pipe, fuel pipe, bracket or any other part.**
- **When using frame contact hoist, apply hoist as shown (right and left at the same position). Lift up the vehicle till 4 tires are a little off the ground and make sure that the vehicle will not fall off by trying to move vehicle body in both ways. Work can be started only after this confirmation.**
- **Make absolutely sure to lock hoist after vehicle is hoisted up.**

When Using Frame Contact Hoist



I4RS0A010001-

1. Vehicle front	3. Floor jack position
2. Support position for frame contact hoist and safety stand	4. Body mounting stay

When Using Floor Jack

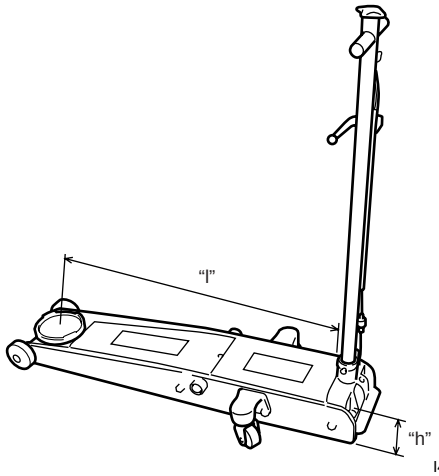
WARNING:

If the vehicle to be jacked up only at the front or rear end, be sure to block the wheels on ground in order to ensure safety.
After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on jack alone.

CAUTION:

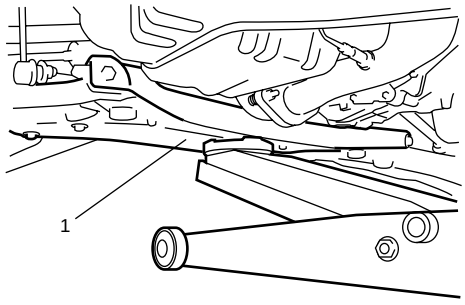
- **Never apply jack against rear suspension parts (i.e., stabilizer, etc.) or vehicle floor, or it may get deformed.**
- **When jacking up the front end, be sure to use an air type floor jack with the following specified height or a manual type floor jack of the following size. Otherwise, the jack may cause the bumper or vehicle body panel a damage.**

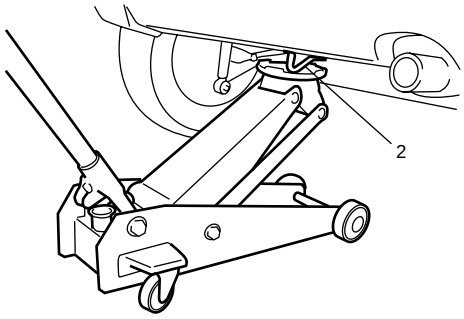
Jack size
Height "h": under 145 mm (under 5.71 in.)
Length "l": above 900 mm (above 35.4 in.)



I4RS0A010002-

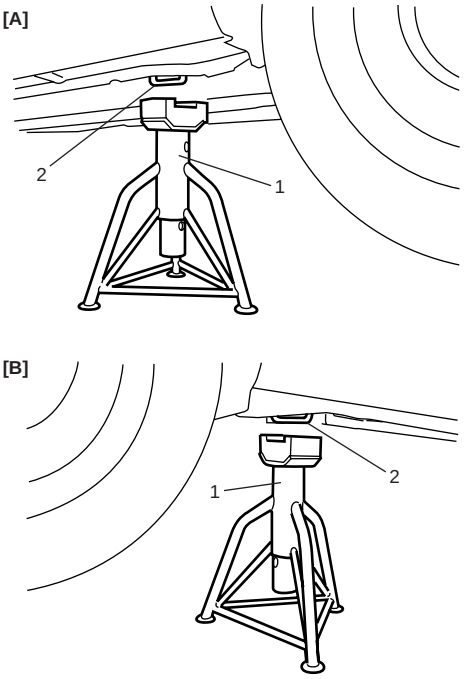
In raising front or rear vehicle end off the floor by jacking, be sure to put the jack against front suspension frame (1) or rear jacking bracket (2).





I4RS0A010003-

To perform service with either front or rear vehicle end jacked up, be sure to place safety stands (1) under body mounting stay (2) so that vehicle body is securely supported. And then check to ensure that body mounting stay (2) does not slide on safety stands (1) and the vehicle is held stable for safety's sake.



I4RS0A010004-

[A]:	Front
[B]:	Rear

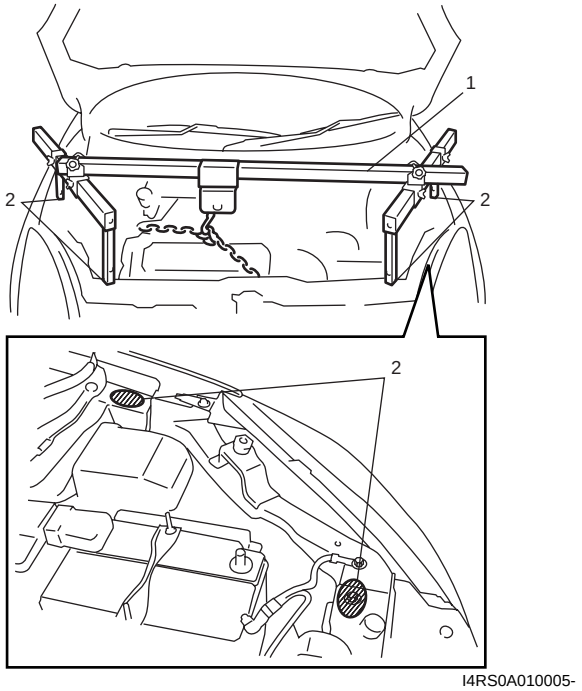
Engine Supporting Points

S4RS0A0101008

WARNING:

When using engine supporting device (1), be sure to observe the followings. Otherwise, not only deformation of vehicle body but also personal injury may result.

- **Apply supporting device at the specified positions (2) indicated in figure**
- **Install supporting device taking a well-balanced posture.**
- **Do not contact supporting device with other parts than engine room body panel and engine hooks.**

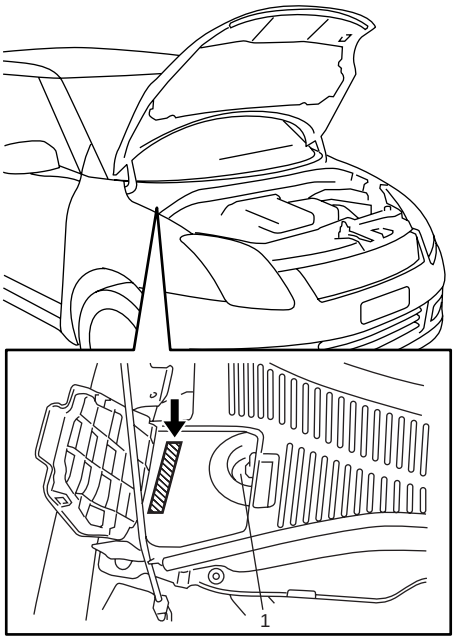


I4RS0A010005-

Vehicle Identification Number

S4RS0A0101006

The number is punched close by the right side strut support (1) in engine room.

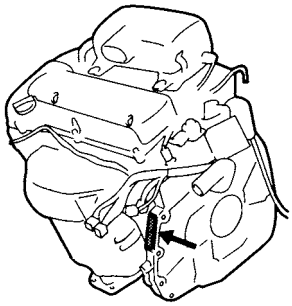


I4RS0A010006-

Engine Identification Number

S4RS0A0101007

The number is punched on cylinder block.

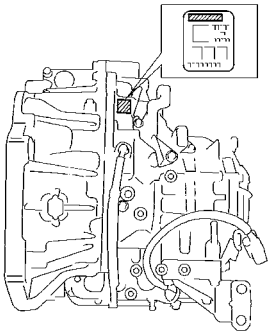


I3RM0A010005-

Transmission Identification Number

S4RS0A0101009

The automatic transmission identification number is located on transmission case.



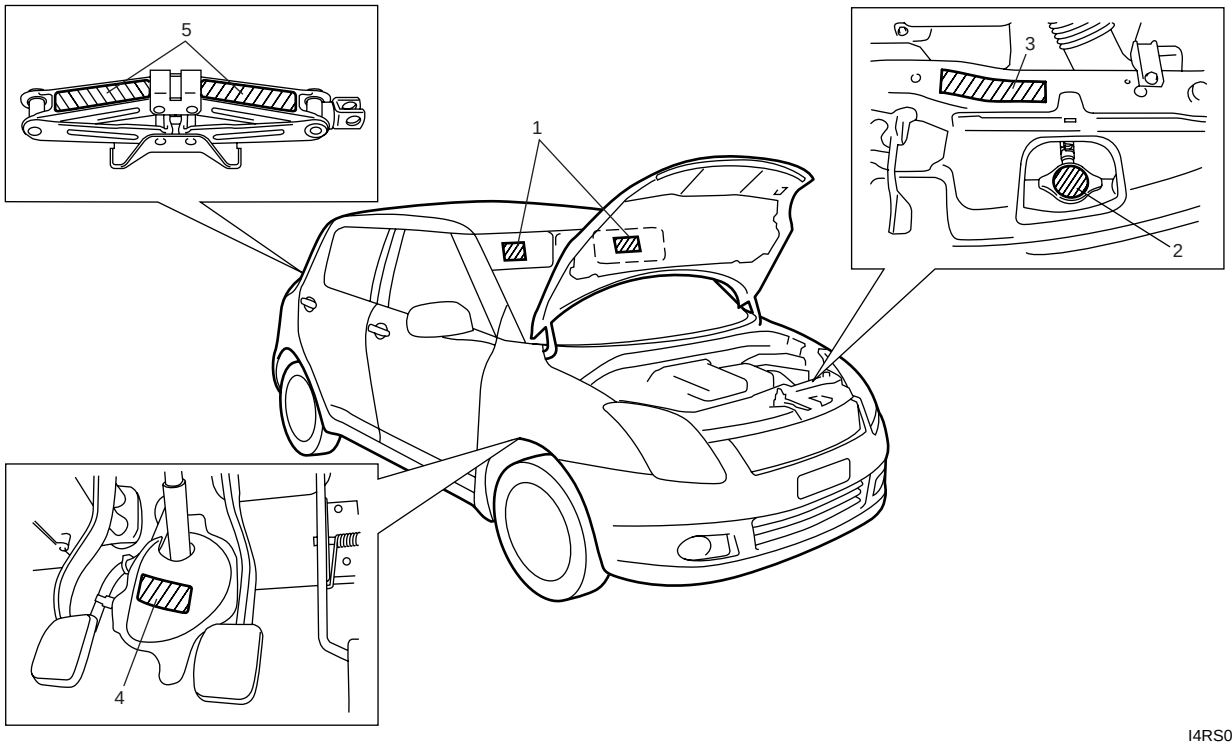
I4RS0A010008-

Component Location

Warning, Caution and Information Labels Location

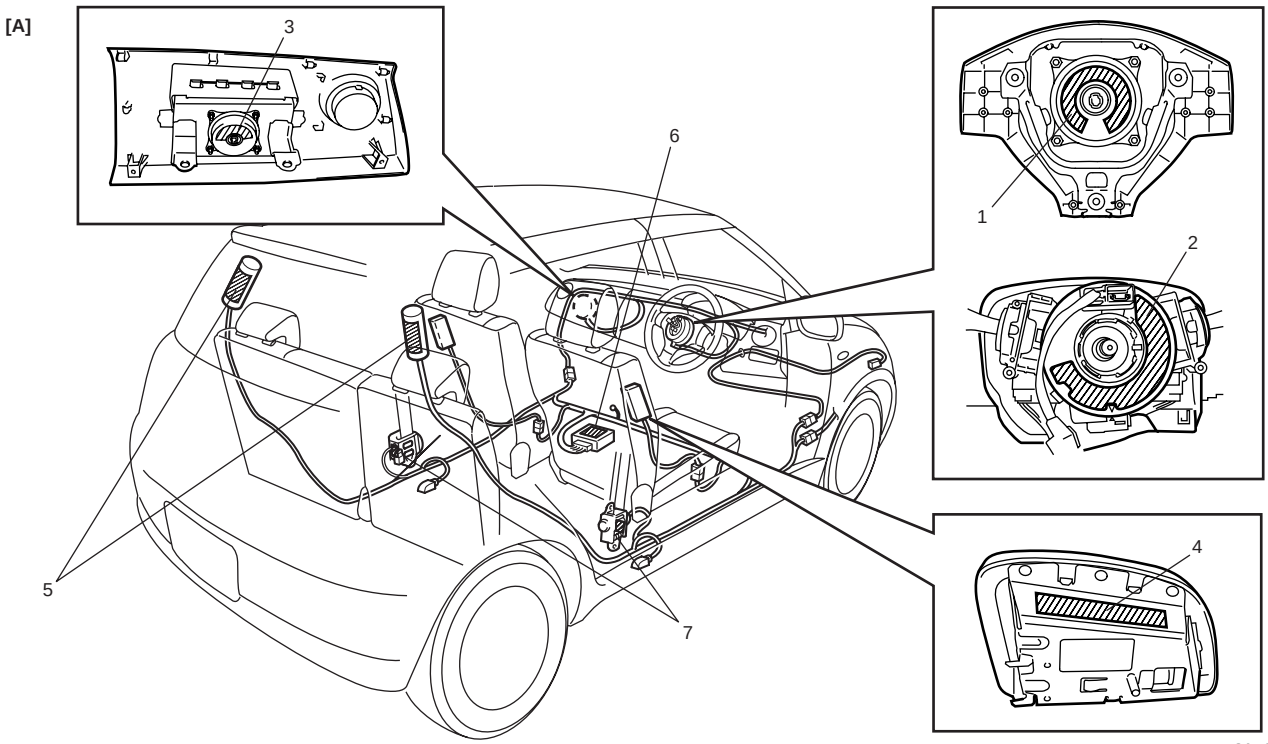
S4RS0A0103001

The figure shows main labels among others that are attached to vehicle component parts.
When servicing and handling parts, refer to WARNING / CAUTION instructions printed on labels.
If any WARNING / CAUTION label is found stained or damaged, clean or replace it as necessary.



I4RS0A010007-

1. Air bag label on sun visor (if equipped)	4. Steering shaft joint cover label (if equipped)
2. Radiator cap label	5. Jack label
3. Engine cooling fan label	



I4RS0A010009-

1. Air bag label on driver air bag (inflator) module	5. Air bag label on curtain air bag (inflator) module
2. Air bag label on combination switch and contact coil assembly	6. Air bag label on SDM
3. Air bag label on passenger air bag (inflator) module	7. Pretensioner label on seat belt retractor
4. Air bag label on side air bag (inflator) module	[A]: These labels are attached on vehicle equipped with air bag system only.

Maintenance and Lubrication

Precautions

Precautions for Maintenance and Lubrication

S4RS0A0200001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Scheduled Maintenance

Maintenance Schedule under Normal Driving Conditions

S4RS0A0205001

NOTE:

- **This interval should be judged by odometer reading or months, whichever comes first.**
- **This table includes service as scheduled up to 90,000 km (54,000 miles) mileage. Beyond 90,000 km (54,000 miles), carry out the same services at the same intervals respectively.**

Interval				Km (x 1,000)	15	30	45	60	75	90
				Miles (x 1,000)	9	18	27	36	45	54
				Months	12	24	36	48	60	72
Engine										
Accessory drive belt (I: ☞, R: ☞)					—	—	I	—	—	R
Valve lash (clearance) (I: ☞)					—	I	—	I	—	I
Engine oil and oil filter (R: ☞)					R	R	R	R	R	R
Engine coolant (R: ☞)					—	—	R	—	—	R
Exhaust system (I: ☞)					—	I	—	I	—	I
Ignition system										
Spark plugs (R: ☞)	When unleaded fuel is used	Vehicle without HO2S	Nickel plug		—	R	—	R	—	R
			Iridium plug		—	—	—	R	—	—
		Vehicle with HO2S	Nickel plug		—	—	R	—	—	R
			Iridium plug (Highly recommended)		Replace every 105,000 km (63,000 miles) or 84 months					
	When leaded fuel is used, refer to “Maintenance Recommended under Severe Driving Conditions: ”.									
Fuel system										
Air cleaner filter (R: ☞, I: ☞)			Paved-road		I	I	R	I	I	R
			Dusty conditions		Refer to “Maintenance Recommended under Severe Driving Conditions: ”.					
Fuel lines and connections (I: ☞)					—	I	—	I	—	I
Fuel filter (R: ☞)					Replace every 105,000 km (63,000 miles)					
Fuel tank (I: ☞)					—	—	I	—	—	I
Emission control system										
PCV valve (I: ☞)		Vehicle without HO2S			—	—	I	—	—	I
		Vehicle with HO2S			—	—	—	—	—	I
Fuel evaporative emission control system (I: ☞)					—	—	—	—	—	I
Brake										
Brake discs and pads (thickness, wear, damage) (I: ☞)					I	I	I	I	I	I
Brake drums and shoes (wear, damage) (I: ☞)					—	I	—	I	—	I
Brake hoses and pipes (leakage, damage, clamp) (I: ☞)					—	I	—	I	—	I
Brake fluid (R: ☞)					—	R	—	R	—	R
Brake lever and cable (damage, stroke, operation) (I: ☞)					Inspect at first 15,000 km (9,000 miles only)					
Chassis and body										
Clutch (fluid level, leakage) (I: ☞)					—	I	—	I	—	I
Tires (wear, damage, rotation) / wheels (damage) (I: ☞ / ☞)					I	I	I	I	I	I
Suspension system (tightness, damage, rattle, breakage) (I: ☞)					—	I	—	I	—	I

Interval	Km (x 1,000)	15	30	45	60	75	90
	Miles (x 1,000)	9	18	27	36	45	54
	Months	12	24	36	48	60	72
Steering system (tightness, damage, breakage, rattle) (I: ☞)		—	I	—	I	—	I
Drive shaft (axle) boots (I: ☞)		—	—	I	—	—	I
Manual transaxle oil (leakage, level) (I: ☞ 1st 15,000 km only) (R: ☞)		I	—	R	—	—	R
Automatic transaxle fluid	Fluid level (I: ☞)	—	I	—	I	—	I
	Fluid change (R: ☞)	Replace every 165,000 km (99,000 miles)					
	Fluid hose (I: ☞)	—	—	—	I	—	—
All latches, hinges and locks (I: ☞)		—	I	—	I	—	I
Air conditioning filter (if equipped) (I: ☞) (R: ☞)		—	I	R	—	I	R

NOTE:

- **"R": Replace or change**
- **"I": Inspect and correct, replace or lubricate if necessary**
- **For spark plugs, replace every 50,000 km if the local law requires.**
- **Nickel spark plug: BKR6E-11 (NGK) or K20PR-U11 (DENSO)**
- **Iridium spark plug: IFR6J11 (NGK)**

Maintenance Recommended under Severe Driving Conditions

S4RS0A0205002

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, IT IS RECOMMENDED that applicable maintenance operation be performed at the particular interval as shown in the following table.

Severe condition code:

A: Repeated short trips
B: Driving on rough and/or muddy roads
C: Driving on dusty roads
D: Driving in extremely cold weather and/or salted roads
E: Repeated short trips in extremely cold weather
F: Leaded fuel use
G: – – – – –
H: Towing a trailer (if admitted)

Severe condition code	Maintenance		Maintenance operation	Maintenance interval
– B C D – – – –	Accessory drive belt		☞ I	Every 15,000 km (9,000 miles) or 12 months
			☞ R	Every 45,000 km (27,000 miles) or 36 months
A – C D E F – H	Engine oil and oil filter		☞ R	Every 7,500 km (4,500 miles) or 6 months
– – C – – – – –	Air cleaner filter *1		☞ I	Every 2,500 km (1,500 miles)
			☞ R	Every 30,000 km (18,000 miles) or 24 months
A B C – E F – H	Spark plugs	Nickel spark plug	☞ R	Every 10,000 km (6,000 miles) or 8 months
		Iridium spark plug		Every 30,000 km (18,000 miles) or 24 months
– B C D – – – H	Wheel bearings		☞ I	Every 15,000 km (9,000 miles) or 12 months
– B – D E – – H	Drive shafts		☞ I	Every 15,000 km (9,000 miles) or 12 months

Severe condition code	Maintenance	Maintenance operation	Maintenance interval
– B – – E – – H	Manual transaxle oil	☞ R	First time only: 15,000 km (9,000 miles) or 12 months
			Second time and after: Every 30,000 km (18,000 miles) or 24 months reckoning from 0 km (0 mile) or 0 month
– B – – E – – H	Automatic transaxle fluid	☞ R	Every 30,000 km (18,000 miles) or 24 months
– – C D – – – –	Air conditioning filter *2	☞ I	Every 15,000 km (9,000 miles) or 12 months
		☞ R	Every 45,000 km (27,000 miles) or 36 months

NOTE:

- **"I": Inspect and correct or replace if necessary**
- **"R": Replace or change**
- ***1: Inspect more frequently if the vehicle is used under dusty conditions.**
- ***2: Clean or replace more frequently if the air from the air conditioning decreases.**

Repair Instructions

Accessory Drive Belt Inspection

S4RS0A0206001

WARNING:

All inspection and replacement are to be performed with ENGINE NOT RUNNING.

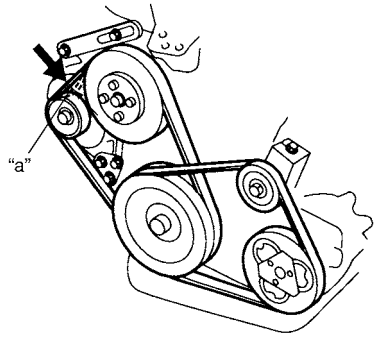
Water Pump and Generator Drive Belt

1) Disconnect negative (–) cable at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace.
   Check belt for tension.

   Water pump and generator belt tension
   "a": 4.5 – 5.5 mm (0.18 – 0.22 in.) deflection under 100 N (10 kg, 22 lb) pressure

   NOTE:

   When replacing belt with a new one, adjust belt tension to 3 – 4 mm (0.12 – 0.16 in.)



I3RM0A020001-

3) If belt is too tight or too loose, adjust it to specification by adjusting alternator position.
4) Tighten alternator adjusting bolts and pivot bolt.
5) Connect negative (–) cable to battery.

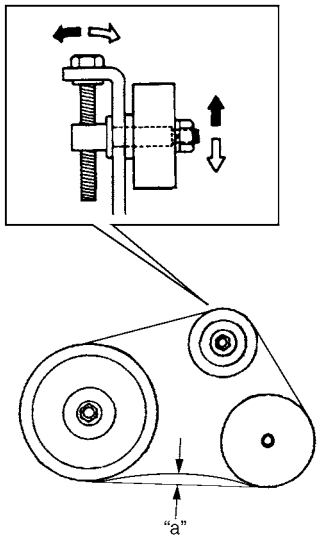
A/C Compressor Drive Belt (If Equipped)

1) Disconnect negative (–) cable at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace.
   Check belt for tension.
   If belt tension is out of specification, adjust it referring to "Compressor Drive Belt Inspection and Adjustment: in Section 7B".

   A/C compressor drive belt tension
   "a": 7 – 8 mm (0.28 – 0.31 in.) deflection under 100 N (10 kg, 22 lb) pressure

NOTE:

When replacing belt with a new one, adjust belt tension to 6 – 7 mm (0.24 – 0.28 in.).



I4RS0A020001-

3) Connect negative (–) cable to battery

Accessory Drive Belt Replacement

S4RS0A0206002

Water Pump and Generator Drive Belt

Replace belt with new one referring to "Water Pump / Generator Drive Belt Removal and Installation: in Section 1F".

A/C Compressor Drive Belt (If Equipped)

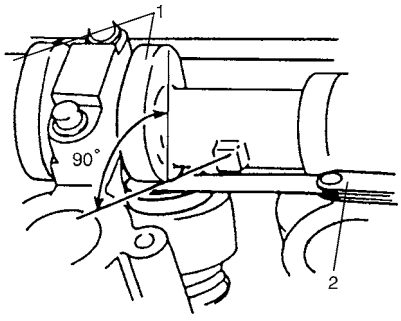
Replace belt with new one referring to "Compressor Drive Belt Removal and Installation: in Section 7B".

Valve Lash (Clearance) Inspection

S4RS0A0206003

Inspect intake and exhaust valve lash and adjust as necessary.

Refer to "Valve Lash (Clearance) Inspection: in Section 1D" for valve lash inspection and adjustment procedure.



I2RH0B020003-

1. Camshaft	2. Thickness gauge

Engine Oil and Filter Change

S4RS0A0206004

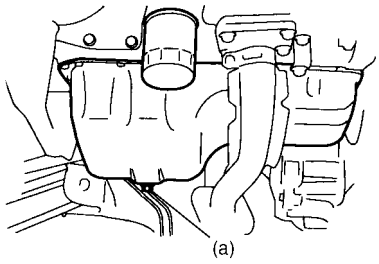
WARNING:

- **New and used engine oil can be hazardous.**
  Be sure to read "WARNING" in "General Precautions: in Section 00" and observe what is written there.
- **Step 1) – 7) outlined below must be performed with ENGINE NOT RUNNING.**
  For Step 8), be sure to have adequate ventilation while engine is running.

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.

1) Drain engine oil by removing drain plug.
2) After draining oil, wipe drain plug clean. Reinstall drain plug.

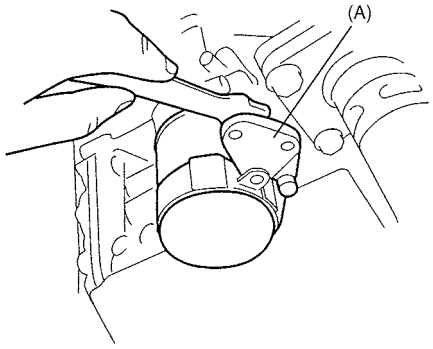
Tightening torque
Engine oil drain plug (a): 35 N·m (3.5 kg-m, 25.5 lb-ft)



I2RH0B020004-

3) Loosen oil filter by using oil filter wrench (special tool).

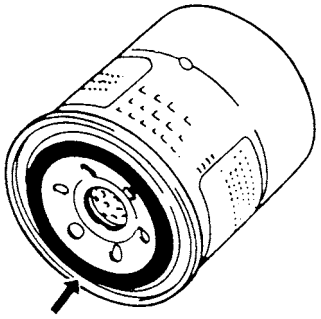
Special tool
(A): 09915–47331



I2RH0B020005-

NOTE:

Before fitting new oil filter, be sure to oil its O-ring. Use engine oil for this purpose.



IYSQ01020009-

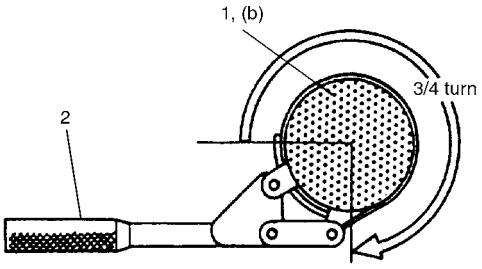
4) Screw new filter on oil filter stand by hand until the filter O-ring contacts mounting surface.

CAUTION:

To tighten oil filter properly, it is important to accurately identify the position at which filter O-ring first contacts mounting surface.

5) Tighten the filter (1) 3/4 turn from the point of contact with the mounting surface using an oil filter wrench (2).

Tightening torque
Oil filter (b): 14 N·m (1.4 kg-m, 10.5 lb-ft) (for reference)



IYSQ01020010-

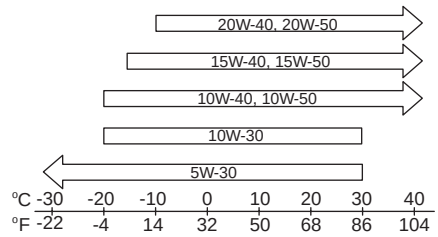
6) Replenish oil until oil level is brought to FULL level mark on dipstick (oil pan and oil filter capacity). The filler inlet is at the top of the cylinder head cover. It is recommended to use engine oil of SG, SH, SJ or SL grade. Select the appropriate oil viscosity according to the proper engine oil viscosity chart [A].

NOTE:

Engine oil capacity is specified as the following.
However, note that the amount of oil required when actually changing oil may somewhat differ from the data depending on various conditions (temperature, viscosity, etc.).

Engine oil specification
Oil pan capacity: About 3.7 liters (7.8 / 6.5 US / lmp pt.)
Oil filter capacity: About 0.2 liter (0.4 / 0.3 US / lmp pt.)
Others: About 0.3 liter (0.6 / 0.5 US / lmp pt.)
Total: About 4.2 liters (8.9 / 7.4 US / lmp pt.)

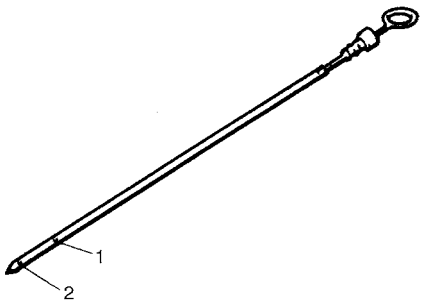
[A]



I4RS0A020002-

7) Check oil filter and drain plug for oil leakage.

8) Start engine and run it for 3 minutes. Stop it and wait another 5 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark (1) on dipstick.



IYSQ01020012-

2. Low level mark (hole)

Engine Coolant Change

S4RS0A0206005

WARNING:

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

CAUTION:

When changing engine coolant, use mixture of 50% specified water and 50% ANTIFREEZE / ANTICORROSION COOLANT for the purpose of corrosion protection and lubrication.

Change engine coolant with new one referring to “Cooling System Flush and Refill: in Section 1F”.

Exhaust System Inspection

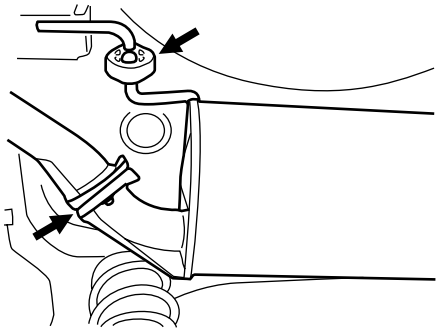
S4RS0A0206006

WARNING:

To avoid danger of being burned, do not touch exhaust system when it is still hot. Any service on exhaust system should be performed when it is cool.

When carrying out periodic maintenance, or the vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connections, dents and damages.
  If bolts or nuts are loose, tighten them to specification.
- Check nearby body areas for damaged, missing or mispositioned parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into the vehicle.
- Make sure that exhaust system components have enough clearance from the underbody to avoid overheating and possible damage to floor carpet.



I4RS0A020003-

- Any defects should be fixed at once.

Spark Plugs Replacement

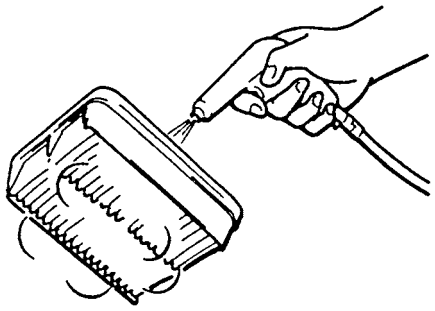
S4RS0A0206007

Replace spark plugs with new ones referring to “Spark Plug Removal and Installation: in Section 1H”.

Air Cleaner Filter Inspection

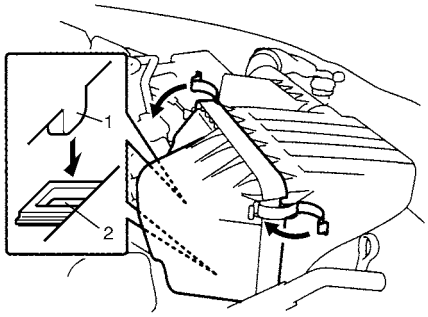
S4RS0A0206008

1) Remove air cleaner case clamps.
2) Take air cleaner filter out of case.
3) Check that filter is not excessively dirty, damaged or oily, clean filter with compressed air from air outlet side of filter.



I2RH01140007-

4) Install air cleaner filter and then case cap by inserting cap tab (1) into case groove (2). Clamp cap securely.



I4RS0A020004-

Air Cleaner Filter Replacement

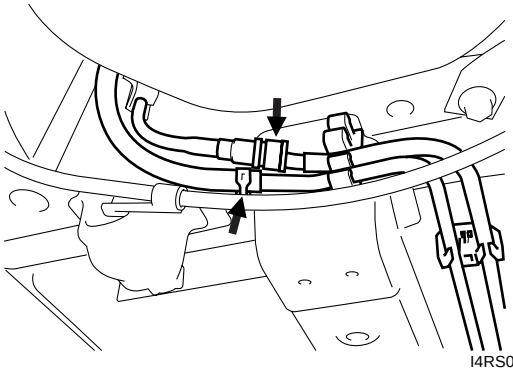
S4RS0A0206009

Replace air cleaner filter with new one according to Steps 1), 2) and 4) of “Air Cleaner Filter Inspection: ”.

Fuel Lines and Connections Inspection

S4RS0A0206010

Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking and damage. Make sure all clamps are secure.
Repair leaky joints, if any.
Replace hoses that are suspected of being cracked.



I4RS0A020005-

Fuel Filter Replacement

S4RS0A0206042

WARNING:

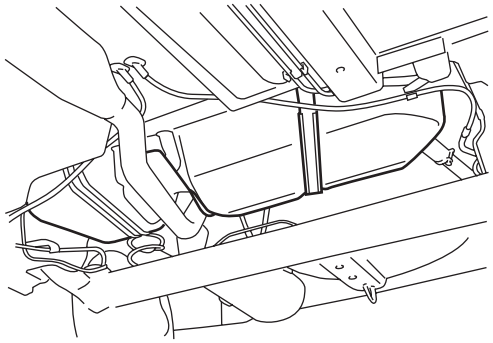
This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).

Fuel filter is installed in fuel pump assembly in fuel tank. Replace fuel filter or fuel pump assembly with new one, referring to “Fuel Pump Assembly Removal and Installation: in Section 1G” for proper procedure.

Fuel Tank Inspection

S4RS0A0206012

Check fuel tank damage, cracks, fuel leakage, corrosion and tank bolts looseness.
If a problem is found, repair or replace.



I4RS0A020019-

PCV Valve Inspection

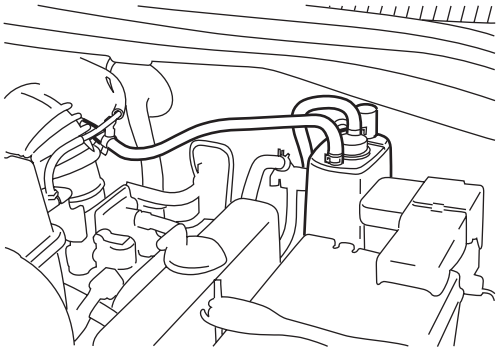
S4RS0A0206013

Check crankcase ventilation hose and PCV hose for leaks, cracks or clog, and PCV valve for stick or clog. Refer to “PCV Valve Inspection: in Section 1B” for PCV valve checking procedure.

Fuel Evaporative Emission Control System Inspection

S4RS0A0206014

1) Visually inspect hoses for cracks, damage, or excessive bends. Inspect all clamps for damage and proper position.
2) Check EVAP canister for operation and clog, referring to “EVAP Canister Inspection: in Section 1B”.
   If a malfunction is found, repair or replace.

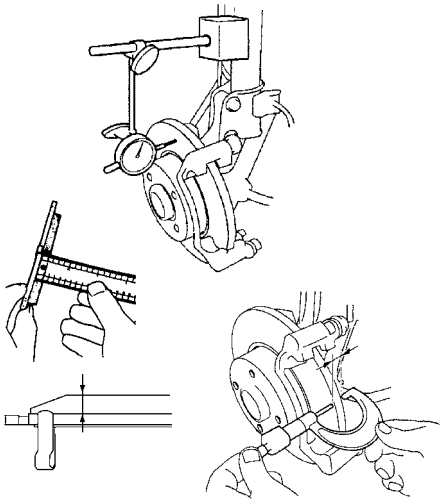


I4RS0A020006-

Brake Discs and Pads (Front) Inspection

S4RS0A0206015

1) Remove wheel and caliper but don’t disconnect brake hose from caliper.
2) Check front disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For details, refer to “Front Disc Brake Pad Inspection: in Section 4B” and “Front Brake Disc Inspection: in Section 4B”.
   Be sure to torque caliper pin bolts to specification.

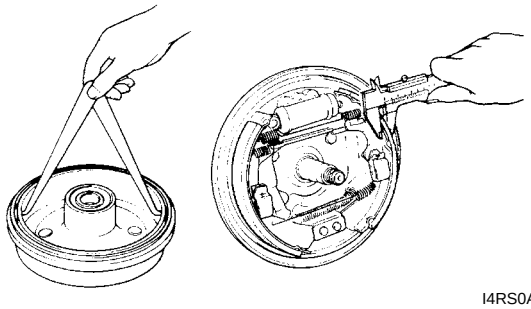


I3RM0A020006-

Brake Drums and Shoes (Rear) Inspection

S4RS0A0206016

1) Remove wheel and brake drum.
2) Check rear brake drums and brake linings for excessive wear and damage, while wheels and drums are removed. At the same time, check wheel cylinders for leaks. Replace these parts as necessary.
   For details, refer to “Rear Brake Drum and Shoe Inspection: in Section 4C” and “Rear Brake Shoe Inspection: in Section 4C”.



I4RS0A020007-

Brake Hoses and Pipes Inspection

S4RS0A0206017

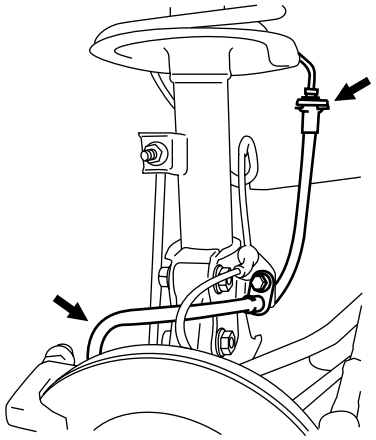
Perform this inspection where these is enough light and use a mirror as necessary.

- Check brake hoses and pipes for proper hookup, leaks, cracks, chafing and other damage.
- Check that hoses and pipes are clear of sharp edges and moving parts.

Repair or replace any of these parts as necessary.

CAUTION:

After replacing any brake pipe or hose, be sure to carry out air purge operation.



I4RS0A020008-

Brake Fluid Replacement

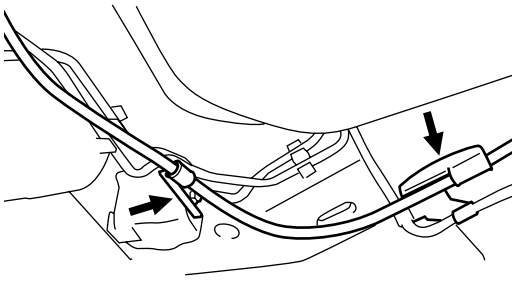
S4RS0A0206018

Change brake fluid as follows.
Drain existing fluid from brake system completely, fill system with specified fluid and carry out air purge operation.
For air purging procedure, refer to “Air Bleeding of Brake System: in Section 4A”.

Brake Lever and Cable Inspection

S4RS0A0206019

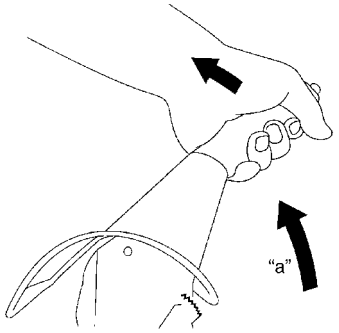
1) Inspect brake cable for damage and smooth movement.
   Replace cable if it is in deteriorated condition.



I4RS0A020009-

2) Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking lever.
3) Check parking brake lever for proper operation and stroke, and adjust it if necessary.
   For checking and adjusting procedures, refer to “Parking Brake Inspection and Adjustment: in Section 4D”.

Parking brake lever stroke
“a”: 4 – 9 notches (with 200 N (20 kg, 44 lbs) of pull pressure)

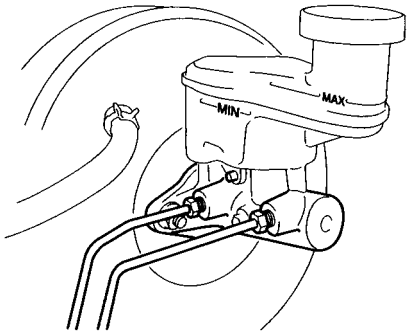


I4RS0A020010-

Clutch fluid Inspection

S4RS0A0206020

1) Check clutch system for evidence of fluid leakage. Repair leaky point if any.
2) Check reservoir for fluid level referring to “Clutch Fluid Level Inspection: in Section 5C”.
   If fluid is lower than minimum level of reservoir, refill reservoir with specified brake fluid indicated on reservoir cap.

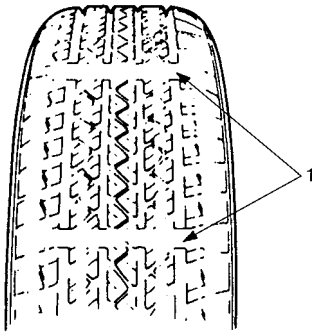


I4RS0A410006-

Tires Inspection

S4RS0A0206021

1) Check tires for uneven or excessive wear, or damage. If defective, replace.
   Refer to “Irregular and/or Premature Wear Description: in Section 2D” and “Wear Indicators Description: in Section 2D” for details.



I2RH01020022-

1. Wear indicator

2) Check inflating pressure of each tire and adjust pressure to specification as necessary.

NOTE:

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner’s manual which came with the vehicle.**

3) Rotate tires. For details, refer to “Tire Rotation: in Section 2D”.

Wheel Discs Inspection

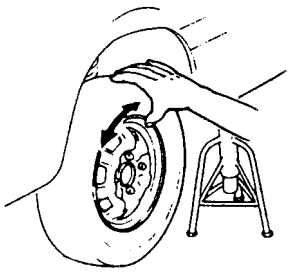
S4RS0A0206022

Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.

Wheel Bearing Inspection

S4RS0A0206023

1) Check front wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to “Front Wheel Hub, Disc, Nut and Bearing Check: in Section 2B”.
2) Check rear wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to “Rear Wheel Disc, Nut and Bearing Inspection: in Section 2C”.

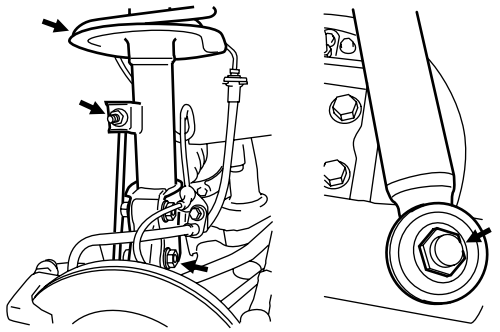


I2RH01020023-

Suspension System Inspection

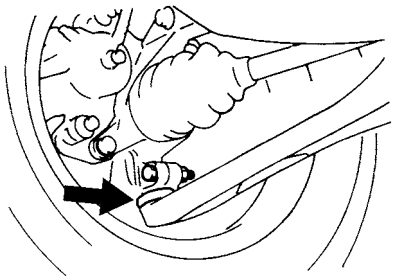
S4RS0A0206024

- Inspect front struts and rear shock absorbers for evidence of oil leakage, dents or any other damage on sleeves; and inspect anchor ends for deterioration. Replace defective parts, if any.
- Check front and rear suspension systems for damaged, loose or missing parts; also for parts showing signs of wear or lack of lubrication. Repair or replace defective parts, if any.



I4RS0A020011-

- Check front suspension arm ball joint stud dust seals for leakage, detachment, tear or any other damage. Replace defective boot, if any.



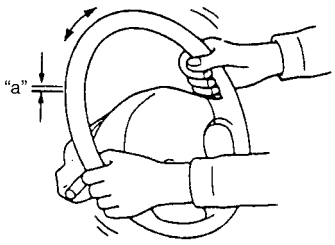
I4RS0A020012-

Steering System Inspection

S4RS0A0206025

1) Check steering wheel for play and rattle, holding vehicle straight on ground.

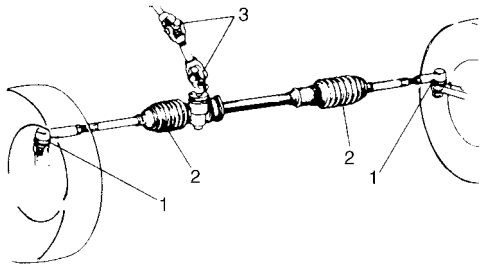
Steering wheel play
“a”: 0 – 30 mm (0 – 1.1 in.)



I2RH01020026-

2) Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.
3) Check steering linkage for looseness and damage. Repair or replace defective parts, if any.

4) Check boots (1) and (2) of steering linkage and steering gear case for damage (leak, detachment, tear, etc.). If damage is found, replace defective boot with new one.
   If any dent is found on steering gear case boots, correct it to original shape by turning steering wheel to the right or left as far as it stops and holding it for a few seconds.
5) Check universal joints (3) of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.



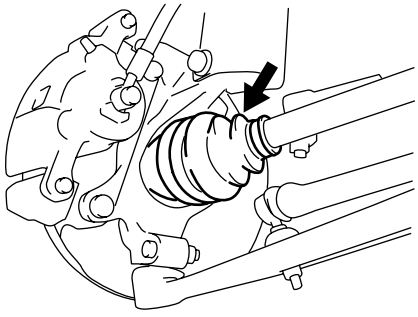
I4RS0A020013-

6) Check that steering wheel can be turned fully to the right and left. Repair or replace defective parts, if any.
7) If equipped with power steering system, check also, in addition to check items, that steering wheel can be turned fully to the right and left more lightly when engine is running at idle speed than when it is stopped. Repair, if found faulty.
8) Check wheel alignment referring to “Front Wheel Alignment Inspection and Adjustment: in Section 2B”.

Drive Shaft (Axle) Boots Inspection

S4RS0A0206026

Check drive shaft boots (wheel side and differential side) for leaks, detachment, tear or other damage.
Replace defective parts as necessary.

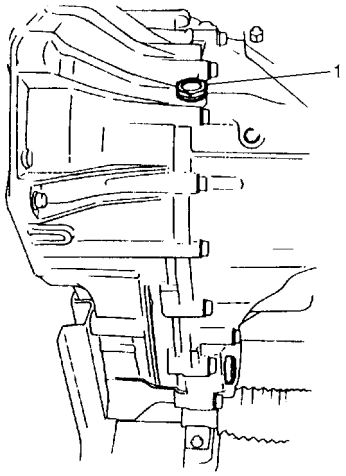


I2RH01310001-

Manual Transaxle Oil Inspection

S4RS0A0206028

1) Inspect transaxle case for evidence of oil leakage. Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Remove oil filler/level plug (1) of transaxle.



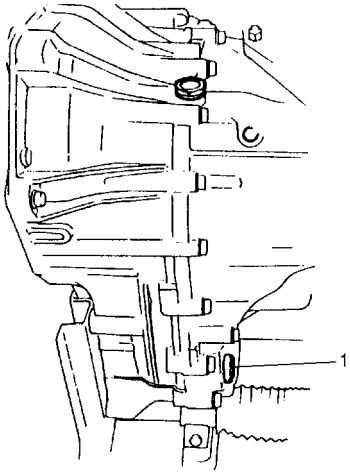
I4RS0A020014-

4) Check oil level.
   Oil level can be checked roughly by means of filler/level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified oil up to level hole. For specified oil, refer to “Manual Transaxle Oil Change: in Section 5B”.
5) Apply sealant to filler/level plug and tighten it to specified torque.

Manual Transaxle Oil Replacement

S4RS0A0206029

1) Place the vehicle level and drain oil by removing drain plug (1).



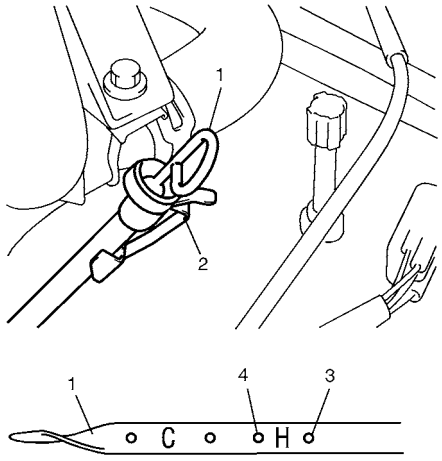
I4RS0A020015-

2) Apply sealant to drain plug after cleaning it and tighten drain plug to specified torque.
3) Pour specified oil up to level hole.
4) Tighten filler plug to specified torque.
   For recommended oil, its amount and tightening torque data, refer to “Manual Transaxle Oil Change: in Section 5B”.

Automatic Transaxle Fluid Level Inspection

S4RS0A0206039

1) Inspect transaxle case for evidence of fluid leakage. Repair leaky point, if any.
2) Make sure that vehicle is placed level for fluid level check.
3) Pull out dipstick and check fluid level.
   For fluid level checking procedure, refer to “A/T Fluid Level Check: in Section 5A” and be sure to perform it under specified conditions.
   If fluid level is low, replenish specified fluid.



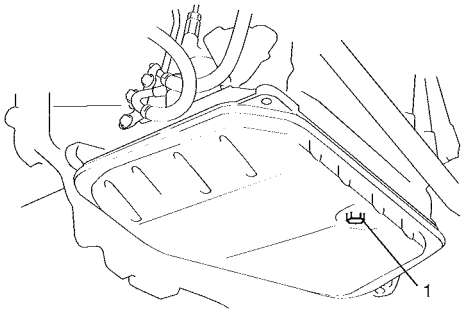
I4RS0A020016-

1. Dipstick	3. FULL HOT mark
2. Clamp	4. LOW HOT mark

Automatic Transaxle Fluid Replacement

S4RS0A0206040

1) Inspect transaxle case for evidence of fluid leakage. Repair leaky point, if any.
2) Make sure that vehicle is placed level for fluid level check.
3) Change fluid. For its procedure, refer to “A/T Fluid Change: in Section 5A”.



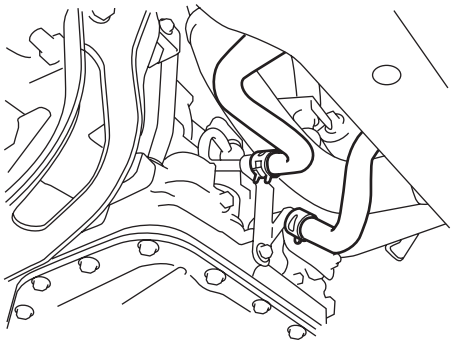
I4RS0A020017-

1. Drain plug

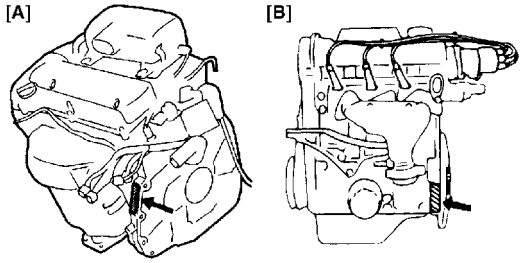
Automatic Transaxle Fluid Cooler Hose Inspection

S4RS0A0206041

Check automatic transaxle fluid cooler hose for fluid leakage, cracks, damage and deterioration.
Replace hose and/or clamp if any faulty condition is found.



I4RS0A020020-



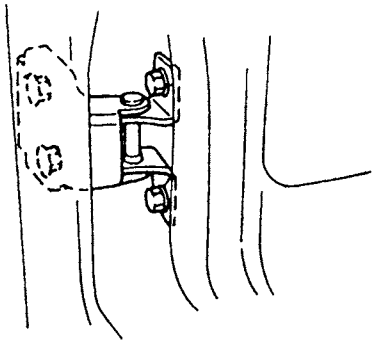
I3RB0A010004-

All Latches, Hinges and Locks Inspection

S4RS0A0206035

Doors

Check that each door of front, rear and back doors opens and closes smoothly and locks securely when closed.
If any malfunction is found, lubricate hinge and latch or repair door lock system.



I2RH01020033-

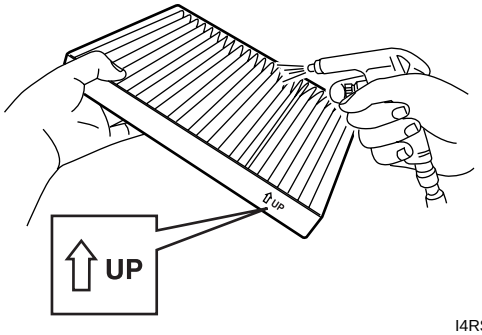
Engine Hood

Check that secondary latch operates properly (check that secondary latch keeps hood from opening all the way even when pulling hood release handle inside vehicle.) Also check that hood opens and closes smoothly and properly and hood locks securely when closed.
If any malfunction is found, lubricate hinge and latch, or repair hood lock system.

Air Conditioning Filter (If Equipped) Inspection

S4RS0A0206036

1) Remove the air conditioning filter from the HVAC unit referring to “Air Filter Removal and Installation: in Section 7A”.
2) Check for dirt and dust. If the air conditioning filter is excessively dirty, replace the air conditioning filter with the new one. If not, go to the next step.
3) Blow compressed air on the air outlet side of the air conditioning filter for removing dust.



I4RS0A020018-

4) Install the air conditioning filter into the HVAC unit referring to “Air Filter Removal and Installation: in Section 7A”.

Air Conditioning Filter (If Equipped) Replacement

S4RS0A0206038

Replace air conditioning filter with new one referring to “Air Filter Removal and Installation: in Section 7A”.

Final Inspection for Maintenance Service

S4RS0A0206037

WARNING:

When carrying out road tests, select a safe place where no man or no running vehicle is seen so as to prevent any accident.

Seats
Check that seat slides smoothly and locks securely at any position. Also check that reclining mechanism of front seat back allows it to be locked at any angle.

Seat Belt
Inspect belt system including webbing, buckles, latch plates, retractors and anchors for damage or wear. Check that seat belt is securely locked. If “REPLACE BELT” label on front seat belt is visible, replace belt.

Battery Electrolyte Level Check
Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case. If battery is equipped with built-in indicator, check battery condition by the indicator.

Accelerator Pedal Operation
Check that pedal operates smoothly without getting caught or interfered by any other part.

Engine Start
Check engine start for readiness.

WARNING:

Before performing the following check, be sure to have enough room around the vehicle. Then, firmly apply both the parking brake and the regular brakes. Do not use the accelerator pedal. If the engine starts, be ready to turn off the ignition promptly. Take these precautions because the vehicle could move without warning and possibly cause personal injury or property damage.

On automatic transaxle vehicles, try to start the engine in each select lever position. The starting motor should crank only in “P” (Park) or “N” (Neutral).
On manual transaxle vehicles, place the shift lever in “Neutral,” depress clutch pedal fully and try to start.

Exhaust System Check
Check for leakage, cracks or loose supports.

Clutch (for Manual Transaxle)
Check for the following.

- Clutch is completely released when depressing clutch pedal,
- No slipping clutch occurs when releasing pedal and accelerating.
- Clutch itself is free from any abnormal condition.

Gearshift or Select Lever (Transaxle)
Check gear shift or select lever for smooth shifting to all positions and for good performance of transaxle in any position.
With automatic transaxle equipped vehicle, also check that shift indicator indicates properly according to which position select lever is shifted to.
With automatic transaxle equipped vehicle, make sure that vehicle is at complete stop when shifting select lever to “P” range position and release all brakes.

Brake

Foot brake
Check the following:

- that brake pedal has proper travel,
- that brake works properly,
- that it is free from noise,
- that vehicle does not pull to one side when brake is applied.
- and that brake do not drag.

Parking brake
Check that lever has proper travel.

WARNING:

With vehicle parked on a fairly steep slope, make sure nothing is in the way downhill to avoid any personal injury or property damage. Be prepared to apply regular brake quickly even if vehicle should start to move.

Check to ensure that parking brake is fully effective when the vehicle is stopped on the safe slope and brake lever is pulled all the way.

Steering

- Check to ensure that steering wheel is free from instability, or abnormally heavy feeling.
- Check that the vehicle does not wander or pull to one side.

Engine

- Check that engine responds readily at all speeds.
- Check that engine is free from abnormal noise and abnormal vibration.

Body, Wheels and Power Transmitting System
Check that body, wheels and power transmitting system are free from abnormal noise and abnormal vibration or any other abnormal condition.

Meters and Gauge
Check that speedometer, odometer, fuel meter, temperature gauge, etc. are operating accurately.

Lights
Check that all lights operate properly.

Windshield Defroster
Periodically check that air comes out from defroster outlet when operating heater or air conditioning.
Set mode control lever to defroster position and fan switch lever to “HI” position for this check.

Specifications

Tightening Torque Specifications

S4RS0A0207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Engine oil drain plug	35	3.5	25.5	☞
Oil filter	14	1.4	10.5	(for reference) ☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

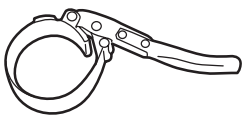
Recommended Fluids and Lubricants

S4RS0A0208001

Engine oil	SG, SH, SJ or SL grade (Refer to “Engine Oil and Filter Change: ” for engine oil viscosity.)
Engine coolant (Ethylene glycol base coolant)	“Antifreeze/Anticorrosion coolant”
Brake fluid	DOT 3 or SAE J1703
Manual transaxle oil	Refer to “Manual Transaxle Oil Change: in Section 5B”.
Automatic transaxle fluid	Refer to “A/T Fluid Change: in Section 5A”.
Door hinges	Engine oil or water resistance chassis grease
Hood latch assembly	Engine oil or water resistance chassis grease
Key lock cylinder	Spray lubricant

Special Tool

S4RS0A0208002

09915–47331 Oil filter wrench ☞ 	

Section 1

Engine

CONTENTS

Precautions 1-1
Precautions 1-1
Precautions for Engine 1-1

Engine General Information and Diagnosis 1A-1
Precautions 1A-1
Precautions on Engine Service 1A-1
Precautions in Diagnosing Trouble 1A-1
Precautions of ECM Circuit Inspection 1A-1
General Description 1A-2
Statement on Cleanliness and Care 1A-2
Engine Diagnosis General Description 1A-2
On-Board Diagnostic System Description 1A-2
Engine and Emission Control System Description 1A-5
CAN Communication System Description 1A-5
Air Intake System Description 1A-6
Electronic Control System Description 1A-7
Engine and Emission Control Input / Output Table 1A-13
Schematic and Routing Diagram 1A-14
Engine and Emission Control System Diagram 1A-14
Component Location 1A-15
Electronic Control System Components Location 1A-15
Diagnostic Information and Procedures 1A-16
Engine and Emission Control System Check 1A-16
Malfunction Indicator Lamp (MIL) Check 1A-19
DTC Check 1A-19
DTC Clearance 1A-20
DTC Table 1A-20
Fail-Safe Table 1A-24
Scan Tool Data 1A-24
Visual Inspection 1A-28
Engine Basic Inspection 1A-29
Engine Symptom Diagnosis 1A-32
Malfunction Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started) 1A-38
Malfunction Indicator Lamp Remains ON after Engine Starts 1A-40
DTC P0010: Camshaft Position Actuator Circuit 1A-42
DTC P0011 / P0012: Camshaft Position - Timing Over-Advanced or System Performance / -Retarded 1A-44
DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1) 1A-46
DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2) 1A-48
DTC P0101: Mass Air Flow Circuit Range / Performance 1A-50
DTC P0102: Mass Air Flow Circuit Low Input 1A-54
DTC P0103: Mass Air Flow Circuit High Input 1A-56
DTC P0106: Manifold Absolute Pressure Range / Performance 1A-58
DTC P0107: Manifold Absolute Pressure Circuit Low Input 1A-60
DTC P0108: Manifold Absolute Pressure Circuit High Input 1A-62
DTC P0111: Intake Air Temperature Circuit Range / Performance 1A-64
DTC P0112: Intake Air Temperature Sensor Circuit Low 1A-67
DTC P0113: Intake Air Temperature Sensor Circuit High 1A-70
DTC P0116: Engine Coolant Temperature Circuit Range / Performance 1A-73
DTC P0117: Engine Coolant Temperature Circuit Low 1A-76
DTC P0118: Engine Coolant Temperature Circuit High 1A-78
DTC P0121: Throttle Position Sensor Circuit Range / Performance 1A-80
DTC P0122: Throttle Position Sensor Circuit Low 1A-85
DTC P0123: Throttle Position Sensor Circuit High 1A-88
DTC P0131 / P0132: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-1) 1A-91
DTC P0133: O2 Sensor (HO2S) Circuit Slow Response (Sensor-1) 1A-94
DTC P0134: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-1) 1A-95
DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2) 1A-98
DTC P0140: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-2) 1A-101

DTC P0171 / P0172: Fuel System Too Lean / Rich 1A-103
DTC P0300 / P0301 / P0302 / P0303 / P0304: Random Misfire Detected / Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Misfire Detected 1A-105
DTC P0327 / P0328: Knock Sensor Circuit Low / High 1A-107
DTC P0335: Crankshaft Position (CKP) Sensor Circuit 1A-109
DTC P0340: Camshaft Position (CMP) Sensor Circuit 1A-111
DTC P0401 / P0402: Exhaust Gas Recirculation Flow Insufficient Detected / Excessive Detected 1A-114
DTC P0403: Exhaust Gas Recirculation Control Circuit 1A-117
DTC P0420: Catalyst System Efficiency below Threshold 1A-119
DTC P0443: Evaporative Emission System Purge Control Valve Circuit 1A-121
DTC P0462: Fuel Level Sensor Circuit Low 1A-123
DTC P0463: Fuel Level Sensor Circuit High 1A-125
DTC P0480: Fan 1 (Radiator Cooling Fan) Control Circuit 1A-127
DTC P0500: Vehicle Speed Sensor (VSS) Malfunction 1A-131
DTC P0505: Idle Air Control System 1A-134
DTC P0532: A/C Refrigerant Pressure Sensor Circuit Low 1A-136
DTC P0533: A/C Refrigerant Pressure Sensor Circuit High 1A-138
DTC P0601 / P0602: Internal Control Module Memory Check Sum Error / Control Module Programming Error 1A-140
DTC P0616: Starter Relay Circuit Low 1A-141
DTC P0617: Starter Relay Circuit High 1A-142
DTC P1510: ECM Back-Up Power Supply Malfunction 1A-144
DTC P1603: TCM Trouble Code Detected 1A-145
DTC P1674: CAN Communication (Bus Off Error) 1A-146
DTC P1675: CAN Communication (Transmission Error) 1A-150
DTC P1676: CAN Communication (Reception Error for TCM) 1A-153
DTC P1678: CAN Communication (Reception Error for BCM) 1A-156
DTC P2227 / P2228 / P2229: Barometric Pressure Circuit Malfunction 1A-158
Inspection of ECM and Its Circuits 1A-160
ECM Power and Ground Circuit Check 1A-177
Fuel Injector Circuit Check 1A-180
Fuel Pump and Its Circuit Check 1A-182
Fuel Pressure Check 1A-185
Idle Air Control System Check 1A-186
A/C System Circuits Check 1A-188
Electric Load Signal Circuit Check 1A-192
Radiator cooling fan Low Speed Control System Check 1A-193
Radiator cooling fan High Speed Control System Check 1A-195
Repair Instructions 1A-198
Idle Speed / Idle Air Control (IAC) Duty Inspection 1A-198
Special Tools and Equipment 1A-199
Special Tool 1A-199

Aux. Emission Control Devices 1B-1

Diagnostic Information and Procedures 1B-1
EGR System Inspection 1B-1
Repair Instructions 1B-1
EVAP Canister Purge Inspection 1B-1
EVAP Canister Purge Valve and Its Circuit Inspection 1B-1
Vacuum Passage Inspection 1B-2
Vacuum Hose Inspection 1B-3
EVAP Canister Purge Valve Inspection 1B-3
EVAP Canister Inspection 1B-3
EGR Valve Removal and Installation 1B-4
EGR Valve Inspection 1B-4
PCV Hose Inspection 1B-4
PCV Valve Inspection 1B-4
Special Tools and Equipment 1B-5
Special Tool 1B-5

Engine Electrical Devices 1C-1

Repair Instructions 1C-1
Idle Air Control (IAC) Valve Operation Inspection 1C-1
Idle Air Control (IAC) Valve On-Vehicle Inspection 1C-1
Idle Air Control (IAC) Valve Removal and Installation 1C-2
Engine Control Module (ECM) Removal and Installation 1C-2
Manifold Absolute Pressure (MAP) Sensor Inspection 1C-3
Throttle Position (TP) Sensor On-Vehicle Inspection 1C-3
Throttle Position (TP) Sensor Removal and Installation 1C-4
Engine Coolant Temperature (ECT) Sensor Removal and Installation 1C-4
Engine Coolant Temperature (ECT) Sensor Inspection 1C-5
Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection 1C-5
Heated Oxygen Sensor (HO2S-1 and HO2S-2) Removal and Installation 1C-5
Camshaft Position (CMP) Sensor Removal and Installation 1C-6
Camshaft Position (CMP) Sensor Inspection 1C-6
Crankshaft Position (CKP) Sensor Removal and Installation 1C-7
Crankshaft Position (CKP) Sensor Inspection 1C-7

Vehicle Speed Sensor (VSS) Inspection (M/T model)....1C-8
Knock Sensor Removal and Installation....1C-8
Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection....1C-9
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection....1C-9
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Removal and Installation....1C-10
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection....1C-10
Specifications....1C-11
Tightening Torque Specifications....1C-11
Special Tools and Equipment....1C-11
Special Tool....1C-11

Engine Mechanical 1D-1

General Description....1D-1
Engine Construction Description....1D-1
Camshaft Position Control (VVT Variable Valve Timing) System Description....1D-1
Diagnostic Information and Procedures....1D-4
Compression Check....1D-4
Engine Vacuum Check....1D-5
Valve Lash (Clearance) Inspection....1D-6
Repair Instructions....1D-8
Air Cleaner Element Removal and Installation....1D-8
Air Cleaner Element Inspection and Cleaning....1D-9
Cylinder Head Cover Removal and Installation....1D-9
Accelerator Cable Adjustment....1D-11
Throttle Body Components....1D-11
Throttle Body On-Vehicle Inspection....1D-12
Throttle Body Removal and Installation....1D-12
Throttle Body Cleaning....1D-13
Throttle Body and Intake Manifold Components....1D-14
Intake Manifold Removal and Installation....1D-15
Engine Mountings Components....1D-16
Engine Assembly Removal and Installation....1D-17
Timing Chain Cover Components....1D-20
Timing Chain Cover Removal and Installation....1D-21
Timing Chain Cover Inspection....1D-23
Oil Control Valve Removal and Installation....1D-23
Oil Control Valve Inspection....1D-24
Timing Chain and Chain Tensioner Components....1D-24
Timing Chain and Chain Tensioner Removal and Installation....1D-25
Timing Chain and Chain Tensioner Inspection....1D-27
Camshaft, Tappet and Shim Components....1D-28
Camshaft, Tappet and Shim Removal and Installation....1D-29
Camshaft, Tappet and Shim Inspection....1D-31
Valves and Cylinder Head Components....1D-34
Valves and Cylinder Head Removal and Installation....1D-35
Valves and Cylinder Head Disassembly and Assembly....1D-37
Valves and Valve Guides Inspection....1D-39
Cylinder Head Inspection....1D-42
Valve Spring Inspection....1D-42
Pistons, Piston Rings, Connecting Rods and Cylinders Components....1D-43
Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation....1D-44
Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly....1D-45
Cylinders, Pistons and Piston Rings Inspection....1D-46
Piston Pins and Connecting Rods Inspection....1D-48
Crank Pin and Connecting Rod Bearings Inspection....1D-49
Main Bearings, Crankshaft and Cylinder Block Components....1D-53
Main Bearings, Crankshaft and Cylinder Block Removal and Installation....1D-54
Crankshaft Inspection....1D-56
Main Bearings Inspection....1D-58
Sensor Plate Inspection....1D-63
Rear Oil Seal Inspection....1D-63
Flywheel Inspection....1D-63
Cylinder Block Inspection....1D-63
Specifications....1D-64
Tightening Torque Specifications....1D-64
Special Tools and Equipment....1D-65
Recommended Service Material....1D-65
Special Tool....1D-65

Engine Lubrication System 1E-1

General Description....1E-1
Engine Lubrication Description....1E-1
Diagnostic Information and Procedures....1E-3
Oil Pressure Check....1E-3
Repair Instructions....1E-4
Oil Pan and Oil Pump Strainer Components....1E-4
Oil Pan and Oil Pump Strainer Removal and Installation....1E-5
Oil Pan and Oil Pump Strainer Cleaning....1E-6
Oil Pump Components....1E-7
Oil Pump Removal and Installation....1E-7
Oil Pump Disassembly and Reassembly....1E-7
Oil Pump Inspection....1E-8
Specifications....1E-10
Tightening Torque Specifications....1E-10
Special Tools and Equipment....1E-10
Recommended Service Material....1E-10
Special Tool....1E-10

Engine Cooling System 1F-1
- **General Description 1F-1**
  - Cooling System Description 1F-1
  - Coolant Description 1F-1
- **Schematic and Routing Diagram 1F-2**
  - Coolant Circulation 1F-2
- **Diagnostic Information and Procedures 1F-3**
  - Engine Cooling Symptom Diagnosis 1F-3
- **Repair Instructions 1F-4**
  - Cooling System Components 1F-4
  - Coolant Level Check 1F-5
  - Engine Cooling System Inspection and Cleaning 1F-5
  - Cooling System Draining 1F-5
  - Cooling System Flush and Refill 1F-6
  - Cooling Water Pipes or Hoses Removal and Installation 1F-7
  - Thermostat Removal and Installation 1F-7
  - Thermostat Inspection 1F-8
  - Radiator Cooling Fan Motor On-Vehicle Inspection 1F-8
  - Radiator Cooling Fan Relay Inspection 1F-9
  - Radiator Cooling Fan Removal and Installation 1F-9
  - Radiator On-Vehicle Inspection and Cleaning 1F-9
  - Radiator Removal and Installation 1F-10
  - Water Pump / Generator Drive Belt Tension Inspection and Adjustment 1F-10
  - Water Pump / Generator Drive Belt Removal and Installation 1F-11
  - Water Pump Removal and Installation 1F-11
  - Water Pump Inspection 1F-12
- **Specifications 1F-12**
  - Tightening Torque Specifications 1F-12
- **Special Tools and Equipment 1F-12**
  - Recommended Service Material 1F-12

Fuel System 1G-1
- **Precautions 1G-1**
  - Precautions on Fuel System Service 1G-1
- **General Description 1G-1**
  - Fuel System Description 1G-1
  - Fuel Delivery System Description 1G-1
  - Fuel Pump Description 1G-2
- **Schematic and Routing Diagram 1G-2**
  - Fuel Delivery System Diagram 1G-2
- **Diagnostic Information and Procedures 1G-2**
  - Fuel Pressure Inspection 1G-2
  - Fuel Cut Operation Inspection 1G-3
- **Repair Instructions 1G-4**
  - Fuel System Components 1G-4
  - Fuel Hose Disconnecting and Reconnecting 1G-6
  - Fuel Pressure Relief Procedure 1G-8
  - Fuel Leakage Check Procedure 1G-8
  - Fuel Lines On-Vehicle Inspection 1G-8
  - Fuel Pipe Removal and Installation 1G-8
  - Fuel Injector On-Vehicle Inspection 1G-9
  - Fuel Injector Removal and Installation 1G-9
  - Fuel Injector Inspection 1G-10
  - Fuel Filler Cap Inspection 1G-11
  - Fuel Tank Inlet Valve Removal and Installation 1G-12
  - Fuel Tank Inlet Valve Inspection 1G-13
  - Fuel Tank Removal and Installation 1G-13
  - Fuel Tank Inspection 1G-14
  - Fuel Tank Purging Procedure 1G-14
  - Fuel Pump On-Vehicle Inspection 1G-15
  - Fuel Pump Assembly Removal and Installation 1G-15
  - Fuel Level Sensor Removal and Installation 1G-16
  - Fuel Pump Inspection 1G-17
- **Specifications 1G-17**
  - Tightening Torque Specifications 1G-17
- **Special Tools and Equipment 1G-18**
  - Special Tool 1G-18

Ignition System 1H-1
- **General Description 1H-1**
  - Ignition System Construction 1H-1
- **Schematic and Routing Diagram 1H-2**
  - Ignition System Wiring Circuit Diagram 1H-2
- **Component Location 1H-3**
  - Ignition System Components Location 1H-3
- **Diagnostic Information and Procedures 1H-4**
  - Ignition System Symptom Diagnosis 1H-4
  - Reference Waveform of Ignition System 1H-4
  - Ignition System Check 1H-5
  - Ignition Spark Test 1H-6
- **Repair Instructions 1H-7**
  - High-Tension Cord Removal and Installation 1H-7
  - High-Tension Cord Inspection 1H-7
  - Spark Plug Removal and Installation 1H-8
  - Spark Plug Inspection 1H-8
  - Ignition Coil Assembly (Including ignitor) Removal and Installation 1H-8
  - Ignition Coil Assembly (Including ignitor) Inspection 1H-9
  - Ignition Timing Inspection 1H-9
- **Specifications 1H-10**
  - Tightening Torque Specifications 1H-10
- **Special Tools and Equipment 1H-10**
  - Special Tool 1H-10

Starting System 1I-1
- **Schematic and Routing Diagram 1I-1**
  - Cranking System Circuit Diagram 1I-1
- **Diagnostic Information and Procedures 1I-1**
  - Cranking System Symptom Diagnosis 1I-1
  - Cranking System Test 1I-3
- **Repair Instructions 1I-4**
  - Starting Motor Dismounting and Remounting 1I-4
  - Starting Motor Components 1I-5
  - Starting Motor Inspection 1I-6

Specifications 1I-9
Cranking System Specifications 1I-9
Tightening Torque Specifications 1I-9
Special Tools and Equipment 1I-9
Recommended Service Material 1I-9

Charging System 1J-1
General Description 1J-1
Battery Description 1J-1
Generator Description 1J-2
Diagnostic Information and Procedures 1J-3
Battery Inspection 1J-3
Generator Symptom Diagnosis 1J-3
Generator Test (Undercharged Battery Check) 1J-4
Generator Test (Overcharged Battery Check) 1J-5
Repair Instructions 1J-6
Jump Starting in Case of Emergency 1J-6
Battery Dismounting and Remounting 1J-6
Generator Dismounting and Remounting 1J-7
Generator Components 1J-7
Generator Inspection 1J-8
Specifications 1J-10
Charging System Specifications 1J-10
Tightening Torque Specifications 1J-10

Exhaust System 1K-1
General Description 1K-1
Exhaust System Description 1K-1
Diagnostic Information and Procedures 1K-1
Exhaust System Check 1K-1
Repair Instructions 1K-2
Exhaust System Components 1K-2
Exhaust Manifold Removal and Installation 1K-3
Exhaust Pipe and Muffler Removal and Installation 1K-4
Specifications 1K-5
Tightening Torque Specifications 1K-5

Precautions

Precautions

Precautions for Engine

S4RS0A1000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Precautions on Engine Service
Refer to “Precautions on Engine Service: in Section 1A”.

Precautions in Diagnosing Trouble
Refer to “Precautions in Diagnosing Trouble: in Section 1A”.

Precautions of ECM Circuit Inspection
Refer to “Precautions of ECM Circuit Inspection: in Section 1A”.

Precautions on Fuel System Service
Refer to “Precautions on Fuel System Service: in Section 1G”.

Precaution for CAN Communication System
Refer to “Precaution for CAN Communication System: in Section 00”.

Precautions for Catalytic Converter
Refer to “Precautions for Catalytic Converter: in Section 00”.

Precautions for Electrical Circuit Service
Refer to “Precautions for Electrical Circuit Service: in Section 00”.

Engine General Information and Diagnosis

Precautions

Precautions on Engine Service

S4RS0A1100001

CAUTION:

The following information on engine service should be noted carefully, as it is important in preventing damage, and in contributing to reliable engine performance.

- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer, resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits.
  When performing any work where electrical terminals can be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, throttle body or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.

Precautions in Diagnosing Trouble

S4RS0A1100002

- Don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse before confirming diagnostic information (DTC, freeze frame data, etc.) stored in ECM memory. Such disconnection will erase memorized information in ECM memory.
- Diagnostic information stored in ECM memory can be cleared as well as checked by using SUZUKI scan tool or OBD generic scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
  It is indistinguishable which module turns on MIL because not only ECM but also TCM turns on MIL (For details of on-board diagnostic system for A/T, refer to "On-Board Diagnostic System Description: in Section 5A"). Therefore, check both ECM and TCM for DTC when MIL lights on.
  When checking ECM for DTC, keep in mind that DTC is displayed on the scan tool as follows depending on the scan tool used.
  - SUZUKI scan tool displays DTC detected by ECM.
  - OBD-II generic scan tool displays DTC detected by each of ECM and TCM simultaneously.
- Priorities for diagnosing troubles
  If two or more DTCs are stored, proceed to the DTC flow which has been detected earliest in the order and follow the instruction in that flow.
  If no instructions are given, troubleshoot DTCs according to the following priorities.
  a. DTCs other than DTC P0171 / P0172 (Fuel system too lean / too rich), DTC P0300 / P0301 / P0302 / P0303 / P0304 (Misfire detected) and DTC P0401 / P0402 (EGR flow malfunction)
  b. DTC P0171 / P0172 (Fuel system too lean / too rich) and DTC P0401 / P0402 (EGR flow malfunction)
  c. DTC P0300 / P0301 / P0302 / P0303 / P0304 (Misfire detected)
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00" before inspection and observe what is written there.
- ECM replacement:
  When substituting a known-good ECM, check for the following conditions. Neglecting this check may cause damage to a known-good ECM.
  - Resistance value of all relays, actuators is as specified respectively.
  - MAP sensor, A/C refrigerant pressure sensor (if equipped with A/C) and TP sensor are in good condition and none of power circuits of these sensors is shorted to ground.
- Communication of ECUs, ECM, BCM, combination meter and TCM, is established by CAN (Controller Area Network). (For more detail of CAN communication for ECM, refer to "CAN Communication System Description: "). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System: in Section 00".
- Immobilizer transponder code registration after replacing ECM
  When ECM is replaced with new one or with another one, make sure to register immobilizer transponder code to ECM correctly according to "Procedure after ECM Replacement: in Section 10C".

Precautions of ECM Circuit Inspection

S4RS0A1100003

- ECM connectors are waterproofed. Each terminal of the ECM connectors is sealed up with the grommet. Therefore, when measuring circuit voltage, resistance and/or pulse signal at ECM connector, do not insert the tester's probe into the sealed terminal at the harness side. When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to the ECM connectors. And, insert the tester's probe into the special tool's

connectors at the harness side, and then measure voltage, resistance and/or pulse signal. Or, ECM and its circuits may be damaged by water.

- Wire colors of the special tool's connectors are different from the ones of the ECM connectors. However, the circuit arrangement of the special tool's connectors is same as the one of the ECM connectors. Therefore, measure circuit voltage and resistance by identifying the terminal location subject to the measurement.

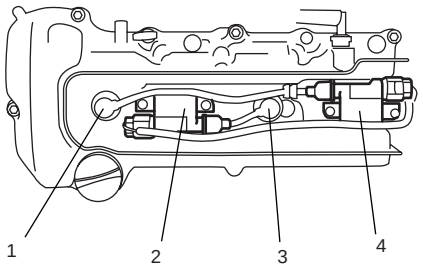
General Description

Statement on Cleanliness and Care

S4RS0A1101001

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands of an inch).
Accordingly, when any internal engine parts are serviced, care and cleanliness are important.
It should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.
  At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine.
  Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- The four cylinders of the engine are identified by numbers; No.1 (1), No.2 (2), No.3 (3) and No.4 (4) counted from crankshaft pulley side to flywheel side.



I3RM0A110001-

Engine Diagnosis General Description

S4RS0A1101002

This vehicle is equipped with an engine and emission control system which are under control of ECM.
The engine and emission control system in this vehicle are controlled by ECM. ECM has an On-Board Diagnostic system which detects a malfunction in this system and abnormality of those parts that influence the engine exhaust emission. When diagnosing engine troubles, be sure to have full understanding of the outline of "On-Board Diagnostic System Description: " and each item in "Precautions in Diagnosing Trouble: " and execute diagnosis according to "Engine and Emission Control System Check: ".
There is a close relationship between the engine mechanical, engine cooling system, ignition system, exhaust system, etc. and the engine and emission control system in their structure and operation. In case of an engine trouble, even when the malfunction indicator lamp (MIL) doesn't turn ON, it should be diagnosed according to "Engine and Emission Control System Check: ".

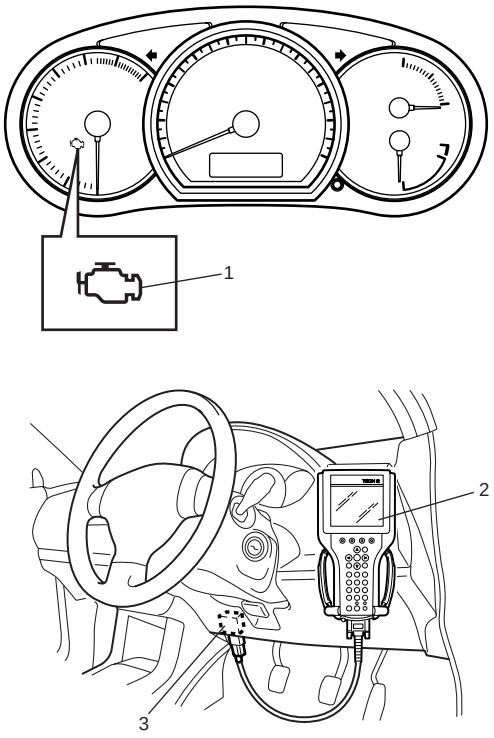
On-Board Diagnostic System Description

S4RS0A1101003

ECM in this vehicle has the following functions.

- When the ignition switch is turned ON with the engine at a stop, malfunction indicator lamp (MIL) (1) turns ON to check the circuit of the malfunction indicator lamp (1).
- When ECM detects a malfunction which gives an adverse effect to vehicle emission while the engine is running, it makes the malfunction indicator lamp (1) in the meter cluster of the instrument panel turn ON or flash (flashing only when detecting a misfire which can cause damage to the catalyst) and stores the malfunction area in its memory.
  (If it detects that continuously 3 driving cycles are normal after detecting a malfunction, however, it makes MIL (1) turn OFF although DTC stored in its memory will remain.)
- As a condition for detecting a malfunction in some areas in the system being monitored by ECM and turning ON the malfunction indicator lamp (1) due to that malfunction, 2 driving cycle detection logic is adopted to prevent erroneous detection.

- When a malfunction is detected, engine and driving conditions then are stored in ECM memory as freeze frame data. (For the details, refer to description on “Freeze Frame Data: ”.)
- It is possible to communicate by using not only SUZUKI scan tool (2) but also OBD generic scan tool. (Diagnostic information can be accessed by using a scan tool.)



I4RS0A110001-

3. DLC

Warm-Up Cycle

A warm-up cycle means sufficient vehicle operation such that the coolant temperature has risen by at least 22 °C (40 °F) from engine starting and reaches a minimum temperature of 70 °C (160 °F).

Driving Cycle

A “Driving Cycle” consists of engine startup and engine shutoff.

2 Driving Cycle Detection Logic

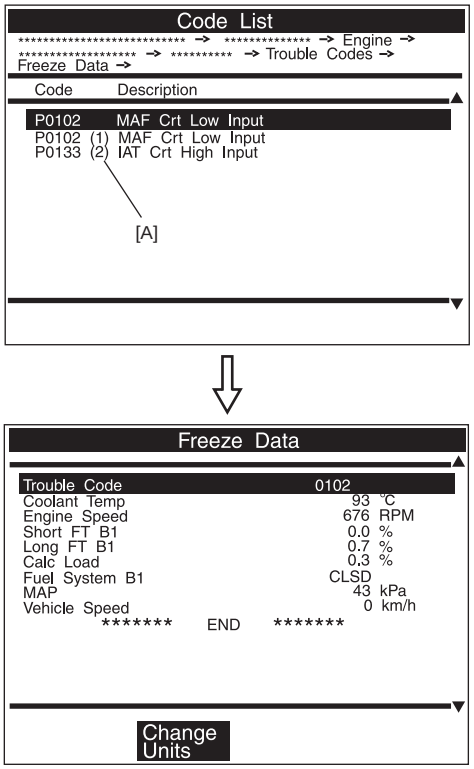
The malfunction detected in the first driving cycle is stored in ECM memory (in the form of pending DTC) but the malfunction indicator lamp does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

Pending DTC

Pending DTC means a DTC detected and stored temporarily at 1 driving cycle of the DTC which is detected in the 2 driving cycle detection logic.

Freeze Frame Data

ECM stores the engine and driving conditions (in the form of data as shown in the figure) at the moment of the detection of a malfunction in its memory. This data is called “Freeze frame data”.
Therefore, it is possible to know engine and driving conditions (e.g., whether the engine was warm or not, where the vehicle was running or stopped, where air/fuel mixture was lean or rich) when a malfunction was detected by checking the freeze frame data. Also, ECM has a function to store each freeze frame data for three different malfunctions in the order as each malfunction is detected. Utilizing this function, it is possible to know the order of malfunctions that have been detected. Its use is helpful when rechecking or diagnosing a trouble.



I3RB0A110002-

[A]: 1st or 2nd in parentheses here represents which position in the order the malfunction is detected.

Priority of freeze frame data:
ECM has 4 frames where the freeze frame data can be stored. The first frame stores the freeze frame data of the malfunction which was detected first. However, the freeze frame data stored in this frame is updated according to the priority described. (If malfunction as described in the upper square “1” is detected while the freeze frame data in the lower square “2” has been stored, the freeze frame data “2” will be updated by the freeze frame data “1”.)

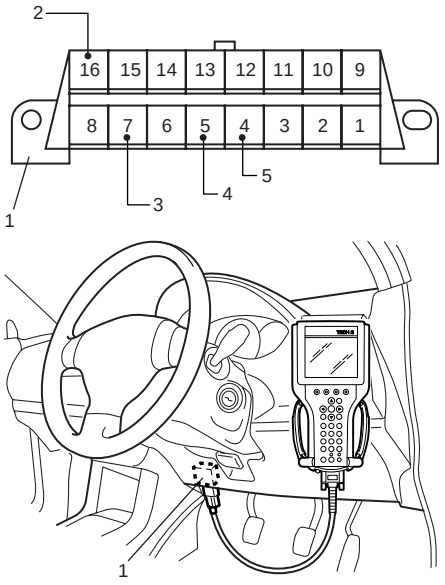
Priority	Freeze frame data in frame 1
1	Freeze frame data at initial detection of malfunction among misfire detected (P0300 – P0304), fuel system too lean (P0171) and fuel system too rich (P0172)
2	Freeze frame data when a malfunction other than those in “1” is detected

In the 2nd through the 4th frames, the freeze frame data of each malfunction is stored in the order as each malfunction is detected. These data are not updated.
Shown in the table are examples of how freeze frame data are stored when two or more malfunctions are detected.

Malfunction detected order		Frame			
		Frame 1	Frame 2	Frame 3	Frame 4
		Freeze frame data to be updated	1st freeze frame data	2nd freeze frame data	3rd freeze frame data
No malfunction		No freeze frame data			
1	P0401 (EGR) detected	Data at P0401 detection	Data at P0401 detection	—	—
2	P0171 (Fuel system) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	—
3	P0300 (Misfire) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	Data at P0300 detection
4	P0301 (Misfire) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	Data at P0300 detection

Freeze frame data clearance:
The freeze frame data is cleared at the same time as clearance of DTC.

Data Link Connector (DLC)
DLC (1) is in compliance with SAE J1962 in the shape of connector and pin assignment.
OBD serial data line (3) (K line of ISO 9141) is used for SUZUKI scan tool or OBD generic scan tool to communicate with ECM, Air bag SDM, immobilizer control module (in ECM), BCM (Body electrical Control Module), TCM (Transmission Control Module) and ABS control module.



I4RS0A110002-

2. B + (Unswitched vehicle battery positive)
4. ECM ground (Signal ground)
5. Vehicle body ground (Chassis ground)

Engine and Emission Control System Description

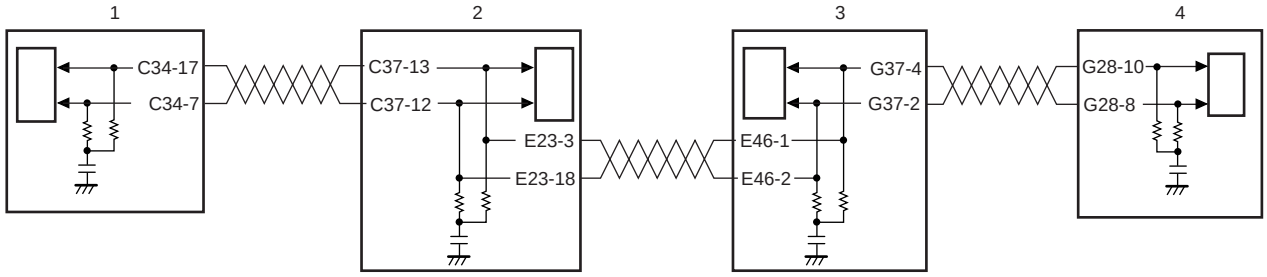
S4RS0A1101004

The engine and emission control system is divided into 4 major sub-systems: air intake system, fuel delivery system, electronic control system and emission control system.
Air intake system includes air cleaner, throttle body, IAC valve and intake manifold.
Fuel delivery system includes fuel pump, delivery pipe, etc.
Electronic control system includes ECM, various sensors and controlled devices.
Emission control system includes EGR, EVAP and PCV system.

CAN Communication System Description

S4RS0A1101008

ECM (2), TCM (equipped with A/T) (1), BCM (3) and combination meter (4) of this vehicle communicate control data between each control module.
Communication of each control module is established by CAN (Controller Area Network) communication system.



I4RS0A110085-

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a function to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. ECM communicates control data with each control module as follows.

ECM Transmission Data

				TCM	BCM	Combination Meter
ECM	Transmit	DATA	Engine torque driver requested	○		
			Engine speed	○		○
			Top gear inhibit	○		
			Torque converter clutch control inhibit	○		
			Lock up / slip control inhibit signal	○		
			Throttle position	○		
			Immobilizer indication			○
			Engine emissions related malfunction			○
			Vehicle speed		○	○
			Engine coolant temperature	○	○	○
			Fuel level percent			○
			Brake pedal switch active	○		
			A/C refrigerant pressure		○	
			Distance kilometers per liter of fuel		○	
			Stand by to engage air conditioning compressor clutch	○		

I4RS0A110003-

NOTE:

In communication between ECM and combination meter, data is transmitted only from ECM to combination meter. (Combination meter does not transmit data to ECM.)

ECM Reception Data

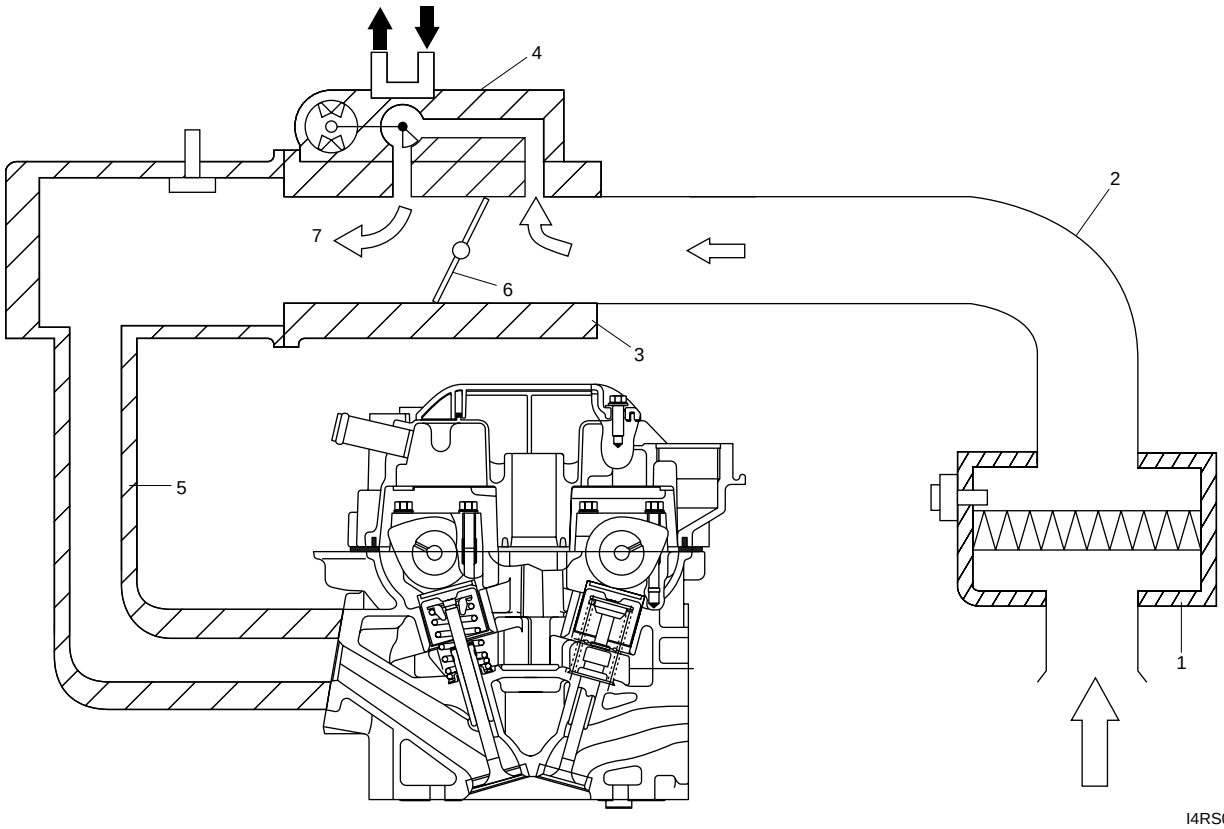
				TCM	BCM
ECM	Receive	DATA	Torque down ignition delay request	○	
			Coast slip control signal	○	
			Vehicle speed pulse	○	
			TCM data validity	○	
			Transmission gear selector position	○	
			Transmission actual gear	○	
			A/C switch ON		○
			Electric load active (small light)		○
			Electric load active (rear defogger)		○
			Ignition key switch ON		○

I4RS0A110004-

Air Intake System Description

S4RS0A1101005

The main components of the air intake system are air cleaner (1), air cleaner outlet hose (2), throttle body (3), idle air control valve (4) and intake manifold (5).
The air (by the amount corresponding to throttle valve (6) opening and engine speed) is filtered by the air cleaner, passes through the throttle body, distributed by the intake manifold and finally drawn into each combustion chamber. When the idle air control valve is opened according to the signal from ECM, the air (7) bypasses the throttle valve through bypass passage and is finally drawn into the intake manifold.



I4RS0A110005-

Electronic Control System Description

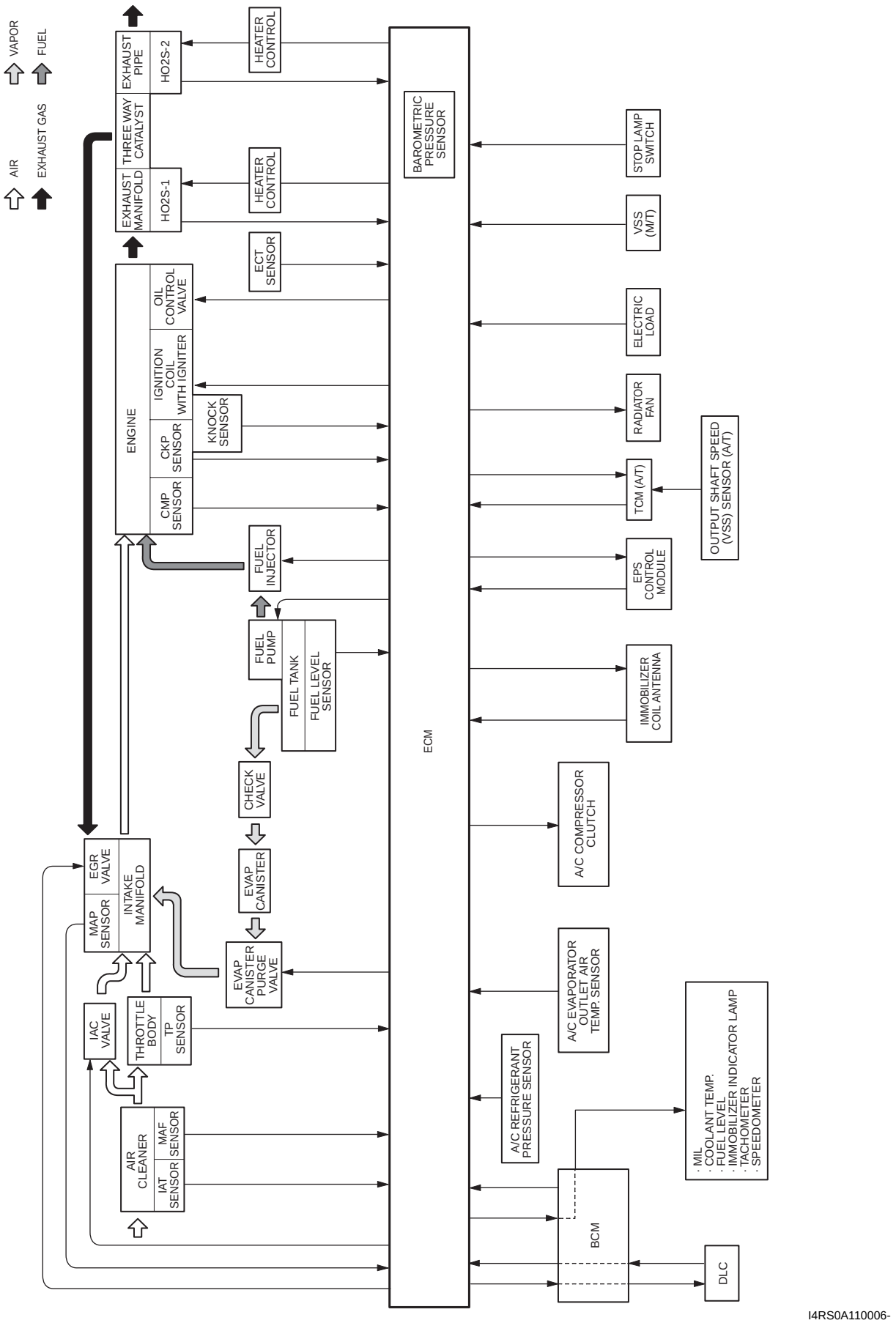
S4RS0A1101006

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices. Functionally, it is divided into the following sub systems:

- Fuel injection control system
- Ignition control system
- Idle speed control system
- Fuel pump control system
- Radiator cooling fan control system
- Evaporative emission control system
- EGR system
- Oxygen sensor heater control system
- A/C control system (if equipped)
- Camshaft position control system
- Immobilizer control system
- Controller (computer) communication system

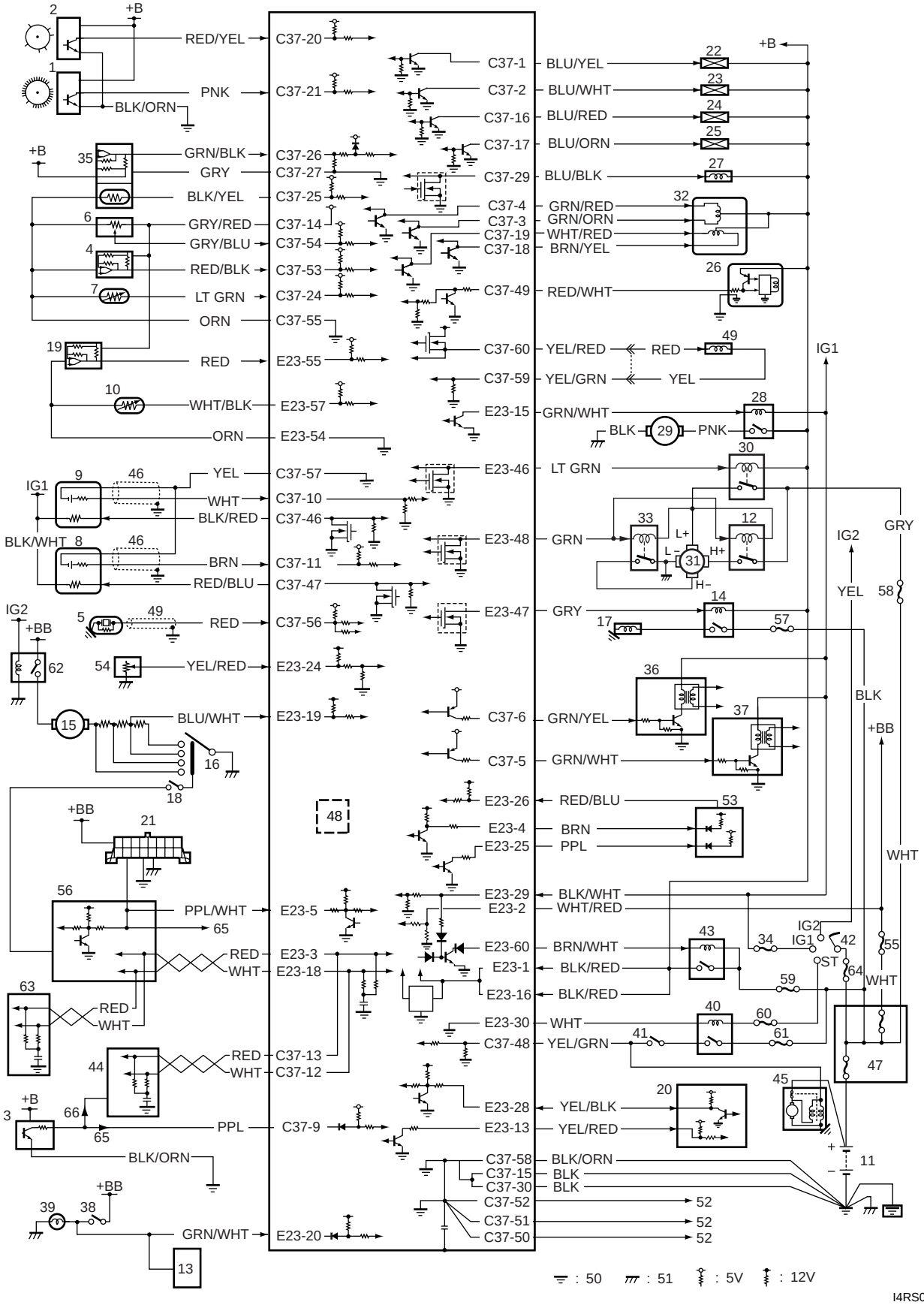
Especially, ECM (Engine Control Module), BCM (Body electrical Control Module), combination meter and TCM (Transmission Control Module (For A/T vehicle only)) intercommunicate by means of CAN (Controller Area Network) communication.

Engine and Emission Control System Flow Diagram



I4RS0A110006-

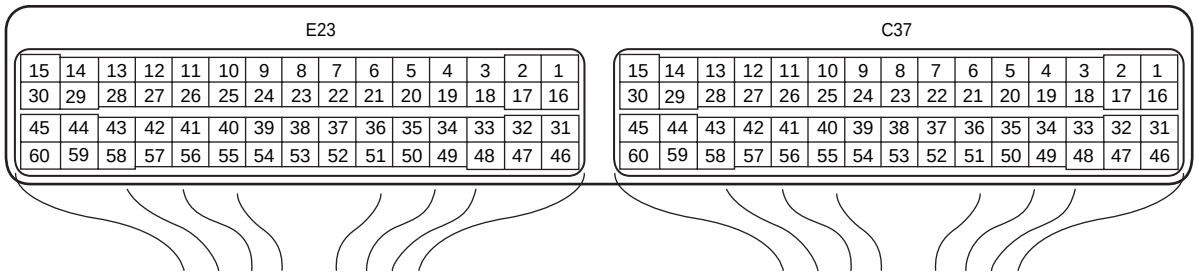
ECM Input / Output Circuit Diagram



1. CKP sensor	23. Injector No.2	45. Starting motor
2. CMP sensor	24. Injector No.3	46. Shield wire
3. VSS	25. Injector No.4	47. Main fuse box

4. MAP sensor	26. IAC valve	48. Barometric pressure sensor
5. Knock sensor	27. EVAP canister purge valve	49. Oil control valve (Camshaft position control)
6. TP sensor	28. Fuel pump relay	50. Engine ground
7. ECT sensor	29. Fuel pump	51. Body ground
8. Heated oxygen sensor-2	30. Radiator cooling fan relay No.1	52. Shield ground
9. Heated oxygen sensor-1	31. Radiator cooling fan motor	53. EPS control module
10. A/C evaporator outlet air temp. sensor	32. EGR valve	54. Fuel level sensor
11. Battery	33. Radiator cooling fan relay No.3	55. “RADIO” fuse
12. Radiator cooling fan relay No.2	34. “IG COIL” fuse	56. BCM
13. ABS control module	35. MAF and IAT sensor	57. “A/C COMP” fuse
14. A/C compressor relay	36. Ignition coil assembly (for No.1 and No.4 spark plugs)	58. “RDTR FAN” fuse
15. Blower motor	37. Ignition coil assembly (for No.2 and No.3 spark plugs)	59. “FI” fuse
16. Blower speed selector	38. Stop lamp switch	60. “ST SIG” fuse
17. Magnet clutch of compressor	39. Stop lamp	61. “ST MOT” fuse
18. A/C switch	40. Starting motor control relay	62. Blower motor relay
19. A/C refrigerant pressure sensor	41. Transmission range switch (A/T)	63. Combination meter
20. Immobilizer coil antenna	42. Ignition switch	64. “IG ACC” fuse
21. Data link connector	43. Main relay	65. Only for M/T vehicle
22. Injector No.1	44. TCM (A/T)	66. Only for A/T vehicle

Terminal Arrangement of ECM Coupler (Viewed from Harness Side)



I4RS0A110008-

Connector: C37

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLU/YEL	Fuel injector No.1 output	31	—	—
2	BLU/WHT	Fuel injector No.2 output	32	—	—
3	GRN/ORN	EGR valve (stepper motor coil 2) output	33	—	—
4	GRN/RED	EGR valve (stepper motor coil 1) output	34	—	—
5	GRN/WHT	Ignition coil No.2 and No.3 output	35	—	—
6	GRN/YEL	Ignition coil No.1 and No.4 output	36	—	—
7	—	—	37	—	—
8	—	—	38	—	—
9	PPL	Vehicle speed sensor signal (M/T)	39	—	—
10	WHT	Oxygen signal of heated oxygen sensor-1	40	—	—
11	BRN	Oxygen signal of heated oxygen sensor-2	41	—	—
12	WHT	CAN (low) communication line (active low signal) to TCM	42	—	—
13	RED	CAN (high) communication line (active high signal) to TCM	43	—	—
14	GRY/RED	Output of 5 V power source for TP sensor, MAP sensor, A/C refrigerant pressure sensor	44	—	—
15	BLK	Ground for ECM	45	—	—

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
16	BLU/RED	Fuel injector No.3 output	46	BLK/RED	Heater output of heated oxygen sensor-1
17	BLU/ORN	Fuel injector No.4 output	47	RED/BLU	Heater output of heated oxygen sensor-2
18	BRN/YEL	EGR valve (stepper motor coil 4) output	48	YEL/GRN	Starting motor signal
19	WHT/RED	EGR valve (stepper motor coil 3) output	49	RED/WHT	IAC valve output
20	RED/YEL	CMP sensor signal	50	—	Ground of ECM for shield wire
21	PNK	CKP sensor signal	51	—	Ground of ECM for shield wire
22	—	—	52	—	Ground of ECM for shield wire
23	—	—	53	RED/BLK	Manifold absolute pressure (MAP) sensor signal
24	LT GRN	Engine coolant temp. (ECT) sensor signal	54	GRY/BLU	Throttle position (TP) sensor signal
25	BLK/YEL	Intake air temp. (IAT) sensor signal	55	ORN	Ground for sensors
26	GRN/BLK	Mass air flow (MAF) sensor signal	56	RED	Knock sensor signal
27	GRY	Ground for MAF sensor	57	YEL	Ground for sensors
28	—	—	58	BLK/ORN	Ground for ECM
29	BLU/BLK	EVAP canister purge valve output	59	YEL/GRN	Oil control valve ground
30	BLK	Ground for ECM	60	YEL/RED	Oil control valve output

Connector: E23

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLK/RED	Main power supply	31	—	—
2	WHT/RED	Power source for ECM internal memory	32	—	—
3	RED	CAN communication line (active high signal) for BCM, combination meter	33	—	—
4	BRN	Engine revolution signal output for EPS control module	34	—	—
5	PPL/WHT	Serial communication line of data link connector 12 V	35	—	—
6	—	—	36	—	—
7	—	—	37	—	—
8	—	—	38	—	—
9	—	—	39	—	—
10	—	—	40	—	—
11	—	—	41	—	—
12	—	—	42	—	—
13	YEL/RED	Clock signal for immobilizer coil antenna	43	—	—
14	—	—	44	—	—
15	GRN/WHT	Fuel pump relay output	45	—	—
16	BLK/RED	Main power supply	46	LT GRN	Radiator cooling fan relay No.1 output
17	—	—	47	GRY	A/C compressor relay output
18	WHT	CAN communication line (active low signal) for BCM, combination meter	48	GRN	Radiator cooling fan relay No.2 and No.3 output
19	BLU/WHT	Electric load signal for heater blower motor	49	—	—
20	GRN/WHT	Stop lamp switch signal	50	—	—
21	—	—	51	—	—
22	—	—	52	—	—

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
23	—	—	53	—	—
24	YEL/RED	Fuel level sensor signal	54	ORN	Ground for sensors
25	PPL	Vehicle speed signal output for EPS control module	55	RED	A/C refrigerant pressure sensor signal
26	RED/BLU	EPS signal	56	—	—
27	—	—	57	WHT/BLK	A/C evaporator outlet air temp. sensor signal
28	YEL/BLK	Serial communication line for immobilizer coil antenna	58	—	—
29	BLK/WHT	Ignition switch signal	59	—	—
30	WHT	Starting motor control relay output	60	BRN/WHT	Main power supply relay output

Engine and Emission Control Input / Output Table

S4RS0A1101007

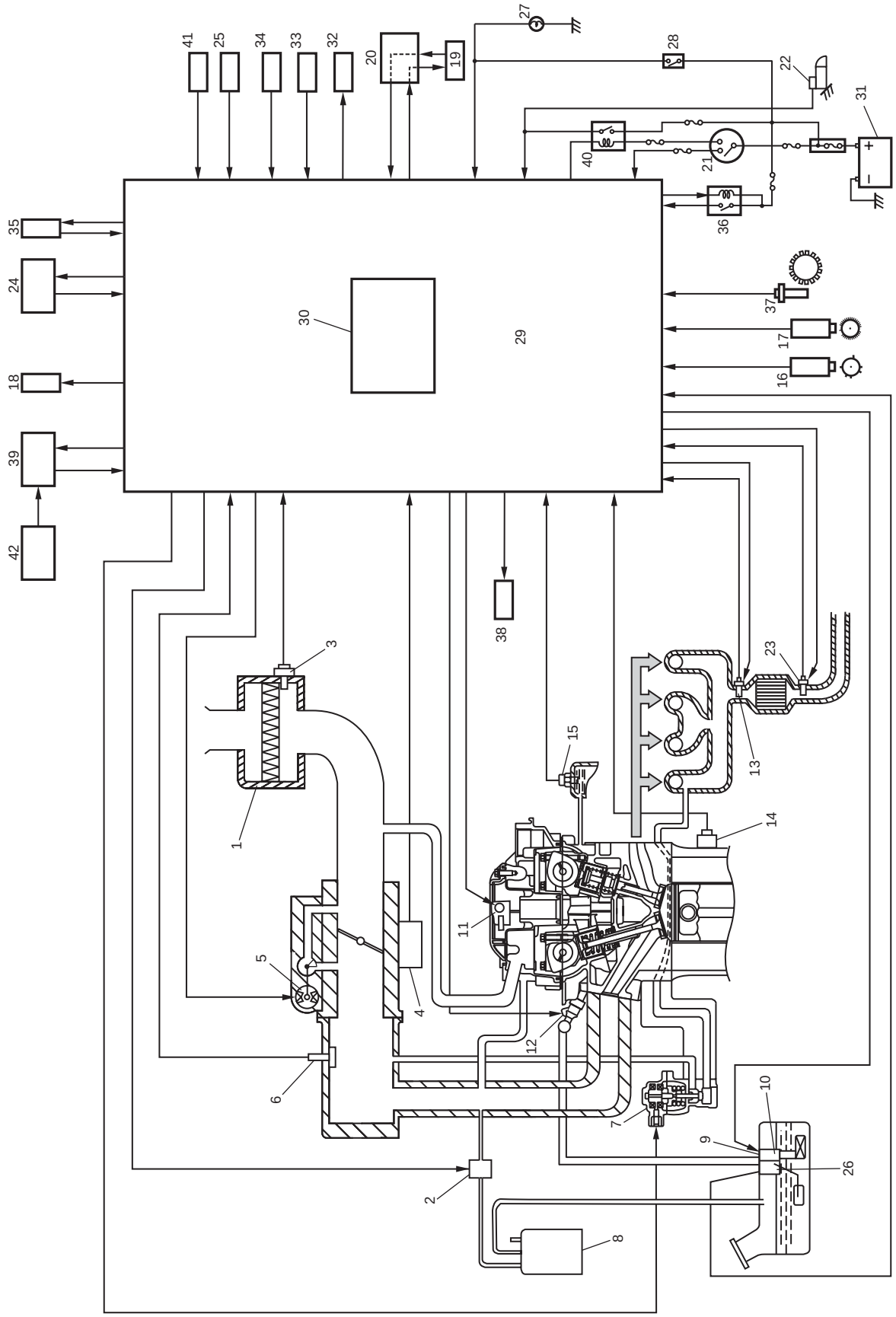
INPUT \ OUTPUT		ELECTRIC CONTROL DEVICE												
		FUEL PUMP RELAY	FUEL INJECTOR	HO2S HEATER	IAC VALVE	IGNITION COIL WITH IGNITER	EGR VALVE	EVAP CANISTER PURGE VALVE	A/C COMPRESSOR RELAY	RADIATOR FAN RELAY	MIL	MAIN RELAY	OIL CONTROL VALVE
SIGNAL FROM SENSOR, SWITCH AND CONTROL MODULE	FUEL LEVEL SENSOR	For detecting fuel level											
	BAROMETRIC PRESSURE SENSOR		○		○	○	○	○			○		
	STOP LAMP SWITCH		○		○								
	START SWITCH	○	○		○	○			○				
	IGNITION SWITCH	○	○	○	○	○	○	○	○	○	○	○	○
	A/C REFRIGERANT PRESSURE SENSOR		○		○				○	○			
	BLOWER SWITCH				○				○				
	A/C SWITCH		○		○			○	○	○			
	A/C EVAP OUTLET AIR TEMP. SENSOR		○		○				○	○			
	VSS		○	○	○	○	○	○	○	○	○		○
	HEATED OXYGEN SENSOR-1		○					○			○		
	HEATED OXYGEN SENSOR-2		○								○		
	MAF SENSOR		○	○	○	○	○	○			○		○
	IAT SENSOR		○		○	○	○	○			○		
	ECT SENSOR		○	○	○	○	○	○	○	○	○		○
	TP SENSOR		○	○	○	○	○	○	○		○		○
	MAP SENSOR		○			○	○				○		
	CMP SENSOR		○			○					○		○
	CKP SENSOR	○	○	○	○	○	○	○	○		○		○
	KNOCK SENSOR					○					○		
	ABS CONTROL MODULE				○								
	IMMOBILIZER CONTROL MODULE (IN ECM)	○	○			○					○		

I4RS0A110009-

Schematic and Routing Diagram

Engine and Emission Control System Diagram

S4RS0A1102001



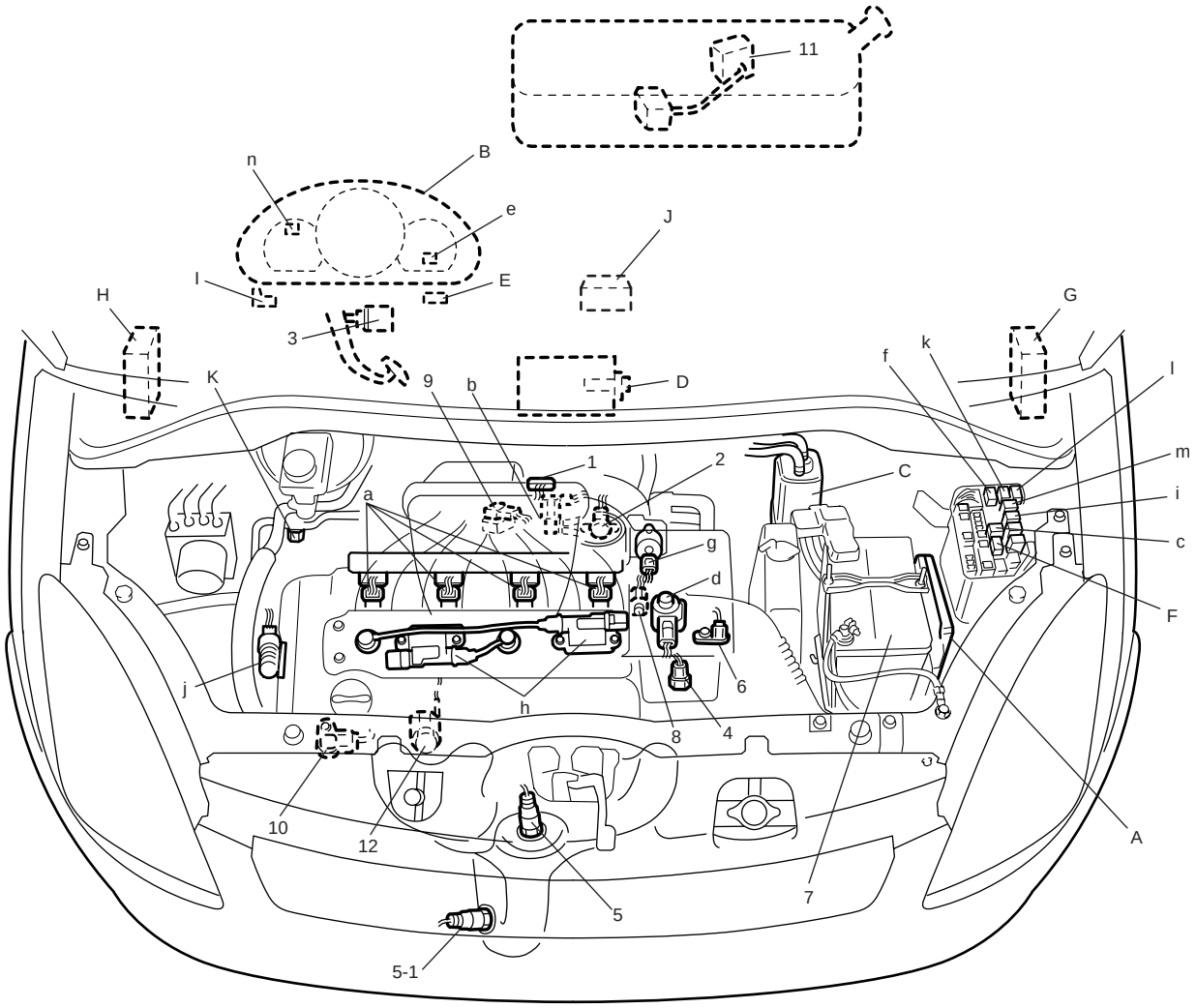
I4RS0A110011-

1. Air cleaner	15. ECT sensor	29. ECM
2. EVAP canister purge valve	16. CMP sensor	30. Barometric pressure sensor
3. MAF and IAT sensor	17. CKP sensor	31. Battery
4. TP sensor	18. Radiator cooling fan	32. A/C compressor relay
5. IAC valve	19. Combination meter	33. A/C switch
6. MAP sensor	20. BCM	34. A/C evaporator outlet air temp. sensor
7. EGR valve	21. Ignition switch	35. Immobilizer coil antenna
8. EVAP canister	22. Starter magnetic switch	36. Main relay
9. Tank pressure control valve (built-in fuel pump)	23. Heated oxygen sensor (HO2S)-2	37. VSS (M/T)
10. Fuel pump (with pressure regulator)	24. DLC	38. Oil control valve
11. Ignition coil assembly	25. Electric load	39. TCM (A/T)
12. Fuel injector	26. Fuel level sensor	40. Starting motor control relay
13. Heated oxygen sensor (HO2S)-1	27. Stop lamp	41. A/C refrigerant pressure sensor
14. Knock sensor	28. Stop lamp switch	42. Output shaft speed (VSS) sensor

Component Location

Electronic Control System Components Location

S4RS0A1103001



I4RS0A110010-

Information sensors	Control devices	Others
1. MAF and IAT sensor	a: Fuel injector	A: ECM
2. TP sensor	b: EVAP canister purge valve	B: Combination meter
3. Stop lamp switch	c: Fuel pump relay	C: EVAP canister
4. ECT sensor	d: EGR valve	D: A/C evaporator outlet air temp. sensor
5. Heated oxygen sensor-1	e: Malfunction indicator lamp	E: Data link connector
5-1. Heated oxygen sensor-2	f: Radiator cooling fan relay No.1	F: A/C compressor relay

Information sensors	Control devices	Others
6. VSS	g: IAC valve	G: TCM (A/T)
7. Battery	h: Ignition coil assembly (with ignitor)	H: BCM (included in junction block assembly)
8. CMP sensor	i: Main relay	I: Immobilizer coil antenna
9. MAP sensor	j: Oil control valve	J: EPS control module
10. CKP sensor	k: Radiator cooling fan relay No.2	K: A/C refrigerant pressure sensor
11. Fuel level sensor	l: Radiator cooling fan relay No.3	
12. Knock sensor	m: Starting motor control relay	
	n: Immobilizer indicator lamp	

Diagnostic Information and Procedures

Engine and Emission Control System Check

S4RS0A1104001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis referring to “Customer Complaint Analysis”. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	☞ **DTC / Freeze frame data check, record and clearance** 1) Check for DTC (including pending DTC) referring to “DTC / Freeze Frame Data Check, Record and Clearance”. *Is there any DTC(s)?*	Print DTC and freeze frame data or write them down and clear them by referring to “DTC Clearance: ”, and go to Step 3.	Go to Step 4.
3	☞ **Visual inspection** 1) Perform visual inspection referring to “Visual Inspection”. *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 11.	Go to Step 5.
4	☞ **Visual inspection** 1) Perform visual inspection referring to “Visual Inspection”. *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 11.	Go to Step 8.
5	☞ **Trouble symptom confirmation** 1) Confirm trouble symptom referring to “Trouble Symptom Confirmation”. *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	☞ **Rechecking and record of DTC / Freeze frame data** 1) Recheck for DTC and freeze frame data referring to “DTC Check: ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 8.
7	☞ **Rechecking and record of DTC / Freeze frame data** 1) Recheck for DTC and freeze frame data referring to “DTC Check: ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	☞ **Engine basic inspection and engine symptom diagnosis** 1) Check and repair according to “Engine Basic Inspection: ” and “Engine Symptom Diagnosis: ”. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.
9	☞ **Troubleshooting for DTC** 1) Check and repair according to applicable DTC diag. flow. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.

Step	Action	Yes	No
10	☞ **Intermittent problems check** 1) Check for intermittent problems referring to “Intermittent Problems Check”. *Is there any faulty condition?*	Repair or replace malfunction part(s), and go to Step 11.	Go to Step 11.
11	☞ **Final confirmation test** 1) Clear DTC if any. 2) Perform final confirmation test referring to “Final Confirmation Test”. *Is there any problem symptom, DTC or abnormal condition?*	Go to Step 6.	End.

Step 1: Customer Complaint Analysis
Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of such an inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

PROBLEM SYMPTOMS	
☐ **Difficult Starting** ☐ No cranking ☐ No initial combustion ☐ No combustion ☐ Poor starting at (☐cold ☐warm ☐always) ☐ Other_____	☐ **Poor Driveability** ☐ Hesitation on acceleration ☐ Back fire/☐After fire ☐ Lack of power ☐ Surging ☐ abnormal knocking ☐ Other_____
☐ **Poor Idling** ☐ Poor fast idle ☐ Abnormal idling speed (☐High ☐Low) (r/min.) ☐ Unstable ☐ Hunting (r/min. to r/min.) ☐ Other_____	☐ **Engine Stall when** ☐ Immediately after start ☐ Accel. pedal is depressed ☐ Accel. pedal is released ☐ Load is applied ☐ A/C ☐Electric load ☐P/S ☐ Other_____ ☐ Other_____
☐ OTHERS:	

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather Temperature Frequency Road	☐Fair ☐Cloudy ☐Rain ☐Snow ☐Always ☐Other_____ ☐Hot ☐Warm ☐Cool ☐Cold (°F/ °C) ☐Always ☐Always ☐Sometimes (times/ day, month) ☐Only once ☐Under certain condition ☐Urban ☐Suburb ☐Highway ☐Mountainous (☐Uphill ☐Downhill) ☐Tarmacadam ☐Gravel ☐Other_____
Vehicle Condition	
Engine condition	☐Cold ☐Warming up phase ☐Warmed up ☐Always ☐Other at starting ☐Immediately after start ☐Racing without load ☐Engine speed (r/min)
Vehicle condition	During driving: ☐Constant speed ☐Accelerating ☐Decelerating ☐Right hand corner ☐Left hand corner ☐When shifting (Lever position) ☐At stop ☐Vehicle speed when problem occurs (km/h, Mile/h) ☐Other

Malfunction indicator lamp condition	☐Always ON ☐Sometimes ON ☐Always OFF ☐Good condition	
Diagnostic trouble code	First check:	☐No code ☐Malfunction code ( )
	Second check:	☐No code ☐Malfunction code ( )

I2RH01110010-

NOTE:

The form is a standard sample. It should be modified according to conditions characteristic of each market.

Step 2: DTC / Freeze Frame Data Check, Record and Clearance
First, check DTC (including pending DTC), referring to "DTC Check: ". If DTC is indicated, print it and freeze frame data or write them down and then clear them by referring to "DTC Clearance: ". DTC indicates malfunction that occurred in the system but does not indicate whether it exists now or it occurred in the past and the normal condition has been restored now. To check which case applies, check the symptom in question according to Step 5 and recheck DTC according to Step 6 and 7.
Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC in this step will lead to incorrect diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting.

Step 3 and 4: Visual Inspection
As a preliminary step, be sure to perform visual check of the items that support proper function of the engine referring to "Visual Inspection: ".

Step 5: Trouble Symptom Confirmation
Based on information obtained in "Step 1: Customer Complaint Analysis: " and "Step 2: DTC / Freeze Frame Data Check, Record and Clearance: ", confirm trouble symptoms. Also, reconfirm DTC according to "DTC Confirmation Procedure" described in each DTC diag. flow.

Step 6 and 7: Rechecking and Record of DTC / Freeze Frame Data
Refer to "DTC Check: " for checking procedure.

Step 8: Engine Basic Inspection and Engine Symptom Diagnosis
Perform basic engine check according to "Engine Basic Inspection: " first. When the end of the flow has been reached, check the parts of the system suspected as a possible cause referring to "Engine Symptom Diagnosis: " and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or basic engine check) and repair or replace faulty parts, if any.

Step 9: Troubleshooting for DTC (See each DTC Diag. Flow)
Based on the DTC indicated in Step 6 or 7 and referring to the applicable DTC diag. flow, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ECM or other part and repair or replace faulty parts.

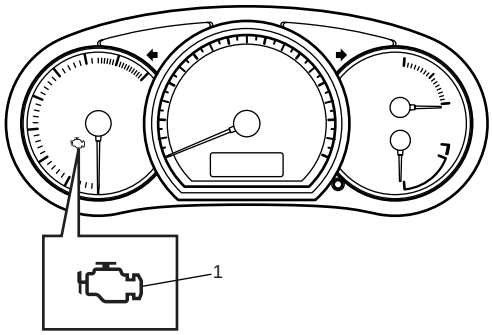
Step 10: Intermittent Problems Check
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to "Intermittent and Poor Connection Inspection: in Section 00" and related circuit of DTC recorded in Step 2.

Step 11: Final Confirmation Test
Confirm that the problem symptom has gone and the engine is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once, perform DTC confirmation procedure and confirm that no DTC is indicated.

Malfunction Indicator Lamp (MIL) Check

S4RS0A1104002

1) Turn ON ignition switch (with engine at stop) and check that MIL (1) lights.
   If MIL does not light up (or MIL dims), go to "Malfunction Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started): " for troubleshooting.
   If MIL does not light with ignition switch ON and engine does not start though it is cranked up, go to "ECM Power and Ground Circuit Check: ".
2) Start engine and check that MIL turns OFF.
   If MIL remains ON and no DTC is stored in ECM, go to "Malfunction Indicator Lamp Remains ON after Engine Starts: " for troubleshooting.



I4RS0A110012-

DTC Check

S4RS0A1104003

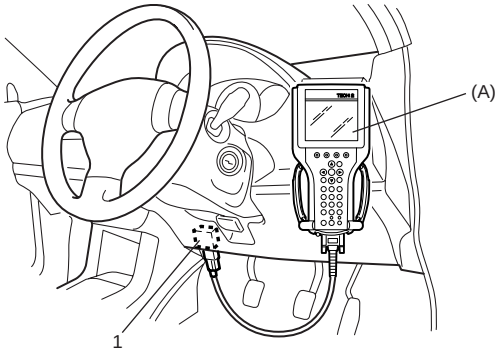
NOTE:

The MIL is turned on when the ECM and/or TCM detect malfunction(s). Each ECM and TCM stores diagnostic information as the diagnostic trouble code (DTC) in its memory and outputs the DTC to the scan tool. Therefore, check both of the ECM and TCM for any DTC with the scan tool because the DTC stored in ECM and TCM is not read and displayed at a time. However, each of the ECM and TCM needs not to be checked with the generic scan tool because the DTC stored in ECM and TCM is read and displayed at a time.

1) Prepare OBD generic scan tool or SUZUKI scan tool.

2) With ignition switch turned OFF, connect it to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0A110013-

3) Turn ignition switch ON and confirm that MIL lights.
4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print them or write them down. Refer to scan tool operator's manual for further details.
If communication between scan tool and ECM is not possible, check if scan tool is communicable by connecting it to ECM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible. If OK, check that power supply and ground circuits of ECM and DLC are in good condition referring to "ECM Power and Ground Circuit Check: ".
5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector.

DTC Clearance

S4RS0A1104004

1) Connect OBD generic scan tool or SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch OFF and then ON.
3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.

NOTE:

DTC and freeze frame data stored in ECM memory are also cleared in the following cases. Be careful not to clear them before keeping their record.

- **When power to ECM is cut off (by disconnecting battery cable, removing fuse or disconnecting ECM connectors).**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles. (See "Warm-Up Cycle" of "On-Board Diagnostic System Description: ".)**

DTC Table

S4RS0A1104005

NOTE:

- **With the generic scan tool, only star (*) marked DTC No. in the following table can be read.**
- **1 driving cycle: MIL lights up when DTC is detected during 1 driving cycle.**
- **2 driving cycles: MIL lights up when the same DTC is detected also in the next driving cycle after DTC is detected and stored temporarily in the first driving cycle.**
- ***2 driving cycles:**
  MIL blinks or lights up. Refer to "DTC P0300 / P0301 / P0302 / P0303 / P0304: Random Misfire Detected / Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Misfire Detected: " for details.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0010	Camshaft position actuator circuit	Oil control valve circuit open or short.	1 driving cycle
☞ *P0011	Camshaft position – timing over-advanced or system performance	Actual value of advanced valve timing does not reach target value, or valve timing is advanced although ECM command is most retarding.	2 driving cycles
☞ *P0012	Camshaft position – timing over-retarded		2 driving cycles
☞ *P0031	HO2S heater control circuit low (Sensor-1)	Heater current is less than specification while heater ON.	2 driving cycles
☞ *P0032	HO2S heater control circuit high (Sensor-1)	Heater current is more than specification while heater ON.	2 driving cycles

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0037	HO2S heater control circuit low (Sensor-2)	Heater current is less than specification while heater ON.	2 driving cycles
☞ *P0038	HO2S heater control circuit high (Sensor-2)	Heater current is more than specification while heater ON.	2 driving cycles
☞ *P0101	Mass air flow circuit range/ performance	MAF sensor volume is more than specification or less than specification.	2 driving cycles
☞ *P0102	Mass air flow circuit low input	Output voltage of MAF sensor is less than specification.	1 driving cycle
☞ *P0103	Mass air flow circuit high input	Output voltage of MAF sensor is more than specification.	1 driving cycle
☞ *P0106	Manifold absolute pressure circuit range/performance	Difference between Max. manifold absolute pressure value and Min. manifold pressure value is less than specification or difference between barometric pressure value and manifold pressure value is less than specification	2 driving cycles
☞ *P0107	Manifold absolute pressure circuit low input	Output voltage of MAP sensor is less than specification.	1 driving cycle
☞ *P0108	Manifold absolute pressure circuit high input	Output voltage of MAP sensor is more than specification.	1 driving cycle
☞ *P0111	Intake air temperature sensor circuit range/performance	Variation of intake air temperature from engine start is less than specification.	2 driving cycles
☞ *P0112	Intake air temperature sensor circuit low	Circuit voltage of IAT sensor is less than specification.	1 driving cycle
☞ *P0113	Intake air temperature sensor circuit high	Circuit voltage of IAT sensor is more than specification.	1 driving cycle
☞ *P0116	Engine coolant temperature circuit range/performance	Engine coolant temperature is less than specified temperature for specified time from engine start.	2 driving cycles
☞ *P0117	Engine coolant temperature circuit low	Circuit voltage of ECT sensor is less than specification.	1 driving cycle
☞ *P0118	Engine coolant temperature circuit high	Circuit voltage of ECT sensor is more than specification.	1 driving cycle
☞ *P0121	Throttle position sensor circuit range/performance	Difference between actual throttle opening and opening calculated by ECM is out of specification.	2 driving cycles
☞ *P0122	Throttle position sensor circuit low	Output voltage of TP sensor is less than specification.	1 driving cycle
☞ *P0123	Throttle position sensor circuit high	Output voltage of TP sensor is more than specification.	1 driving cycle
☞ *P0131	O2 sensor (HO2S) circuit low voltage (Sensor-1)	Max. output voltage of HO2S-1 is less than specification.	2 driving cycles
☞ *P0132	O2 sensor (HO2S) circuit high voltage (Sensor-1)	Min. output voltage of HO2S-1 is more than specification.	2 driving cycles
☞ *P0133	O2 sensor (HO2S) circuit slow response (Sensor-1)	Response time of HO2S-1 output voltage between rich and lean is longer than specification.	2 driving cycles
☞ *P0134	O2 sensor (HO2S) circuit no activity detected (Sensor-1)	Output voltage of HO2S-1 is more than specification or less than specification. (or HO2S-1 circuit open or short)	2 driving cycles
☞ *P0137	O2 sensor (HO2S) circuit low voltage (Sensor-2)	Output voltage of HO2S-2 is less than specification while engine is idling after driving with high engine load and Max. output voltage of HO2S-2 minus Min. output voltage of HO2S-2 is less than specification.	2 driving cycles
☞ *P0138	O2 sensor (HO2S) circuit high voltage (Sensor-2)	Output voltage of HO2S-2 is more than specification while engine is idling after driving with high engine load and Max. output voltage of HO2S-2 minus Min. output voltage of HO2S-2 is less than specification.	2 driving cycles
☞ *P0140	O2 sensor (HO2S) circuit no activity detected (Sensor-2)	Output voltage of HO2S-2 is more than specification after warming up engine.	2 driving cycles
☞ *P0171	System too lean	Total fuel trim is larger than specification for specified time or longer. (Fuel trim toward rich side is large.)	2 driving cycles

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0172	System too rich	Total fuel trim is smaller than specification for specified time or longer. (Fuel trim toward lean side is large.)	2 driving cycles
☞ *P0300	Random misfire detected	Misfire of such level as to cause damage to three way catalyst.	*2 driving cycles
☞ *P0301 *P0302 *P0303 *P0304	Cylinder 1 misfire detected Cylinder 2 misfire detected Cylinder 3 misfire detected Cylinder 4 misfire detected	Misfire of such level as to deteriorate emission but not to cause damage to three way catalyst.	*2 driving cycles
☞ *P0327	Knock sensor circuit low	Output voltage of knock sensor is less than specification.	1 driving cycle
☞ *P0328	Knock sensor circuit high	Output voltage of knock sensor is more than specification.	1 driving cycle
☞ *P0335	Crankshaft position sensor circuit	No signal of CKP sensor for specified time even if starting motor signal is input.	1 driving cycle
☞ *P0340	Camshaft position sensor circuit	CMP sensor pulse is out of specification.	1 driving cycle
☞ *P0401	Exhaust gas recirculation flow detected as insufficient	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is less than specification.	2 driving cycles
☞ *P0402	Exhaust gas recirculation flow detected as excessive	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is more than specification.	2 driving cycles
☞ *P0403	Exhaust gas recirculation control circuit	Output voltage is different from output command with more than one pole out of 4 poles.	1 driving cycle
☞ *P0420	Catalyst system efficiency below threshold	Output waveforms of HO2S-1 and HO2S-2 are similar.	2 driving cycles
☞ *P0443	Evaporative emission system purge control valve circuit	Monitor signal of EVAP canister purge valve is different from command signal. (circuit open or shorted to ground)	2 driving cycles
☞ P0462	Fuel level sensor circuit low	Circuit voltage of fuel level sensor is less than specification.	—
☞ P0463	Fuel level sensor circuit high	Circuit voltage of fuel level sensor is more than specification.	—
☞ *P0480	Fan 1 (Radiator cooling fan) control circuit	Monitor signal of radiator cooling fan relay is different from command signal.	1 driving cycle
☞ *P0500	Vehicle speed sensor (VSS) malfunction	No VSS signal during fuel cut for specified time or longer, or VSS signal is not input even if vehicle is driving with more than specified engine speed and D-range (A/T).	2 driving cycles
☞ *P0505	Idle air control system	IAC control duty pulse is not detected in its monitor signal.	2 driving cycles
☞ P0532	A/C refrigerant pressure sensor circuit low	Output voltage of A/C refrigerant pressure sensor is less than specification.	—
☞ P0533	A/C refrigerant pressure sensor circuit high	Output voltage of A/C refrigerant pressure sensor is more than specification.	—
☞ *P0601	Internal control module memory check sum error	Data write error or check sum error.	1 driving cycle
☞ P0602	Control module programming error	Data programming error.	1 driving cycle
☞ *P0616	Starter relay circuit low	Starter signal is low voltage even though engine is started with vehicle at stop.	2 driving cycles
☞ *P0617	Starter relay circuit high	Starter signal is high voltage for specified time while engine is running.	2 driving cycles
☞ *P1510	ECM backup power supply malfunction	Backup power voltage is out of specification after starting engine.	1 driving cycle
☞ *P1603	TCM trouble code detected	When ECM receives a trouble code from TCM, which indicates that some problem occurred in sensor circuits and its calculated values used for operations such as idle speed control, engine power control and so on by TCM, this DTC is detected by ECM.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P1674	CAN communication (buss off error)	Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	1 driving cycle
☞ *P1675	CAN communication (transmission error)	Transmission error of communication data for ECM is detected for longer than specified time continuously.	1 driving cycle
☞ *P1676	CAN communication (reception error for TCM)	Reception error of communication data for TCM is detected for longer than specified time continuously.	1 driving cycle
☞ P1678	CAN communication (reception error for BCM)	Reception error of communication data for BCM is detected for longer than specified time continuously.	—
☞ *P2227	Barometric pressure circuit range/performance	Difference of barometric pressure value and intake manifold pressure value is more than specification at engine start.	2 driving cycles
☞ *P2228	Barometric pressure circuit low	Barometric pressure sensor voltage is less than specification.	1 driving cycle
☞ *P2229	Barometric pressure circuit high	Barometric pressure sensor voltage is more than specification.	1 driving cycle
P1614	Transponder response error	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle
P1621	Immobilizer communication error	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle
P1622	EEPROM error	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle
P1623	Unregistered transponder	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle
P1625	Immobilizer antenna error	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle

For Vehicle Equipped with A/T

When using OBD generic scan tool, not only the previous star (*) marked ECM DTC(s) but also the following DTC(s) is displayed on OBD generic scan tool simultaneously.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)
*P0705	Transmission range sensor circuit malfunction (PRNDL input)	Refer to “DTC Table: in Section 5A”.
*P0707	Transmission range sensor circuit low	
*P0712	Transmission fluid temperature sensor circuit low	
*P0713	Transmission fluid temperature sensor circuit high	
*P0717	Input / Turbine speed sensor circuit no signal	
*P0722	Output speed sensor circuit no signal	
*P0741	Torque converter clutch circuit performance or stuck off	
*P0742	Torque converter clutch circuit stuck on	
*P0751	Shift solenoid-A (No.1) performance or stuck off	
*P0752	Shift solenoid-A (No.1) stuck on	
*P0756	Shift solenoid-B (No.2) performance or stuck off	
*P0757	Shift solenoid-B (No.2) stuck on	
*P0787	Shift / Timing solenoid control circuit low	
*P0788	Shift / Timing solenoid control circuit high	
*P0962	Pressure control solenoid control circuit low	
*P0963	Pressure control solenoid control circuit high	
*P0973	Shift solenoid-A (No.1) control circuit low	
*P0974	Shift solenoid-A (No.1) control circuit high	
*P0976	Shift solenoid-B (No.2) control circuit low	
*P0977	Shift solenoid-B (No.2) control circuit high	
*P1702	Internal control module memory check sum error	
*P1774	Control module communication bus off	
*P1775	High speed can communication bus (Transmission error)	
*P1777	TCM lost communication with ECM (Reception error)	
*P2763	Torque converter clutch pressure control solenoid control circuit high	
*P2764	Torque converter clutch pressure control solenoid control circuit low	

Fail-Safe Table

S4RS0A1104006

When any of the following DTCs is detected, ECM enters fail-safe mode as long as malfunction continues to exist but that mode is canceled when ECM detects normal condition after that.

DTC No.	Detected item	Fail-safe operation
☞ P0102	Mass air flow circuit low input	• ECM controls injector drive time (fuel injection volume) according to throttle valve opening (closed throttle position or not). • ECM stops EGR control.
☞ P0103	Mass air flow circuit high input	
☞ P0112	Intake air temperature sensor circuit low	ECM controls actuators assuming that intake air temperature is 20 °C (68 °F).
☞ P0113	Intake air temperature sensor circuit high	
☞ P0117	Engine coolant temperature circuit low	• ECM controls actuators assuming that engine coolant temperature is 80 °C (176 °F). • ECM operates radiator cooling fan.
☞ P0118	Engine coolant temperature circuit high	
☞ P0122	Throttle position sensor circuit low input	ECM controls actuators assuming that throttle opening is about 20°.
☞ P0123	Throttle position sensor circuit high input	
☞ P0335	Crankshaft position sensor circuit	• Ignition timing is fixed. • ECM changes injection control system from sequential injection to simultaneous one.
☞ P0340	Camshaft position sensor circuit	ECM changes injection control system from sequential injection to simultaneous one.
☞ P0500	Vehicle speed sensor	• ECM controls actuators assuming that vehicle speed is 0 km/h (0 mile/h). • ECM stops IAC feedback control.
☞ P2227	Barometric pressure sensor performance problem	ECM controls actuators assuming that barometric pressure is 101.33 kPa (762 mmHg).

Scan Tool Data

S4RS0A1104007

As the data values are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.
Also, conditions that can be checked by the scan tool are those detected by ECM and output from ECM as commands and there may be cases where the engine or actuator is not operating (in the condition) as indicated by the scan tool. Be sure to use the timing light to check the ignition timing.

NOTE:

- **With the generic scan tool, only star (*) marked data in the following table can be read.**
- **When checking the data with the engine running at idle or racing, be sure to shift M/T gear to the neutral gear position and A/T gear to the "Park" position and pull the parking brake fully. Also, if nothing or "no load" is indicated, turn OFF A/C, all electric loads, P/S and all the other necessary switches.**

	Scan tool data	Vehicle condition	Normal condition / reference values
*	☞ COOLANT TEMP (ENGINE COOLANT TEMP.)	At specified idle speed after warming up	80 – 100 °C, 176 – 212 °F
*	☞ INTAKE AIR TEMP.	At specified idle speed after warming up	–5 °C (23 °F) + environmental temp. to 40 °C (104 °F) + environmental temp.
*	☞ ENGINE SPEED	It idling with no load after warming up	Desired idle speed ± 50 r/min.
	☞ INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH)	At specified idle speed with no load after warming up	2.0 – 4.0 msec.
		At 2500 r/min. with no load after warming up	2.0 – 3.6 msec.

	Scan tool data	Vehicle condition		Normal condition / reference values
	☞ TP SENSOR VOLT (THROTTLE POSITION SENSOR OUTPUT VOLTAGE)	Ignition switch ON / warmed up engine stopped	Accelerator pedal released	0.5 – 1.0 V
			Accelerator pedal depressed fully	Less than 4.8 V
	☞ DESIRED IDLE (DESIRED IDLE SPEED)	It idling with radiator cooling fan stopped and all electrical parts turned OFF after warming up, M/T at neutral		700 r/min.
	☞ IAC FLOW DUTY (IDLE AIR CONTROL FLOW DUTY)	It idling with no load after warming up		5 – 55%
*	☞ SHORT FT B1 (SHORT TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
*	☞ LONG FT B1 (LONG TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
	☞ TOTAL FUEL TRIM B1	At specified idle speed after warming up		–35 – +35%
*	☞ MAF (MASS AIR FLOW RATE)	At specified idle speed with no load after warming up		1.0 – 4.0 g/s 0.14 – 0.52 lb/min.
		At 2500 r/min. with no load after warming up		4.0 – 12.0 g/s 0.53 – 1.58 lb/min.
*	☞ CALC LOAD (CALCULATED LOAD VALUE)	At specified idle speed with no load after warming up		0 – 10%
		At 2500 r/min. with no load after warming up		0 – 10%
*	☞ THROTTLE POSITION (ABSOLUTE THROTTLE POSITION)	Ignition switch ON / warmed up engine stopped	Accelerator pedal released	0 – 5%
			Accelerator pedal depressed fully	90 – 100%
*	☞ O2S B1 S1 (HEATED OXYGEN SENSOR-1)	At specified idle speed after warming up		0.1 – 0.95 V
*	☞ O2S B1 S2 (HEATED OXYGEN SENSOR-2)	At 2000 r/min. for 3 min. or longer after warming up.		0.1 – 0.95 V
*	☞ FUEL SYSTEM B1 (FUEL SYSTEM STATUS)	At specified idle speed after warming up		CLOSED (closed loop)
*	☞ MAP (INTAKE MANIFOLD ABSOLUTE PRESSURE)	At specified idle speed with no load after warming up		24 – 38 kPa, 7.1 – 11.2 in.Hg
	☞ BAROMETRIC PRESS	—		Barometric pressure is displayed
	☞ STEP EGR FLOW DUTY	At specified idle speed after warming up		0%
	☞ FUEL CUT	Engine at fuel cut condition		ON
		Engine at other than fuel cut condition		OFF

	Scan tool data	Vehicle condition		Normal condition / reference values
	☞ A/C PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE)	Engine running	A/C ON (A/C is operating) at ambient temperature: 30 °C (86 °F) and humidity: 50%	1350 – 1650 kPa For more details, refer to pressure of high pressure gage under “A/C System Performance Inspection: in Section 7B”.
			A/C OFF (A/C is not operating) at ambient temperature: 30 °C (86 °F) and engine coolant temperature: 90 – 100 °C (194 – 212 °F)	600 – 1000 kPa After longer than 10 min from A/C switch turned off
	☞ CLOSED THROTTLE POS (CLOSED THROTTLE POSITION)	Throttle valve at idle position		ON
		Throttle valve opens larger than idle position		OFF
	☞ CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY)	At specified idle speed after warming up		0%
*	☞ IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER)	At specified idle speed with no load after warming up		3 – 13° BTDC
	☞ BATTERY VOLTAGE	Ignition switch ON / engine at stop		10 – 14 V
	☞ FUEL PUMP	Within 3 seconds after ignition switch ON or engine running		ON
		Engine at stop with ignition switch ON		OFF
	☞ ELECTRIC LOAD	Ignition switch ON / Headlight, small light, all turned OFF		OFF
		Ignition switch ON / Headlight, small light, turned ON		ON
	☞ BRAKE SWITCH	Ignition switch ON	Brake pedal is released	OFF
			Brake pedal is depressed	ON
	☞ RADIATOR FAN (RADIATOR COOLING FAN CONTROL RELAY)	Ignition switch ON	Engine coolant temp.: Lower than 95 °C (203 °F)	OFF
			Engine coolant temp.: 97.5 °C (208 °F) or higher	ON
	☞ BLOWER FAN	Ignition switch ON	Blower fan switch: 2nd speed position or more	ON
			Blower fan switch: under 2nd speed position	OFF
	☞ A/C SWITCH	Engine running after warming up, A/C not operating		OFF
		Engine running after warming up, A/C operating		ON
	☞ A/C COMP RELAY	Engine running	A/C switch and blower motor switch turned ON	ON
			A/C switch and blower motor switch turned OFF	OFF
*	☞ VEHICLE SPEED	At stop		0 km/h (0 mph)
	☞ VVT GAP (TARGET-ACTUAL POSITION)	At specified idle speed after warming up		0 – 3°

Scan Tool Data Definitions

COOLANT TEMP (ENGINE COOLANT TEMPERATURE, °C, °F)
It is detected by engine coolant temp. sensor.

INTAKE AIR TEMP. (°C, °F)
It is detected by intake air temp. sensor.

ENGINE SPEED (rpm)
It is computed by reference pulses from the camshaft position sensor.

INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH, msec.)
This parameter indicates time of the injector drive (valve opening) pulse which is output from ECM (but injector drive time of NO.1 cylinder for multiport fuel injection).

TP SENSOR VOLT (THROTTLE POSITION SENSOR OUTPUT VOLTAGE, V)
The Throttle Position Sensor reading provides throttle valve opening information in the form of voltage.

DESIRED IDLE (DESIRED IDLE SPEED, rpm)
The Desired Idle Speed is an ECM internal parameter which indicates the ECM requested idle. If the engine is not running, this number is not valid.

IAC FLOW DUTY (IDLE AIR (SPEED) CONTROL DUTY, %)
This parameter indicates current flow time rate within a certain set cycle of IAC valve (valve opening rate) which controls the amount of bypass air (idle speed).

SHORT FT B1 (SHORT TERM FUEL TRIM, %)
Short term fuel trim value represents short term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

LONG FT B1 (LONG TERM FUEL TRIM, %)
Long term fuel trim value represents long term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

TOTAL FUEL TRIM B1 (%)
The value of Total Fuel Trim is obtained by calculating based on values of Short Term Fuel Trim and Long Term Fuel Trim. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

MAF (MASS AIR FLOW RATE, g/s, lb/min.)
It represents total mass of air entering intake manifold which is measured by mass air flow sensor.

CALC LOAD (CALCULATED LOAD VALUE, %)
Engine load displayed as a percentage of maximum possible load. Value is calculated mathematically using the formula: actual (current) intake air volume ÷ maximum possible intake air volume × 100%

THROTTLE POS (ABSOLUTE THROTTLE POSITION, %)
When throttle position sensor is at fully closed position, throttle opening is indicated as 0 – 5% and 90 – 100% full open position.

O2S SENSOR B1 S1 (HEATED OXYGEN SENSOR-1, V)
It indicates output voltage of HO2S-1 installed on exhaust manifold (pre-catalyst).

O2S SENSOR B1 S2 (HEATED OXYGEN SENSOR-2, V)
It indicates output voltage of HO2S-2 installed on exhaust pipe (post-catalyst). It is used to detect catalyst deterioration.

FUEL SYSTEM (FUEL SYSTEM STATUS)
Air/fuel ratio feedback loop status displayed as one of the followings.
OPEN: Open-loop has not yet satisfied conditions to go closed loop.
CLOSED: Closed-loop using oxygen sensor(s) as feedback for fuel control.
OPEN-DRIVE COND: Open-loop due to driving conditions (Power enrichment, etc.).
OPEN SYS FAULT: Open-loop due to detected system fault.

MAP (MANIFOLD ABSOLUTE PRESSURE, in.Hg, kPa)
This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.
It is detected by manifold absolute pressure sensor.

BAROMETRIC PRESS (kPa, in.Hg)
This parameter represents a measurement of barometric air pressure and is used for altitude correction of the fuel injection quantity and IAC valve control.

STEP EGR FLOW DUTY (%)
This parameter indicates opening rate of EGR valve which controls the amount of EGR flow.

FUEL CUT (ON/OFF)
ON: Fuel being cut (output signal to injector is stopped)
OFF: Fuel not being cut

A/C PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE, kPa)
This parameter indicates A/C refrigerant absolute pressure calculated by ECM.

CLOSED THROTTLE POS (CLOSED THROTTLE POSITION, ON/OFF)
This parameter reads ON when throttle valve is fully closed, or OFF when it is not fully closed.

CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY, %)
This parameter indicates valve ON (valve open) time rate within a certain set cycle of EVAP canister purge valve which controls the amount of EVAP purge.

IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER, °)
Ignition timing of No.1 cylinder is commanded by ECM. The actual ignition timing should be checked by using the timing light.

BATTERY VOLTAGE (V)
This parameter indicates battery positive voltage inputted from main relay to ECM.

FUEL PUMP (ON/OFF)
ON is displayed when ECM activates the fuel pump via the fuel pump relay switch.

ELECTRIC LOAD (ON/OFF)
ON: Headlight or small light ON signal inputted.
OFF: Above electric loads all turned OFF.

BRAKE SW (ON/OFF)
This parameter indicates the state of the brake switch.

RADIATOR COOLING FAN (RADIATOR COOLING FAN CONTROL RELAY, ON/OFF)
ON: Command for radiator cooling fan control relay operation being output.
OFF: Command for relay operation not being output.

BLOWER FAN (ON/OFF)
This parameter indicates the state of the blower fan motor switch.

A/C SWITCH (ON/OFF)
ON: Command for A/C operation being output from ECM to HVAC.
OFF: Command for A/C operation not being output.

A/C COMP RELAY (A/C COMPRESSOR RELAY, ON/OFF)
This parameter indicates the state of the A/C switch.

VEHICLE SPEED (km/h)
It is computed based on pulse signals from vehicle speed sensor.

VVT GAP (TARGET-ACTUAL POSITION, °)
It is calculated using the formula: target valve timing advance – actual valve timing advance.

Visual Inspection

S4RS0A1104008

Visually check the following parts and systems.

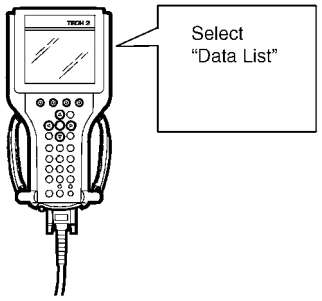
Inspection item	Reference section
• Engine oil – level, leakage	"Engine Oil and Filter Change: in Section 0B"
• Engine coolant – level, leakage	"Coolant Level Check: in Section 1F"
• Fuel – level, leakage	"Fuel Lines and Connections Inspection: in Section 0B"
• Air cleaner element – dirt, clogging	"Air Cleaner Filter Inspection: in Section 0B"
• Battery – fluid level, corrosion of terminal	"Battery Description: in Section 1J"
• Water pump belt – tension damage	"Accessory Drive Belt Inspection: in Section 0B"
• Throttle cable – play (under warm engine), installation	"Accelerator Cable Adjustment: in Section 1D"
• Vacuum hoses of air intake system – disconnection, looseness, deterioration, bend	"Vacuum Hose Inspection: in Section 1B"
• Connectors of electric wire harness – disconnection, friction	
• Fuses – burning	
• Parts – installation, bolt – looseness	
• Parts – deformation	
• Other parts that can be checked visually	
Also check the following items at engine start, if possible	
• Malfunction indicator lamp – Operation	"Malfunction Indicator Lamp (MIL) Check: "
• Charge warning lamp – Operation	"Generator Symptom Diagnosis: in Section 1J"
• Engine oil pressure warning lamp – Operation	"Oil Pressure Switch Inspection: in Section 9C"
• Engine coolant temp. meter – Operation	"Engine Coolant Temperature (ECT) Sensor Inspection: in Section 9C"
• Fuel level meter – Operation	"Fuel Level Sensor Inspection: in Section 9C"

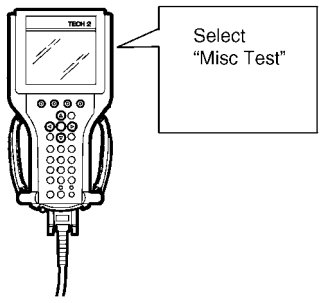
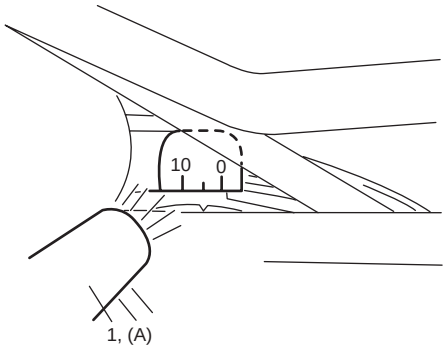
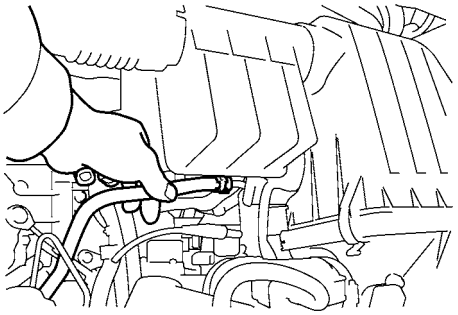
Inspection item	Reference section
• Tachometer – Operation • Abnormal air being inhaled from air intake system • Exhaust system – leakage of exhaust gas, noise • Other parts that can be checked visually	

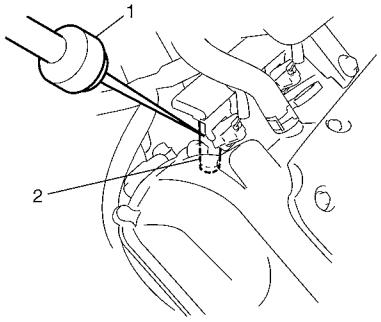
Engine Basic Inspection

S4RS0A1104009

This check is very important for troubleshooting when ECM has detected no DTC and no abnormality has been found in “Visual Inspection: ”.
Follow the flow carefully.

Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.
2	**Check battery voltage** *Is it 11 V or more?*	Go to Step 3.	Charge or replace battery.
3	*Is engine cranked?*	Go to Step 4.	Go to “Cranking System Symptom Diagnosis: in Section 1I”.
4	*Does engine start?*	Go to Step 5.	Go to Step 7.
5	**Check idle speed** 1) Warm up engine to normal operating temperature. 2) Shift transmission to neutral position for M/T (“P” position for A/T). 3) Make sure that a electrical loads are switched off. 4) Check engine idle speed with scan tool.  I2RH01110005- *Is it 650 – 750 r/min.?*	Go to Step 6.	Go to “Engine Symptom Diagnosis: ”.

Step	Action	Yes	No
6	**Check ignition timing** 1) Using SUZUKI scan tool, select “Misc Test” mode on SUZUKI scan tool and fix ignition timing to initial one.  I2RH01110006- 2) Using timing light, check initial ignition timing. **Special tool** **(A): 09930–76420**  I3RB0A180004- *Is it 5 °±3 °BTDC at specified idle speed?*	Go to “Engine Symptom Diagnosis: ”.	Check ignition control related parts referring to “Ignition Timing Inspection: in Section 1H”.
7	**Check immobilizer system malfunction** 1) Check immobilizer indicator lamp for flashing. *Is it flashing when ignition switch is turned to ON position?*	Go to “Diagnostic Trouble Code (DTC) Check: in Section 10C”.	Go to Step 8.
8	**Check fuel supply** 1) Check to make sure that enough fuel is filled in fuel tank. 2) Turn ON ignition switch for 3 seconds and then OFF. Repeat this a few times. *Is fuel pressure felt from fuel feed hose when ignition switch is turned ON?*  I3RM0A110014-	Go to Step 10.	Go to Step 9.

Step	Action	Yes	No
9	**Check fuel pump for operation** *Was fuel pump operating sound heard from fuel filler for about 3 seconds after ignition switch ON and stop?*	Go to “Fuel Pressure Check: ”.	Go to “Fuel Pump and Its Circuit Check: ”.
10	**Check ignition spark** 1) Disconnect injector couplers. 2) Remove spark plugs and connect them to high-tension cords or ignition coil assembly. 3) Ground spark plugs. 4) Crank engine and check if each spark plug sparks. *Is it in good condition?*	Go to Step 11.	Go to “Ignition Spark Test: in Section 1H”.
11	**Check fuel injector for operation** 1) Install spark plugs and connect injector connectors. 2) Using sound scope (1), check operating sound of each injector (2) when cranking engine.  I3RM0A110015- *Was injector operating sound heard from all injectors?*	Go to “Engine Symptom Diagnosis: ”.	Go to “Fuel Injector Circuit Check: ”.

Engine Symptom Diagnosis

S4RS0A1104010

Perform troubleshooting referring to the followings when ECM has detected no DTC and no abnormality has been found in “Visual Inspection: ” and “Engine Basic Inspection: ”.

Condition	Possible cause	Correction / Reference Item
Hard starting (Engine cranks OK)	Faulty spark plug	*“Spark Plug Inspection: in Section 1H”*
	Leaky high-tension cord	*“High-Tension Cord Inspection: in Section 1H”*
	Loose connection or disconnection of high-tension cord(s) or lead wire(s)	*“High-Tension Cord Removal and Installation: in Section 1H”*
	Faulty ignition coil	*“Ignition Coil Assembly (Including ignitor) Inspection: in Section 1H”*
	Dirty or clogged fuel hose or pipe	*“Fuel Pressure Check: ”*
	Malfunctioning fuel pump	*“Fuel Pressure Check: ”*
	Air drawn in through intake manifold gasket or throttle body gasket	
	Faulty idle air control system	*“Idle Air Control System Check: ”*
	Faulty ECT sensor or MAF sensor	*“Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C” or “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C”*
	Faulty ECM	
	Low compression	*“Compression Check: in Section 1D”*
	Poor spark plug tightening or faulty gasket	*“Spark Plug Removal and Installation: in Section 1H”*
	Compression leak from valve seat	*“Valves and Valve Guides Inspection: in Section 1D”*
	Sticky valve stem	*“Valves and Valve Guides Inspection: in Section 1D”*
	Weak or damaged valve springs	*“Valve Spring Inspection: in Section 1D”*
	Compression leak at cylinder head gasket	*“Cylinder Head Inspection: in Section 1D”*
	Sticking or damaged piston ring	*“Cylinders, Pistons and Piston Rings Inspection: in Section 1D”*
	Worn piston, ring or cylinder	*“Cylinders, Pistons and Piston Rings Inspection: in Section 1D”*
	Malfunctioning PCV valve	*“PCV Valve Inspection: in Section 1B”*
	Camshaft position control (VVT) system out of order	*“Oil Control Valve Inspection: in Section 1D”*
	Faulty EGR system	*“EGR System Inspection: in Section 1B”*
Low oil pressure	Improper oil viscosity	*“Engine Oil and Filter Change: in Section 0B”*
	Malfunctioning oil pressure switch	*“Oil Pressure Switch Inspection: in Section 9C”*
	Clogged oil strainer	*“Oil Pan and Oil Pump Strainer Cleaning: in Section 1E”*
	Functional deterioration of oil pump	*“Oil Pump Inspection: in Section 1E”*
	Worn oil pump relief valve	*“Oil Pump Inspection: in Section 1E”*
	Excessive clearance in various sliding parts	
Engine noise – Valve noise ***NOTE:*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Improper valve lash	*“Camshaft, Tappet and Shim Inspection: in Section 1D”*
	Worn valve stem and guide	*“Valves and Valve Guides Inspection: in Section 1D”*
	Weak or broken valve spring	*“Valve Spring Inspection: in Section 1D”*
	Warped or bent valve	*“Valves and Valve Guides Inspection: in Section 1D”*

Condition	Possible cause	Correction / Reference Item
Engine noise – Piston, ring and cylinder noise ***NOTE:*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Worn piston, ring and cylinder bore	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
Engine noise – Connecting rod noise ***NOTE:*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Worn piston, ring and cylinder bore	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
	Worn rod bearing	*"Crank Pin and Connecting Rod Bearings Inspection: in Section 1D"*
	Worn crank pin	*"Crank Pin and Connecting Rod Bearings Inspection: in Section 1D"*
	Loose connecting rod nuts	*"Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: in Section 1D"*
	Low oil pressure	*Condition "Low oil pressure"*
Engine noise – Crankshaft noise ***NOTE:*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Low oil pressure	*Condition "Low oil pressure"*
	Worn bearing	*"Main Bearings Inspection: in Section 1D"*
	Worn crankshaft journal	*"Crankshaft Inspection: in Section 1D"*
	Loose bearing cap bolts	*"Main Bearings, Crankshaft and Cylinder Block Removal and Installation: in Section 1D"*
	Excessive crankshaft thrust play	*"Crankshaft Inspection: in Section 1D"*
Engine overheating	Inoperative thermostat	*"Thermostat Inspection: in Section 1F"*
	Poor water pump performance	*"Water Pump Inspection: in Section 1F"*
	Clogged or leaky radiator	*"Radiator On-Vehicle Inspection and Cleaning: in Section 1F"*
	Improper engine oil grade	*"Engine Oil and Filter Change: in Section 0B"*
	Clogged oil filter or oil strainer	*"Oil Pressure Check: in Section 1E"*
	Poor oil pump performance	*"Oil Pressure Check: in Section 1E"*
	Faulty radiator cooling fan control system	*"Radiator cooling fan Low Speed Control System Check: " or "Radiator cooling fan High Speed Control System Check: "*
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis: in Section 4A"*
	Slipping clutch	*Condition "Slipping clutch" in "Clutch System Symptom Diagnosis: in Section 5C"*
	Blown cylinder head gasket	*"Cylinder Head Inspection: in Section 1D"*
	Air mixed in cooling system	

Condition	Possible cause	Correction / Reference Item
Poor gasoline mileage	Leaks or loose connection of high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty spark plug (improper gap, heavy deposits and burned electrodes, etc.)	*"Spark Plug Inspection: in Section 1H"*
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	High idle speed	*Condition "Improper engine idling or engine fails to idle"*
	Poor performance of ECT sensor, TP sensor or MAF sensor	*"Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C", "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Low compression	*"Compression Check: in Section 1D"*
	Poor valve seating	*"Valves and Valve Guides Inspection: in Section 1D"*
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis: in Section 4A"*
	Slipping clutch	*Condition "Slipping clutch" in"Clutch System Symptom Diagnosis: in Section 5C"*
	Thermostat out of order	*"Thermostat Inspection: in Section 1F"*
	Improper tire pressure	*"Tires Description: in Section 2D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*
Excessive engine oil consumption – Oil leakage	Blown cylinder head gasket	*"Cylinder Head Inspection: in Section 1D"*
	Leaky camshaft oil seals	*"Camshaft, Tappet and Shim Inspection: in Section 1D"*
Excessive engine oil consumption – Oil entering combustion chamber	Sticky piston ring	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
	Worn piston and cylinder	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
	Worn piston ring groove and ring	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
	Improper location of piston ring gap	*"Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly: in Section 1D"*
	Worn or damaged valve stem seal	*"Valves and Valve Guides Inspection: in Section 1D"*
	Worn valve stem	*"Valves and Valve Guides Inspection: in Section 1D"*
Engine hesitates – Momentary lack of response as accelerator is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make vehicle move, as from a stop sign.	Spark plug faulty or plug gap out of adjustment	*"Spark Plug Inspection: in Section 1H"*
	Leaky high-tension cord	*"High-Tension Cord Inspection: in Section 1H"*
	Fuel pressure out of specification	*"Fuel Pressure Check: "*
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Poor performance of TP sensor, ECT sensor or MAF sensor	*"Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Engine overheating	*Condition "Engine overheating"*
	Low compression	*"Compression Check: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*

Condition	Possible cause	Correction / Reference Item
Surge – Engine power variation under steady throttle or cruise. Feels like vehicle speeds up and down with no change in accelerator pedal.	Leaky or loosely connected high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty spark plug (excess carbon deposits, improper gap, burned electrodes, etc.)	*"Spark Plug Inspection: in Section 1H"*
	Variable fuel pressure	*"Fuel Pressure Check: "*
	Kinky or damaged fuel hose and lines	
	Faulty fuel pump (clogged fuel filter)	
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Poor performance of MAF sensor	*"Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
Excessive detonation – Engine makes continuously sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.	Faulty spark plug	*"Spark Plug Inspection: in Section 1H"*
	Loose connection of high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Engine overheating	*Condition "Engine overheating"*
	Clogged fuel filter (faulty fuel pump) or fuel lines	*"Fuel Injector Circuit Check: " or "Fuel Pump and Its Circuit Check: "*
	Air drawn in through intake manifold or throttle body gasket	
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Poor performance of knock sensor, ECT sensor or MAF sensor	*"DTC P0327 / P0328: Knock Sensor Circuit Low / High: ", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Excessive combustion chamber deposits	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D" and/or "Piston Pins and Connecting Rods Inspection: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*

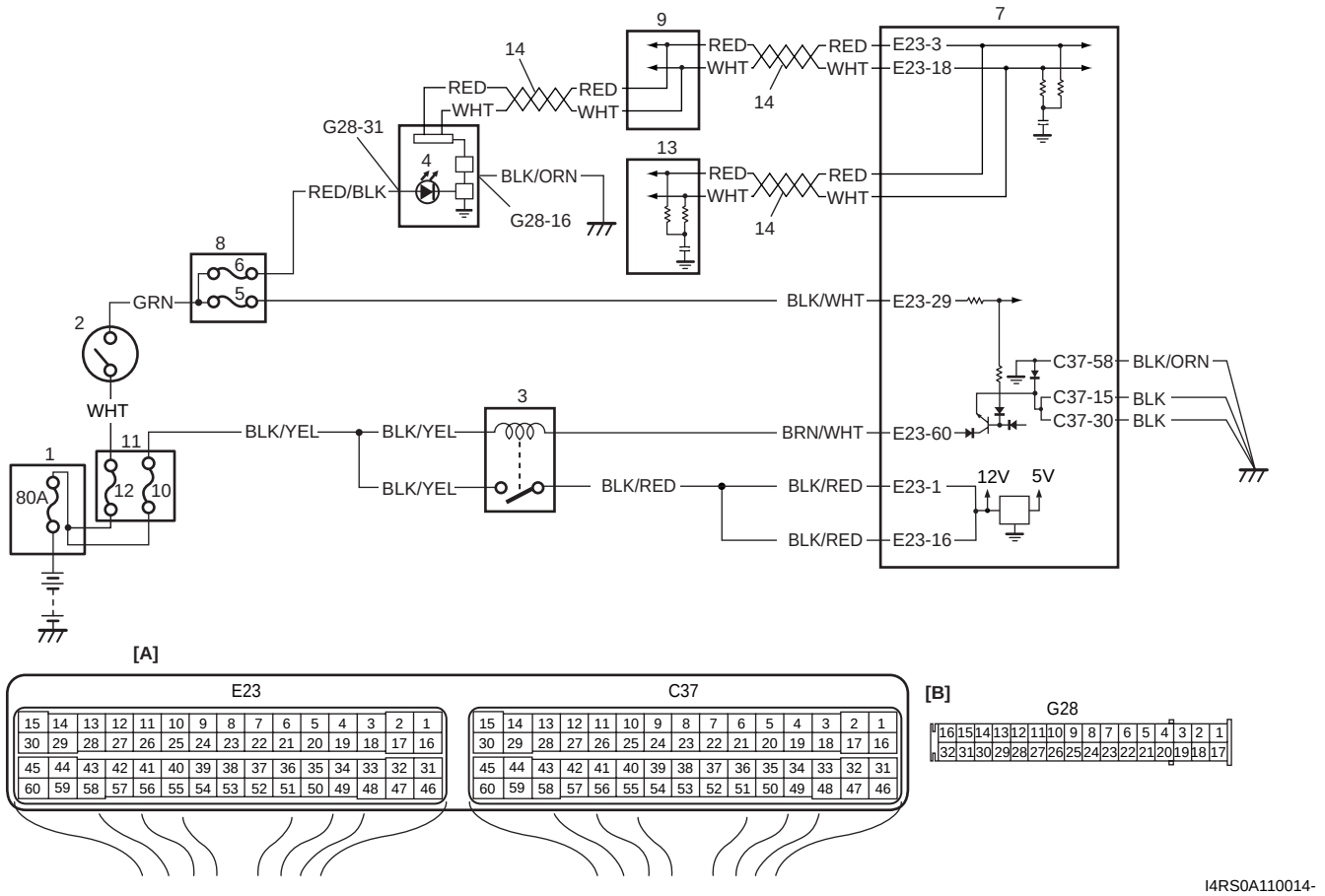
Condition	Possible cause	Correction / Reference Item
Engine has no power	Faulty spark plug	*"Spark Plug Inspection: in Section 1H"*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly (Including ignitor) Inspection: in Section 1H"*
	Leaks, loose connection or disconnection of high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty knock sensor	*"DTC P0327 / P0328: Knock Sensor Circuit Low / High: "*
	Clogged fuel hose or pipe	*"Fuel Pressure Check: "*
	Malfunctioning fuel pump	*"Fuel Pump and Its Circuit Check: "*
	Air drawn in through intake manifold gasket or throttle body gasket	
	Engine overheating	*Condition "Engine overheating"*
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Maladjusted accelerator cable play	*"Accelerator Cable Adjustment: in Section 1D"*
	Poor performance of TP sensor, ECT sensor or MAF sensor	*"Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis: in Section 4A"*
	Slipping clutch	*Condition "Slipping clutch" in "Clutch System Symptom Diagnosis: in Section 5C"*
	Low compression	*"Compression Check: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*
Improper engine idling or engine fails to idle	Faulty spark plug	*"Spark Plug Inspection: in Section 1H"*
	Leaky or disconnected high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly (Including ignitor) Inspection: in Section 1H"*
	Fuel pressure out of specification	*"Fuel Pressure Check: "*
	Leaky manifold, throttle body, or cylinder head gasket	
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Faulty idle air control system	*"Idle Air Control System Check: "*
	Faulty evaporative emission control system	*"EVAP Canister Purge Inspection: in Section 1B"*
	Faulty EGR system	*"EGR System Inspection: in Section 1B"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: "*
	Poor performance of ECT sensor, TP sensor or MAF sensor	*"Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C", "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty ECM	
	Loose connection or disconnection of vacuum hoses	
	Malfunctioning PCV valve	*"PCV Valve Inspection: in Section 1B"*
	Engine overheating	*Condition "Engine overheating"*
	Low compression	*"Compression Check: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*

Condition	Possible cause	Correction / Reference Item
Excessive hydrocarbon (HC) emission or carbon monoxide (CO)	Faulty spark plug	*"Spark Plug Inspection: in Section 1H"*
	Leaky or disconnected high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly (Including ignitor) Inspection: in Section 1H"*
	Low compression	*"Compression Check: in Section 1D"*
	Lead contamination of three way catalytic converter	*Check for absence of filler neck restrictor.*
	Faulty evaporative emission control system	*"EVAP Canister Purge Inspection: in Section 1B"*
	Fuel pressure out of specification	*"Fuel Pressure Check: "*
	Closed loop system (A/F feedback compensation) fails (Faulty TP sensor, Poor performance of ECT sensor or MAF sensor)	*"Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Engine not at normal operating temperature	
	Clogged air cleaner	*"Air Cleaner Element Inspection and Cleaning: in Section 1D"*
	Vacuum leaks	*"Engine Vacuum Check: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*
Excessive nitrogen oxides (NOx) emission	Improper ignition timing	*"Ignition Timing Inspection: in Section 1H"*
	Lead contamination of catalytic converter	*Check for absence of filler neck restrictor.*
	Faulty EGR system	*"EGR System Inspection: in Section 1B"*
	Fuel pressure out of specification	*"Fuel Pressure Check: "*
	Closed loop system (A/F feedback compensation) fails (Faulty TP sensor, Poor performance of ECT sensor or MAF sensor)	*"Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C"or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*

Malfunction Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started)

S4RS0A1104011

Wiring Diagram



I4RS0A110014-

[A]: ECM connector (viewed from harness side)	3. Main relay	7. ECM	11. Relay box
[B]: Combination meter connector (viewed from harness side)	4. Malfunction indicator lamp in combination meter	8. Junction block assembly	12. “IG ACC” fuse
1. Main fuse box	5. “IG COIL” fuse	9. BCM	13. TCM
2. Ignition switch	6. “METER” fuse	10. “FI” fuse	14. CAN communication line

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of malfunction indicator lamp (MIL) to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting

NOTE:

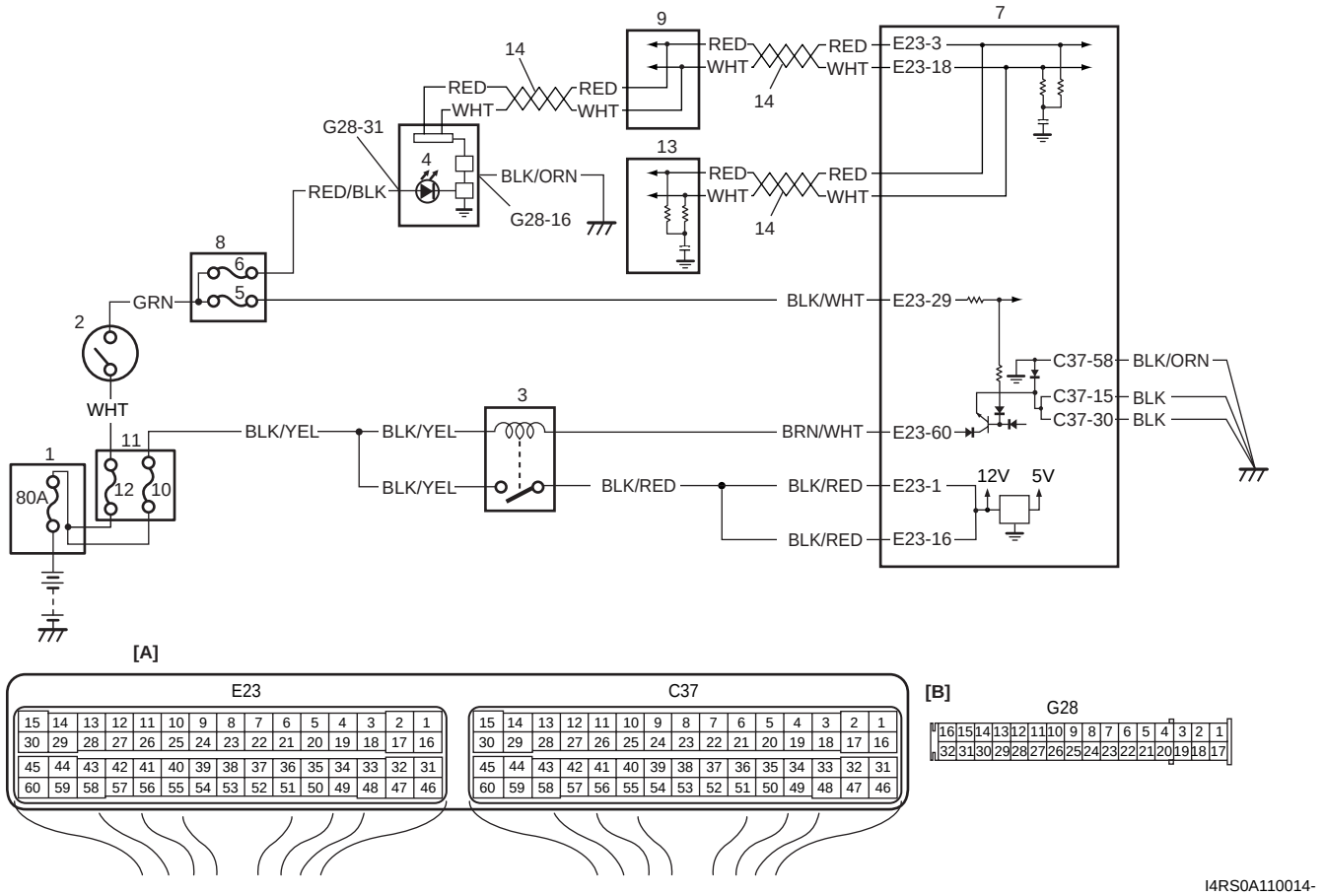
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	**MIL power supply check** 1) Turn ignition switch to ON position. *Do other warning lights come ON?*	Go to Step 2.	Go to Step 3.
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. *Is there DTC(s) P1674, P1675 and/or P1678?*	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.
3	**CAN communication line circuit check** 1) Check CAN communication circuit between combination meter and ECM or TCM (equipped with A/T) referring to Step 9 to 14 of "DTC P1674: CAN Communication (Bus Off Error): " *Is circuit in good condition?*	Go to Step 4.	Repair or replace.
4	**"METER" fuse check** 1) Turn ignition switch to OFF position. 2) Check for fuse blown at "METER" fuse in junction block assembly. *Is "METER" fuse in good condition?*	Go to Step 5.	Replace "METER" fuse and check for short.
5	**Combination meter power supply check** 1) Remove combination meter referring to "Combination Meter Removal and Installation: in Section 9C". 2) Check for proper connection to combination meter connector at "G28-31" and "G28-16" terminals. 3) If OK, then turn ignition switch to ON position and measure voltage between combination meter connector at "G28-31" terminal and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 6.	"RED/BLK" wire is open circuit.
6	**Combination meter circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "G28-16" terminal of combination meter connector and vehicle body ground. *Is resistance 1 Ω or less?*	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.	"BLK/ORN" wire is open or high resistance circuit.

Malfunction Indicator Lamp Remains ON after Engine Starts

S4RS0A1104012

Wiring Diagram



I4RS0A110014-

[A]: ECM connector (viewed from harness side)	3. Main relay	7. ECM	11. Relay box
[B]: Combination meter connector (viewed from harness side)	4. Malfunction indicator lamp in combination meter	8. Junction block assembly	12. “IG ACC” fuse
1. Main fuse box	5. “IG COIL” fuse	9. BCM	13. TCM
2. Ignition switch	6. “METER” fuse	10. “FI” fuse	14. CAN communication line

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of malfunction indicator lamp (MIL) to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting

NOTE:

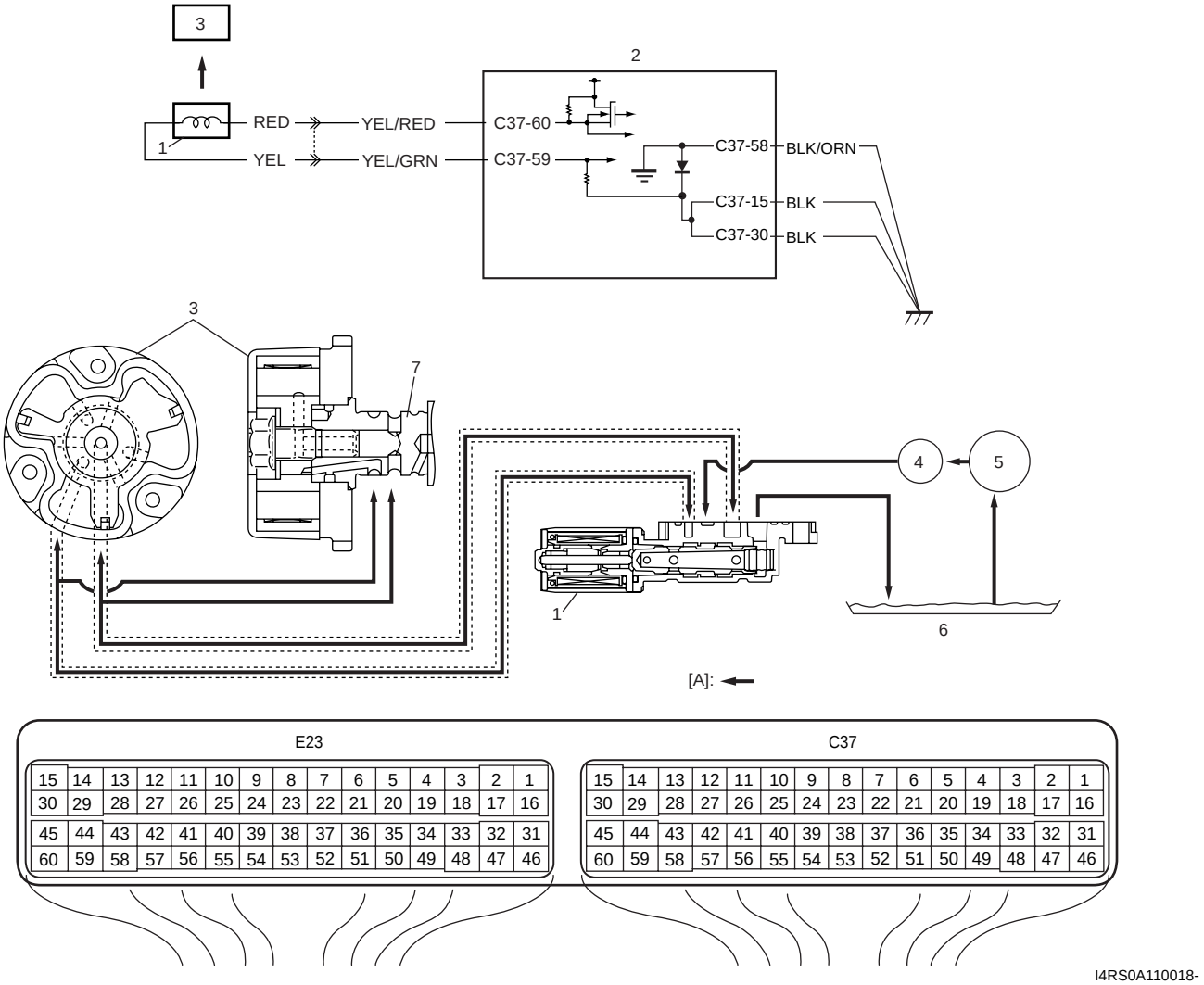
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	**DTC check** 1) Start engine and recheck DTC of ECM and TCM while engine running. *Is there any DTC(s)?*	Go to Step 2 of "Engine and Emission Control System Check: " or Step 2 of "A/T System Check: in Section 5A".	Go to Step 2.
2	**CAN communication line circuit check** 1) Check CAN communication line circuit between combination meter and ECM or TCM (equipped with A/T) referring to Step 9 to 14 "DTC P1674: CAN Communication (Bus Off Error): ". *Is circuit in good condition?*	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.	Repair or replace CAN communication circuit.

DTC P0010: Camshaft Position Actuator Circuit

S4RS0A1104014

System and Wiring Diagram



I4RS0A110018-

[A]: Oil flow	3. Camshaft timing sprocket	6. Oil pan
1. Oil control valve	4. Oil filter	7. Intake camshaft
2. ECM	5. Oil pump	

Circuit Description

Actual valve timing fails to become close to target advance level of each function although advance control function or retarded advance control function is at work.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of oil control valve is different from command signal. (Circuit open or short) (1 driving cycle detection logic)	• Oil control valve • Oil control valve circuit • ECM

DTC Confirmation Procedure

1) Clear DTC. Refer to “DTC Clearance: ”.
2) Start engine and keep it at idle for 10 seconds.
3) Check DTC. Refer to “DTC Check: ”.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Oil control valve electrical circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection at "C37-60" and "C37-59" terminals of ECM connector. 3) If OK, measure resistance between "C37-60" and "C37-59" terminals of ECM connector. *Is resistance below 10 Ω?*	Go to Step 3.	Go to Step 8.
3	**Oil control valve electrical circuit check** *Was resistance more than 6.5 Ω in Step 2?*	Go to Step 4.	Go to Step 7.
4	**Oil control valve electrical circuit for power short check** 1) Turn ON ignition switch. 2) Measure voltage between "C37-60" terminal of ECM connector and engine ground. *Is voltage below 1 V?*	Go to Step 5.	"RED", "YEL/RED", "YEL" or "YEL/GRN" wire is shorted to power supply circuit.
5	**Oil control valve electrical circuit for ground short check** 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between "C37-60" terminal of ECM connector and engine ground. *Is resistance infinity?*	Go to Step 6.	"YEL/RED" wire is shorted to ground circuit.
6	**Oil control valve electrical circuit for ground short check** 1) Measure resistance between "C37-59" terminal of ECM connector and engine ground. *Is resistance infinity?*	Go to Step 9.	"YEL/GRN" wire is shorted to ground circuit.
7	**Oil control valve electrical circuit for short check** 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between "C37-60" and "C37-59" terminals of ECM connector. *Is resistance infinity?*	Go to Step 9.	"YEL/RED" wire is shorted to "YEL/GRN" wire.

Step	Action	Yes	No
8	**Oil control valve electrical circuit check** 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between “C37-60” terminal of ECM connector and “YEL/RED” wire terminal of oil control valve connector and between “C37-59” terminal of ECM connector and “YEL/GRN” wire terminal of oil control valve connector. *Is resistance below 1 Ω?*	Go to Step 9.	“YEL/RED” wire or “YEL/GRN” wire circuit is open or high resistance.
9	**Oil control valve check** Check oil control valve referring to “Oil Control Valve Inspection: in Section 1D”. *Is resistance within specified value?*	Substitute a known-good ECM and recheck.	Faulty oil control valve.

DTC P0011 / P0012: Camshaft Position - Timing Over-Advanced or System Performance / -Retarded

S4RS0A1104015

System Description

Actual value of advanced valve timing does not reach target value.
Valve timing is advanced although ECM command is most retarding.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Actual value of advanced valve timing does not reach target value, or valve timing is advanced although ECM command is most retarding. (2 driving cycle detection logic)	• Oil control valve • Oil galleries of timing sprocket • Intake camshaft timing sprocket (Camshaft position control (VVT) actuator) • Oil control valve circuit • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and tester, on a level road.**

NOTE:

Check to make sure that the following conditions are satisfied when using this “DTC Confirmation Procedure”.

- **altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) Clear DTC. Refer to “DTC Clearance: ”.
2) Start engine and drive vehicle under usual driving condition for 5 minutes or longer until engine is warmed up to normal operating temperature.
3) Stop vehicle.
4) Run engine at idle speed for 1 minute.
5) Start vehicle and increase vehicle speed up to 80 km/h (50 mile/h).
6) Keep vehicle speed at 80 km/h (50 mile/h) for 1 minute or longer at 5th gear position or D range.
7) Decrease vehicle speed gradually.
8) Stop vehicle and turn OFF ignition switch OFF.
9) Repeat Step 4) to 7) one time.
10) Stop vehicle.

11) Check DTC. Refer to “DTC Check: ”.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

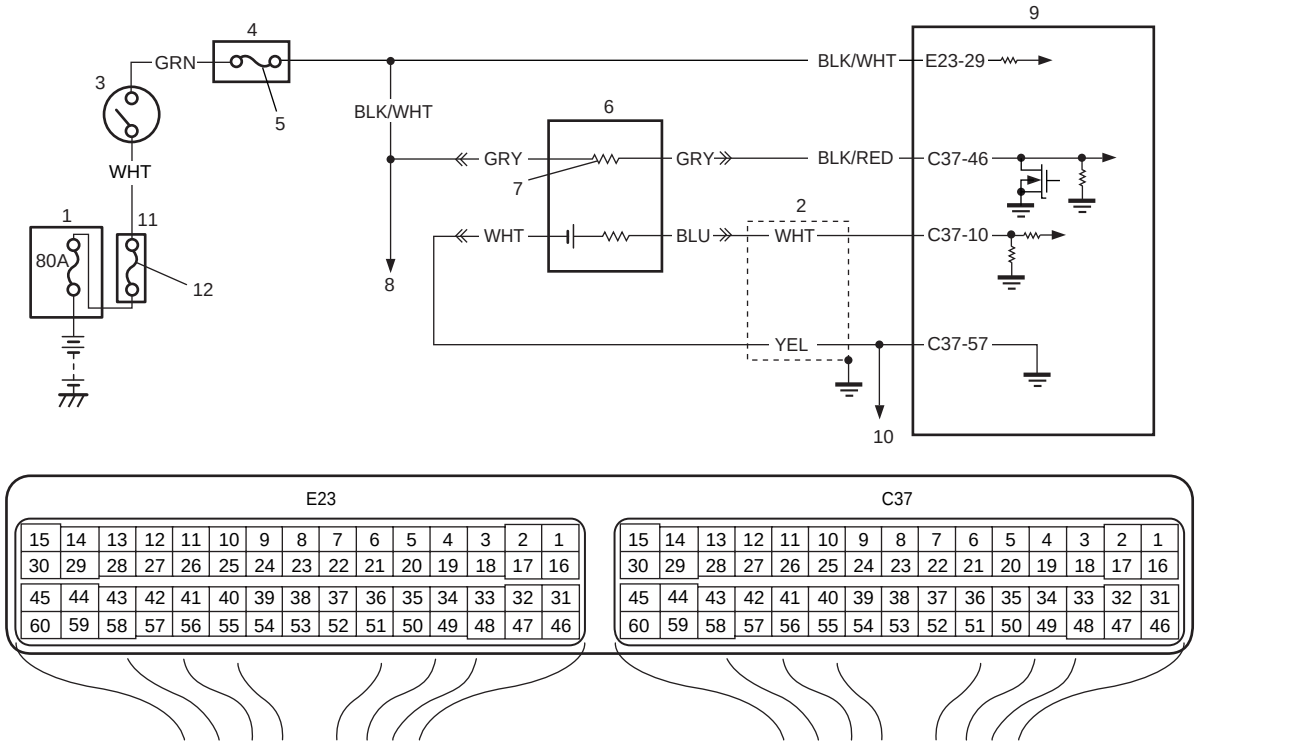
Step	Action	Yes	No
1	*Is DTC P0010 detected together?*	Go to “DTC P0010: Camshaft Position Actuator Circuit: ”.	Go to Step 2.
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 5.
3	**Camshaft position control check** 1) With ignition switch turned OFF, connect SUZUKI scan tool. 2) Start engine and warm up to normal operating temperature. 3) Select menu to DATA LIST. 4) Check that the “VVT GAP” displayed on SUZUKI scan tool is 0 – 5°. *Is it OK?*	Go to Step 4.	Check valve timing referring to “Timing Chain and Chain Tensioner Removal and Installation: in Section 1D”. If OK, go to Step 5.
4	**Camshaft position control check** 1) Drive vehicle under following conditions. • Vehicle speed at 80 km/h (50 mile/h). • Gear position at 5th or D range. 2) Check that “VVT GAP” displayed on SUZUKI scan tool is 0 – 5°. *Is it OK?*	Substitute a known-good ECM and recheck.	Go to Step 5.
5	**Oil control circuit visual inspection** 1) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: in Section 1D”. 2) Check oil pressure leakage from oil control circuit. *Is it in good condition?*	Go to Step 6.	Repair or replace.
6	**Oil control valve and oil gallery pipe check** 1) Remove oil control valve referring to “Oil Control Valve Removal and Installation: in Section 1D”. 2) Remove oil gallery pipe referring to “Timing Chain Cover Removal and Installation: in Section 1D”. 3) Check oil gallery pipe and oil control valve for clog or sludge. *Are they in good condition?*	Go to Step 7.	Clean oil control valve and oil gallery pipe. Replace oil control valve if a problem is not solved after cleaning oil control valve and oil gallery pipe.
7	**Oil control valve electrical circuit check** 1) Check that oil control valve circuit is in good condition referring to “DTC P0010: Camshaft Position Actuator Circuit: ”. *Is circuit in good condition?*	Repair circuit.	Go to Step 8.

Step	Action	Yes	No
8	**Oil control valve check** 1) Check oil control valve referring to“Oil Control Valve Inspection: in Section 1D”. *Is it in good condition?*	Replace camshaft timing sprocket.	Replace oil control valve.

DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1)

S4RS0A1104029

Wiring Diagram



I4RS0A110029-

1. Main fuse box	4. Junction block assembly	7. Heater	10. To other sensor
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-2 heater	11. Relay box
3. Ignition switch	6. HO2S-1	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Current of HO2S-1 heater is more than specified value or lower than specified value for 5 seconds continuously. (2 driving cycle detection logic)	• HO2S-1 heater circuit • HO2S-1 heater • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle speed for 1 min. or more.
5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

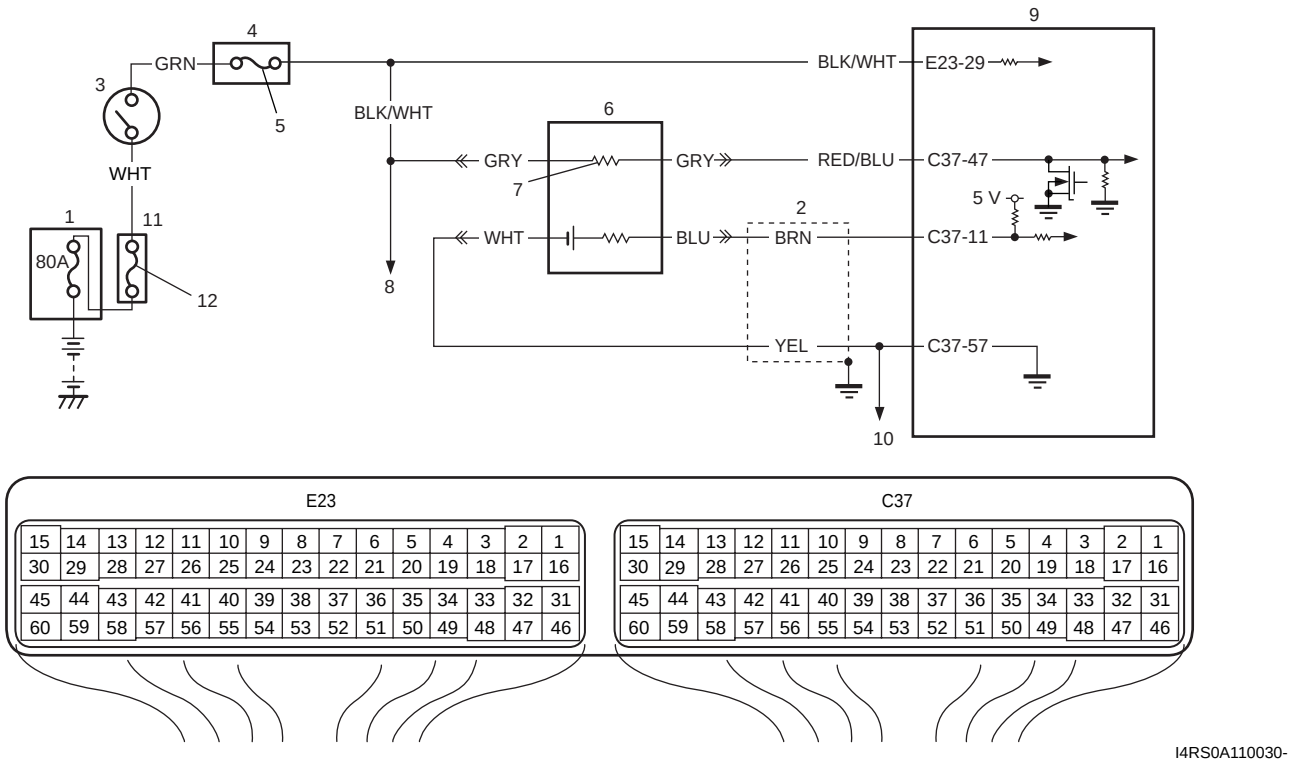
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**HO2S-1 heater power circuit check** 1) Disconnect connector from HO2S-1 with ignition switch turned OFF. 2) Check for proper connection to HO2S-1 at "BLK/WHT" and "BLK/RED" wire terminals. 3) If wire and connection are OK, measure voltage between "BLK/WHT" wire terminal and engine ground with ignition switch turned ON. *Is voltage over 10 V?*	Go to Step 3.	"BLK/WHT" wire is open circuit or shorted to ground circuit.
3	**HO2S-1 heater power circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/WHT" wire terminal of HO2S-1 connector and "E23-29" terminal of ECM connector. *Is resistance below 5 Ω?*	Go to Step 4.	"BLK/WHT" wire is high resistance circuit.
4	**HO2S-1 heater drive circuit check** 1) Measure resistance between "C37-46" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"BLK/RED" wire is shorted to ground circuit.
5	**HO2S-1 heater drive circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "C37-46" terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 6.	"BLK/RED" wire is shorted to power circuit.
6	**HO2S-1 heater drive circuit check** 1) Connect connector to HO2S-1 with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "C37-46" terminal of ECM connector and vehicle body ground with connector disconnected from ECM. *Is voltage over 10 V?*	Go to Step 7.	"BLK/RED" wire is open circuit.

Step	Action	Yes	No
7	**HO2S-1 heater check** 1) Disconnect HO2S-1 connector with ignition switch turned OFF. 2) Check HO2S-1 heater resistance referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C”. *Is resistance within specified value range?*	Go to Step 8.	Replace HO2S-1.
8	**HO2S-1 heater power circuit check** 1) Connect connector to HO2S-1 with ignition switch turned OFF. 2) Measure resistance between “E23-29” and “C37-46” terminals of ECM connector. *It resistance below 12 Ω?*	HO2S-1 heater circuit is OK. Substitute a known-good ECM and recheck.	“BLK/WHT”, “BLK/RED” and / or “GLY” wire is high resistance circuit.

DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2)

S4RS0A1104031

Wiring Diagram



I4RS0A110030-

1. Main fuse box	4. Junction block assembly	7. Heater	10. To other sensor
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-1 heater	11. Relay box
3. Ignition switch	6. HO2S-2	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Current of HO2S-2 heater is more than specified value or less than specified value for 5 seconds continuously (2 driving cycle detection logic)	• HO2S-2 heater • HO2S-2 heater circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle speed for 1 min.
5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

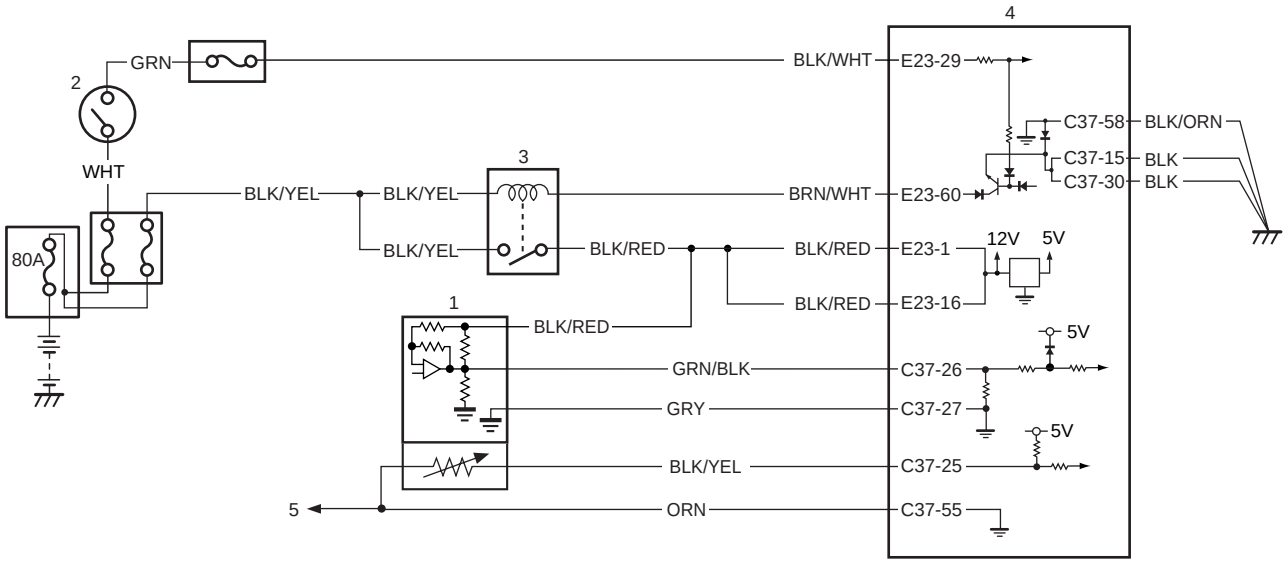
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**HO2S-2 heater power circuit check** 1) Disconnect connector from HO2S-2 with ignition switch turned OFF. 2) Check for proper connection to HO2S-2 at "BLK/WHT" and "RED/BLU" wire terminals. 3) If wire and connection are OK, measure voltage between "BLK/WHT" wire terminal of HO2S-2 connector and engine ground with ignition switch turned ON. *Is voltage over 10 V?*	Go to Step 3.	"BLK/WHT" wire is open circuit or shorted to ground circuit.
3	**HO2S-2 heater power circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/WHT" wire terminal of HO2S-2 connector and "E23-29" terminal wire of ECM connector. *Is resistance below 5 Ω?*	Go to Step 4.	"BLK/WHT" wire is high resistance circuit.
4	**HO2S-2 heater drive circuit check** 1) Measure resistance between "RED/BLU" wire terminal of HO2S-2 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"RED/BLU" wire is shorted to ground circuit.
5	**HO2S-2 heater drive circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "RED/BLU" wire terminal of HO2S-2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 6.	"RED/BLU" wire is shorted to power circuit.
6	**HO2S-2 heater drive circuit check** 1) Connect connector to HO2S-2 with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "C37-47" terminal of disconnected ECM connector and vehicle body ground. *Is voltage over 10 V?*	Go to Step 7.	"RED/BLU" wire is open circuit.

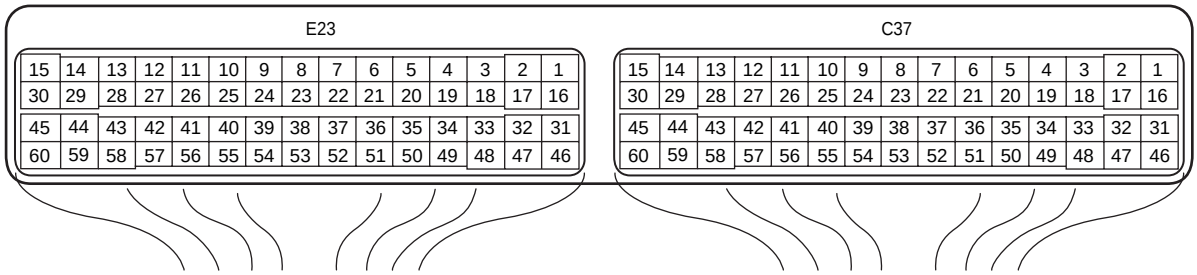
Step	Action	Yes	No
7	**HO2S-2 heater check** 1) Disconnect HO2S-2 connector with ignition switch turned OFF. 2) Check HO2S-2 heater resistance referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C”. *Is resistance within specified value?*	Go to Step 8.	Replace HO2S-2.
8	**HO2S-2 heater power circuit check** 1) Connect connector to HO2S-2 with ignition switch turned OFF. 2) Measure resistance between “E23-9” and “C37-47” terminals of ECM connector. *Is resistance below 30 Ω?*	HO2S-2 heater circuit is OK. Substitute a known-good ECM and recheck.	“RED/BLU” wire is high resistance circuit.

DTC P0101: Mass Air Flow Circuit Range / Performance

S4RS0A1104067

Wiring Diagram





I4RS0A110019-

1. MAF and IAT sensor	3. Main relay	5. To other sensors
2. Ignition switch	4. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• MAF volume is greater than 20 g/sec even if engine revolution is less than 900 rpm and intake manifold pressure is less than 40 kPa (5.80 psi) with TP less than 1.5°. • MAF volume is lower than 10 g/sec even if engine revolution is more than 2500 rpm and intake manifold pressure is more than 60 kPa (8.70 psi) with TP more than 12°. (2 driving cycle detection logic)	• Air intake system (clog or leakage) • MAF sensor and/or its circuit • TP sensor and/or its circuit • MAP sensor and/or its circuit • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

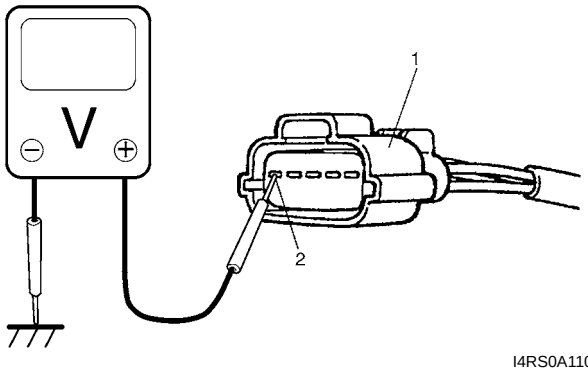
- **Intake air temperature at engine start: -10 °C (14°F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature. (ECT approx. 90 – 95 °C, 194 – 203 °F)
4) Drive vehicle with engine speed: more than 2500 rpm for 1 min.
5) Increase vehicle speed to 80 km/h (45 mile/h) at 5th gear or D range.
6) Release accelerator pedal to decrease vehicle speed to 40 km/h (25 mile/h).
7) Stop vehicle and run it idle for 1 min.
8) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

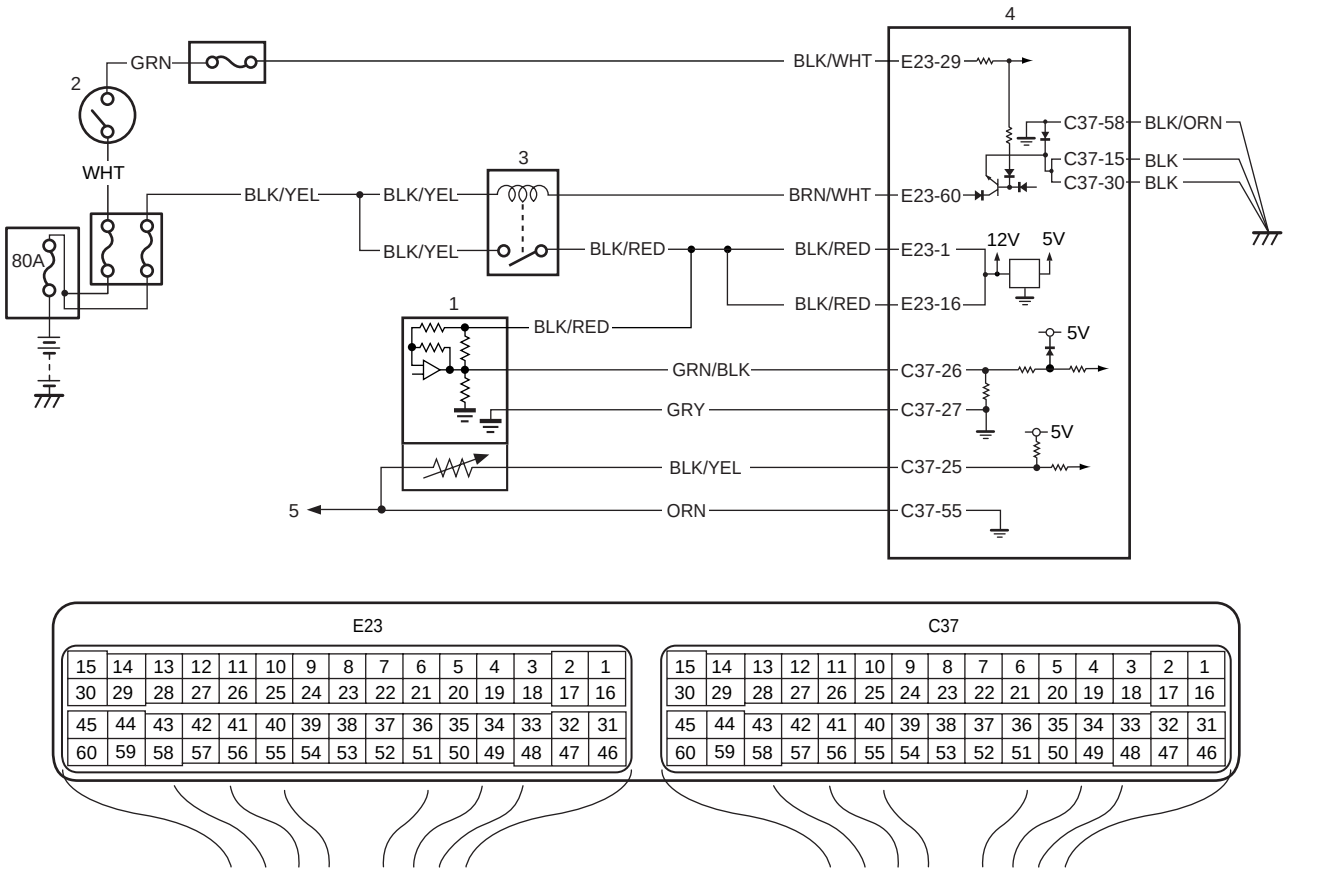
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Visual inspection** Check MAF sensor and air intake system for: • Objects which block measuring duct and resistor of MAF sensor. • Other air flow which does not pass the MAF sensor. *Are they in good condition?*	Go to Step 3.	Repair or replace.
3	**MAF sensor and its circuit check** 1) With ignition switch turned OFF, install scan tool. 2) Start engine and warm up to normal operation temperature. 3) Check MAF value using scan tool. (Refer to "Scan Tool Data: " for normal value.) *Is each value within specified range?*	Go to Step 11.	Go to Step 4.
4	**MAF sensor output voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure voltage between "C37-26" and "C37-27" terminals of ECM connector referring to "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection: in Section 1C". *Is each value within specified range?*	Poor "C37-26" and/or "C37-27" terminal connection. If OK, substitute a known-good ECM and recheck.	Go to Step 5.
5	**MAF sensor power supply voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal (2) of MAF and IAT sensor connector (1).  I4RS0A110020- *Is voltage 10 – 14 V?*	Go to Step 6.	"BLK/RED" wire is open circuit.
6	**MAF sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 8.	Go to Step 7.

Step	Action	Yes	No
7	**Ground circuit check** 1) Measure resistance between “C37-27” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“GRY” wire is open or high resistance circuit.	ECM grounds “C37-58”, “C37-15” and/or “C37-30” circuit is open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
8	**MAF sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between “GRN/BLK” wire terminal of MAF and IAT sensor connector and engine ground. *Is voltage 0 V?*	Go to Step 9.	“GRN/BLK” wire is shorted to others circuit.
9	**MAF sensor signal circuit check** 1) Turn OFF ignition switch, measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance infinity?*	Go to Step 10.	“GRN/BLK” wire is shorted to ground circuit.
10	**MAF sensor signal circuit check** 1) Measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and “C37-26” terminal of ECM connector. *Is resistance below 3 Ω?*	Faulty MAF and IAT sensor.	“GRN/BLK” wire is open or high resistance circuit.
11	*Is DTC P0121 detected?*	Go to “DTC P0121: Throttle Position Sensor Circuit Range / Performance: ”.	Go to Step 12.
12	*Is DTC P0106 displayed?*	Go to “DTC P0106: Manifold Absolute Pressure Range / Performance: ”.	Substitute a known-good ECM and recheck.

DTC P0102: Mass Air Flow Circuit Low Input

S4RS0A1104017

Wiring Diagram



I4RS0A110019-

1. MAF and IAT sensor	4. ECM
2. Ignition switch	5. To other sensors
3. Main relay	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of MAF sensor output is less than specified value for specified time continuously. (1 driving cycle detection logic)	• Open or short in MAF sensor circuit • MAF sensor • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

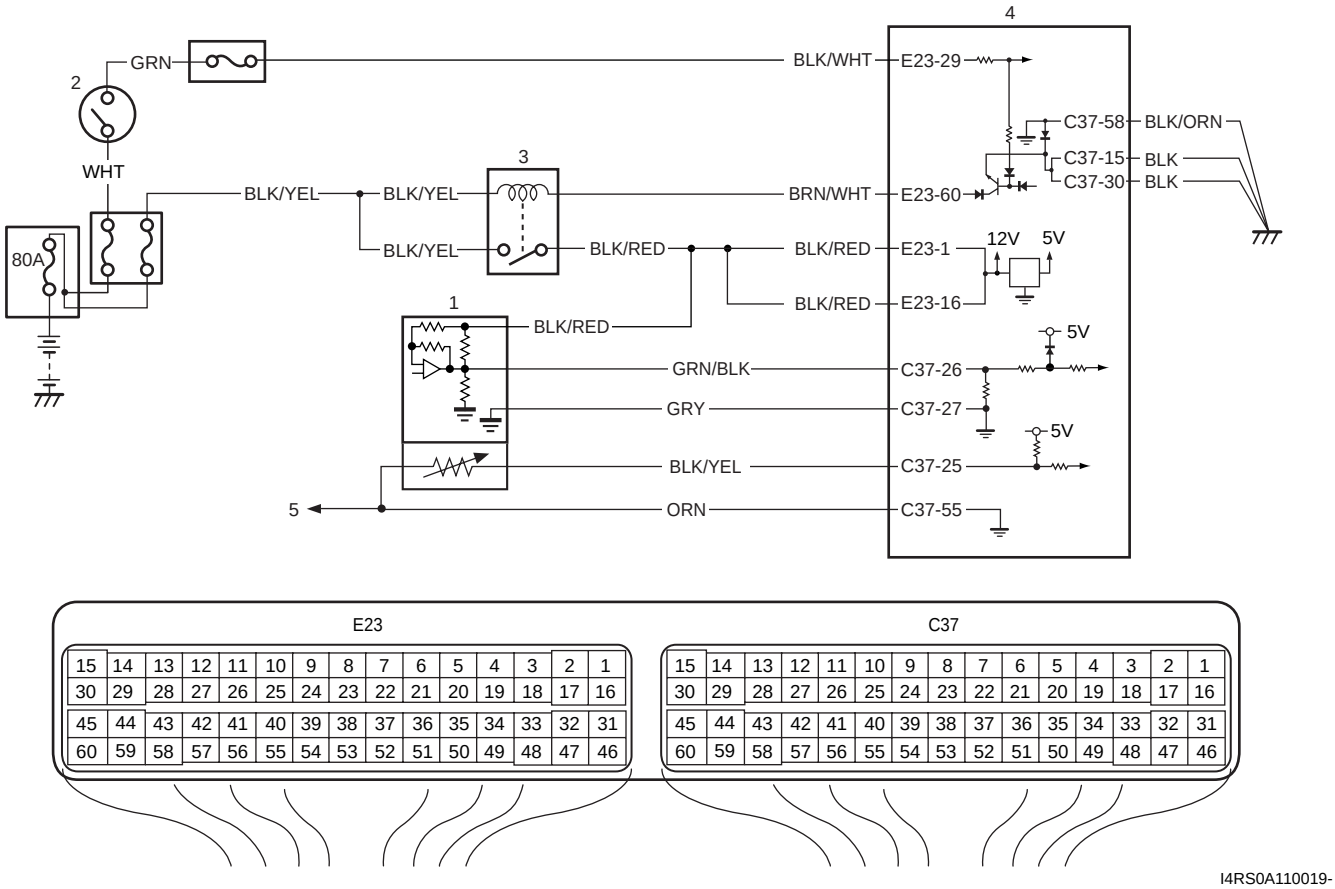
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAF sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data: " for normal value.) *Is normal value indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 3.
3	**MAF sensor power supply voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of MAF and IAT sensor connector. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLK/RED" wire is open circuit.
4	**MAF sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 6.	Go to Step 5.
5	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-27" terminal of ECM connector and engine ground. *Is resistance below 5 Ω?*	"GRY" wire is open or high resistance circuit.	ECM grounds "C37-58", "C37-15" and/or "C37-30" circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
6	**MAF sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between "GRN/BLK" wire terminal of MAF and IAT sensor connector and engine ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 7.	"GRN/BLK" wire is shorted to other circuit.
7	**MAF sensor signal circuit check** 1) Measure resistance between "GRN/BLK" wire terminal of MAF and IAT sensor connector and engine ground with ignition switch turned OFF. *Is resistance infinity?*	Go to Step 8.	"GRN/BLK" wire is shorted to ground circuit.

Step	Action	Yes	No
8	**MAF sensor signal circuit check** 1) Measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and “C37-26” terminal of ECM connector. *Is resistance below 3 Ω?*	Go to Step 9.	“GRN/BLK” wire is open or high resistance circuit.
9	**MAF sensor output signal check** 1) Connect connectors to MAF and IAT sensor and ECM with ignition switch turned OFF. 2) Measure voltage between “C37-26” and “C37-27” terminals of ECM connector referring to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection: in Section 1C”. *Is each value within specified range?*	Substitute a known-good ECM and recheck.	Faulty MAF and IAT sensor.

DTC P0103: Mass Air Flow Circuit High Input

S4RS0A1104018

Wiring Diagram



I4RS0A110019-

1. MAF and IAT sensor	4. ECM
2. Ignition switch	5. To other sensors
3. Main relay	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of MAF sensor output is more than specified value for specified time continuously. (1 driving cycle detection logic)	• Open or short in MAF sensor circuit • MAF sensor • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

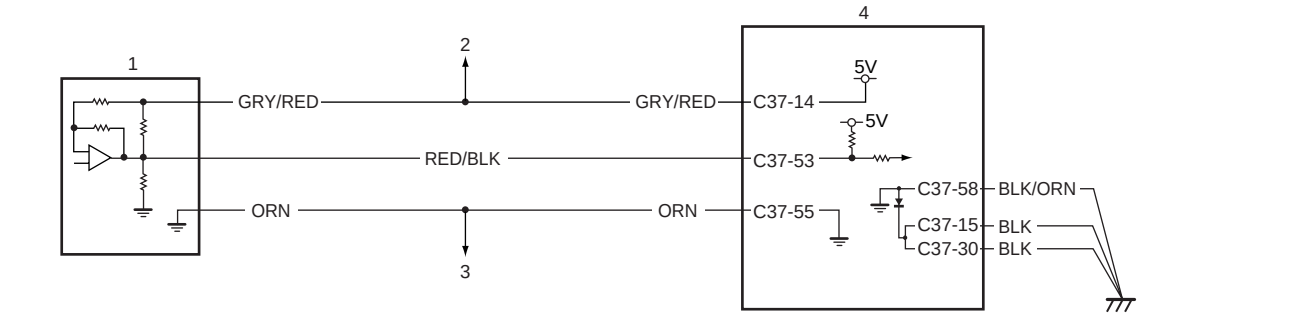
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAF sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data: " for normal value.) *Is normal value indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 3.
3	**MAF sensor power supply voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch tuned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of MAF and IAT sensor connector. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLK/RED" wire is open circuit.
4	**MAF sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 6.	Go to Step 5.
5	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-27" terminal of ECM connector and engine ground. *Is resistance below 5 Ω?*	"GRY" wire is open or high resistance circuit.	ECM grounds "C37-58", "C37-15" and/or "C37-30" circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.

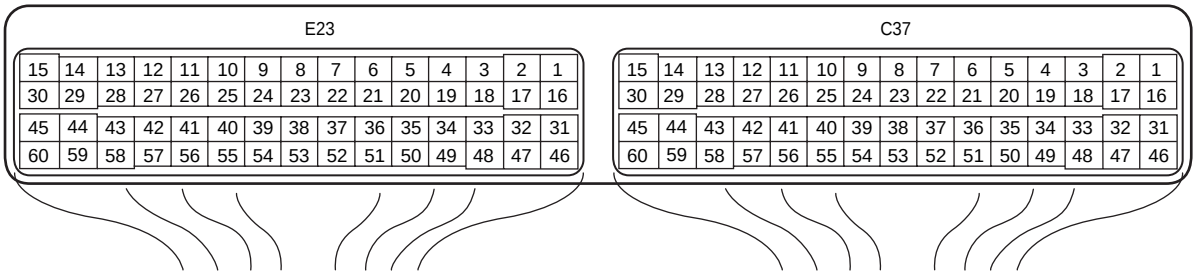
Step	Action	Yes	No
6	**MAF sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between “GRY/BLK” wire terminal of MAF and IAT sensor connector and engine ground. *Is voltage 0 V?*	Go to Step 7.	“GRY/BLK” wire is shorted to other circuit.
7	**MAF sensor output signal check** 1) Connect connector to MAF and IAT sensor and ECM with ignition switch turned OFF. 2) Measure voltage between “C37-26” and “C37-27” terminal of ECM connector referring to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection: in Section 1C”. *Is each value within specified range?*	Substitute a known-good ECM and recheck.	Faulty MAF and IAT sensor.

DTC P0106: Manifold Absolute Pressure Range / Performance

S4RS0A1104079

Wiring Diagram





I4RS0A110049-

1. Manifold absolute pressure sensor	3. To other sensors
2. To TP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• Difference between Max. manifold absolute pressure value and Min. manifold pressure value is less than 1.3 kPa (0.19 psi) when engine running at idle speed. • Difference between barometric pressure value and manifold pressure value is less than 33.3 kPa (4.83 psi) for 2 sec. at 2000 r/mini. or more. (2 driving cycle detection logic)	• Manifold absolute pressure sensor • Manifold absolute pressure sensor vacuum passage • Air intake system • ECM

DTC Confirmation Procedure

NOTE:

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

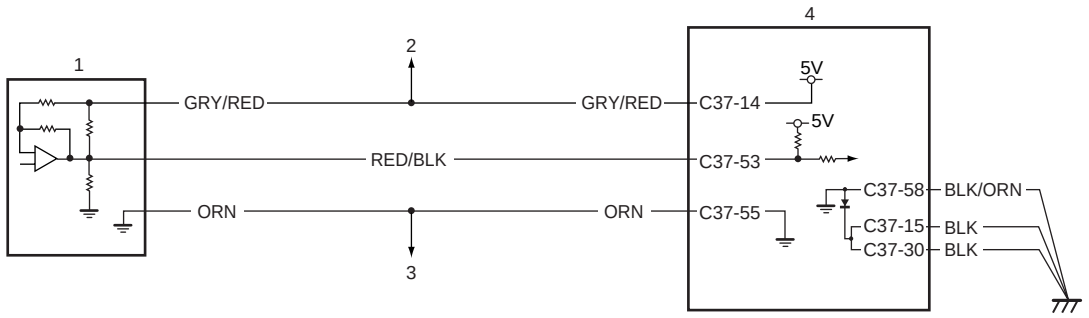
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

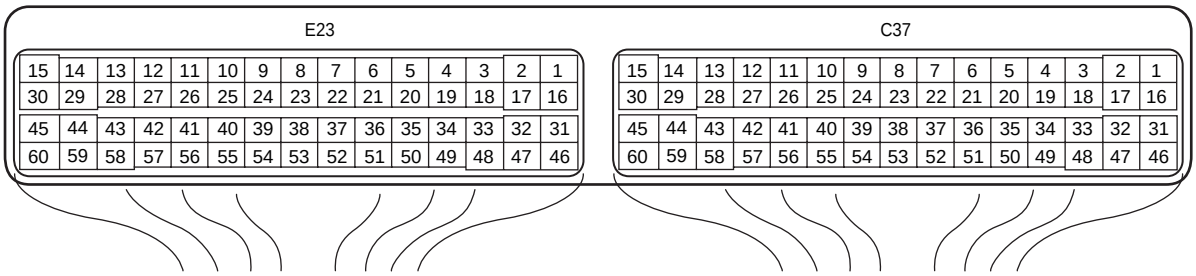
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check DTC. *Is there DTC P0107 or DTC P0108?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**MAP sensor output signal check** 1) Check MAP sensor according to "Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C". *Is it in good condition?*	Go to Step 4.	Faulty MAP sensor.
4	**MAP sensor circuit check** 1) Check MAP sensor circuit referring to Step 3 to 6 of "DTC P0107: Manifold Absolute Pressure Circuit Low Input: " or Step 3 to 8 of "DTC P0108: Manifold Absolute Pressure Circuit High Input: ". *Is circuit in good condition?*	Go to Step 5.	Repair or replace.
5	**Air intake system check** 1) Check air intake system for clog or leak. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace.

DTC P0107: Manifold Absolute Pressure Circuit Low Input

S4RS0A1104050

Wiring Diagram





I4RS0A110049-

1. Manifold absolute pressure sensor	3. To other sensors
2. To TP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Manifold absolute pressure sensor output voltage is lower than specified value for specified time continuously. (1 driving cycle detection logic)	• Manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • TP sensor • A/C refrigerant pressure sensor • ECM

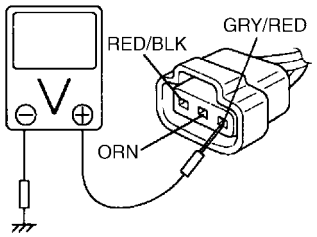
DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

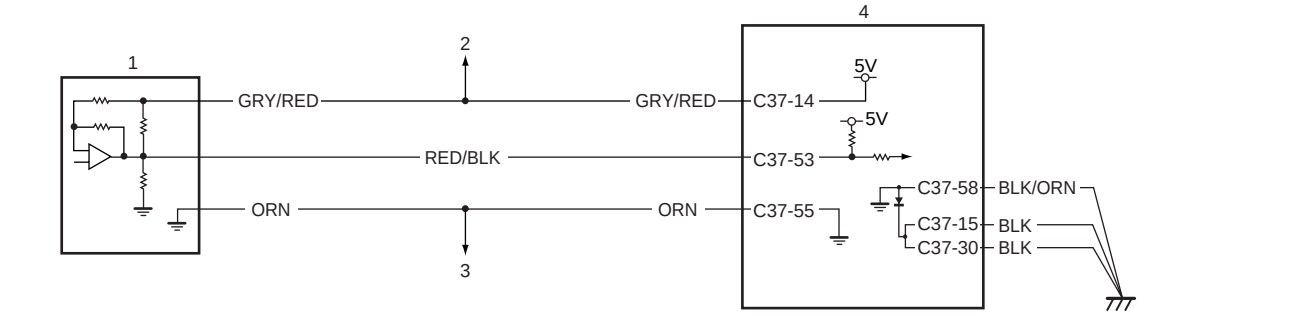
- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

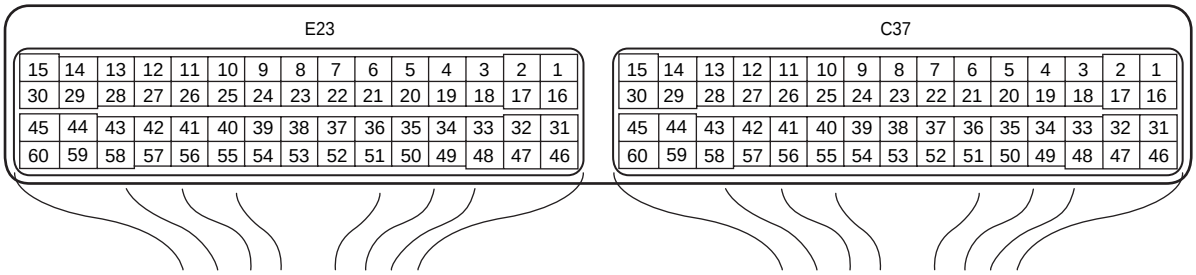
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake manifold pressure displayed on scan tool. *Is it 0 kPa (0 in.Hg)?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**MAP sensor power supply voltage check** 1) Disconnect connector from MAP sensor with ignition switch turned OFF. 2) Check for proper connection of MAP sensor at "GRY/RED", "RED/BLK" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector.  I4RS0A110050- *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 4.
4	**MAP sensor power supply circuit check** 1) Disconnect connectors from TP sensor and A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or A/C refrigerant pressure sensor.	"GRY/RED" wire is shorted to ground circuit. If wires are OK, substitute a known-good ECM and recheck.
5	**MAP sensor signal circuit check** 1) Measure voltage between "RED/BLK" wire terminal of MAP sensor connector and engine ground. *Is voltage 4 – 6 V?*	Go to Step 7.	Go to Step 6.
6	**MAP sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-53" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	"RED/BLK" wire is shorted to ground circuit.
7	**MAP sensor output signal check** 1) Check MAP sensor according to "Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty MAP sensor.

DTC P0108: Manifold Absolute Pressure Circuit High Input

S4RS0A1104051

Wiring Diagram





I4RS0A110049-

1. Manifold absolute pressure sensor	3. To other sensors
2. To TP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Manifold absolute pressure sensor output voltage is higher than specified value for specified time continuously. (1 driving cycle detection logic)	• Manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • TP sensor • A/C refrigerant pressure sensor • ECM

NOTE:

When DTC P0113, P0118 and P0123 are indicated together, it is possible that “ORN” wire circuit is open.

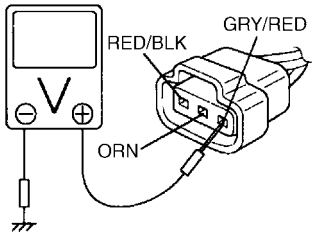
DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

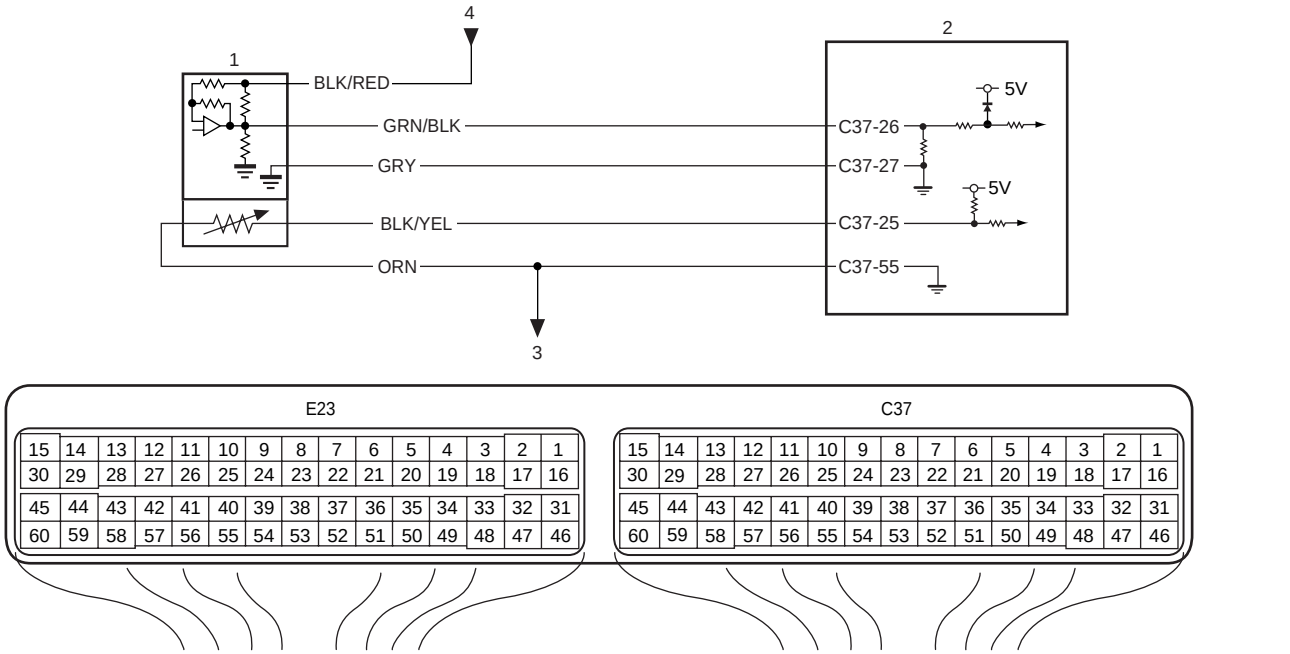
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON. 3) Check intake manifold pressure displayed on scan tool. *Is it 127 kPa (37.5 in.Hg)?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**MAP sensor power supply voltage check** 1) Disconnect connector from MAP sensor with ignition switch turned OFF. 2) Check for proper connection of MAP sensor at "GRY/RED", "RED/BLK" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector.  I4RS0A110050- *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 4.
4	**MAP sensor power supply circuit check** 1) Disconnect connectors from TP sensor and A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or A/C refrigerant pressure sensor.	"GRY/RED" wire is open or shorted to power circuit.
5	**MAP sensor ground circuit check** 1) Measure resistance between "ORN" wire terminal of MAP sensor connector and engine ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 7.	Go to Step 6.

Step	Action	Yes	No
6	**Ground circuit check** 1) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open or high resistance circuit.	ECM grounds “C37-58”, “C37-15” and/or “C37-30” circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
7	**MAP sensor signal circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “RED/BLK” wire terminal of MAP sensor connector and engine ground. *Is voltage 4 – 6 V?*	Go to Step 9.	Go to Step 8.
8	**MAP sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “RED/BLK” wire terminal of MAP sensor connector and “C37-53” terminal of ECM connector. *Is resistance below 2 Ω?*	“RED/BLK” wire is shorted to power supply circuit.	“RED/BLK” wire is open or high resistance circuit.
9	**MAP sensor output signal check** 1) Check MAP sensor according to “Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty MAP sensor.

DTC P0111: Intake Air Temperature Circuit Range / Performance

S4RS0A1104068

Wiring Diagram



I4RS0A110021-

1. MAF and IAT sensor	3. To other sensors
2. ECM	4. From main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference of maximum IAT minus minimum IAT is less than 0.3 °C (32.5 °F) while ECT is over 70 °C (158 °F) after 10 min from cold engine start (ECT is lower than 30°C (86 °F) at engine start). (2 driving cycle detection logic)	• High resistance circuit • MAF and IAT sensor • ECM

DTC Confirmation Procedure

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature at engine start: less than 30 °C (86 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

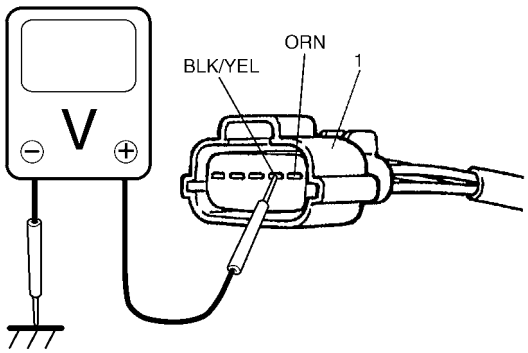
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch, clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature. (ECT approx. 70 – 205°C, 158 – 401°F)
4) Run engine at idle speed for 10 min. or more.
5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**IAT sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check intake air temp. displayed on scan tool. *Is –40 °C (–40 °F) or 119 °C (246 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".

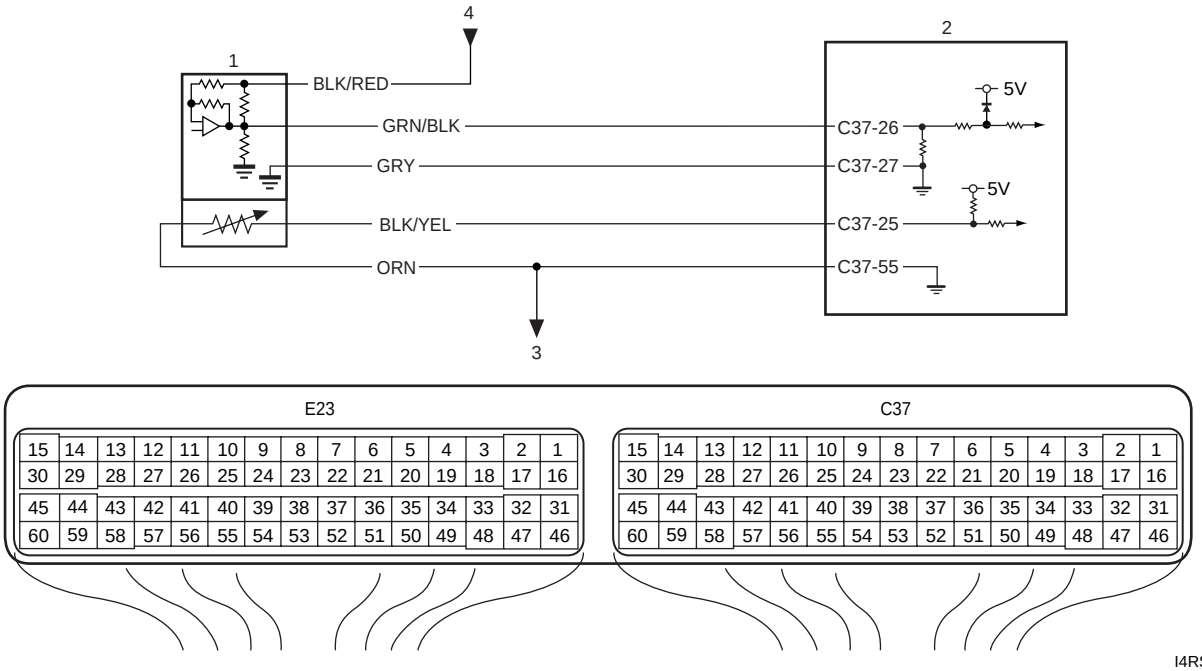
Step	Action	Yes	No
3	**Wire harness check** 1) Disconnect MAF and IAT sensor connector (1) with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor connector (1) at “BLK/YEL” and “ORN” wire terminals. 3) If OK, then with ignition switch turned ON, measure voltage between “BLK/YEL” wire terminal of MAF and IAT sensor connector and vehicle body ground.  I4RS0A110023- *Is measured voltage applied to “BLK/YEL” wire terminal about 4 – 6 V?*	Go to Step 8.	Go to Step 4.
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at “C37-25” terminal. 4) If OK, then turn ON ignition switch, measure voltage between “C37-25” terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V at terminal?*	“BLK/YEL” wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “BLK/YEL” wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	“BLK/YEL” wire is shorted to ground or other circuits. If wire is OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Turn ignition switch to ON position. 2) Measure voltage between “BLK/YEL” wire terminal of MAF and IAT sensor connector and body ground. *Is voltage about 0 V?*	Go to Step 7.	“BLK/YEL” wire is shorted to other circuits. If wire is OK, substitute a known-good ECM and recheck.
7	**Wire circuit check** 1) Measure resistance between “C37-25” terminal of ECM connector and “BLK/YEL” wire terminal of MAF and IAT sensor connector with ignition switch turned OFF. *Is resistance below 3 Ω?*	Go to Step 8.	“BLK/YEL” wire is high resistance circuit.

Step	Action	Yes	No
8	**Ground circuit check** 1) Connect connectors to ECM. 2) Check for proper connection of MAF and IAT sensor connector at “ORN” wire terminal. 3) Measure resistance between “ORN” wire terminal of MAF and IAT sensor connector and vehicle body ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 10.	Go to Step 9.
9	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 3 Ω?*	“ORN” wire is open or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
10	**IAT sensor check** 1) Check IAT sensor according to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0112: Intake Air Temperature Sensor Circuit Low

S4RS0A1104019

Wiring Diagram



I4RS0A110021-

1. MAF and IAT sensor	3. To other sensors
2. ECM	4. From main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of IAT sensor output is less than specified value (High intake air temperature (low voltage / low resistance)) (1 driving cycle detection logic)	• IAT sensor circuit • IAT sensor • ECM

DTC Confirmation Procedure

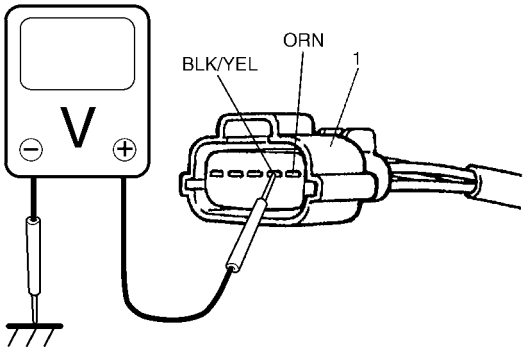
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

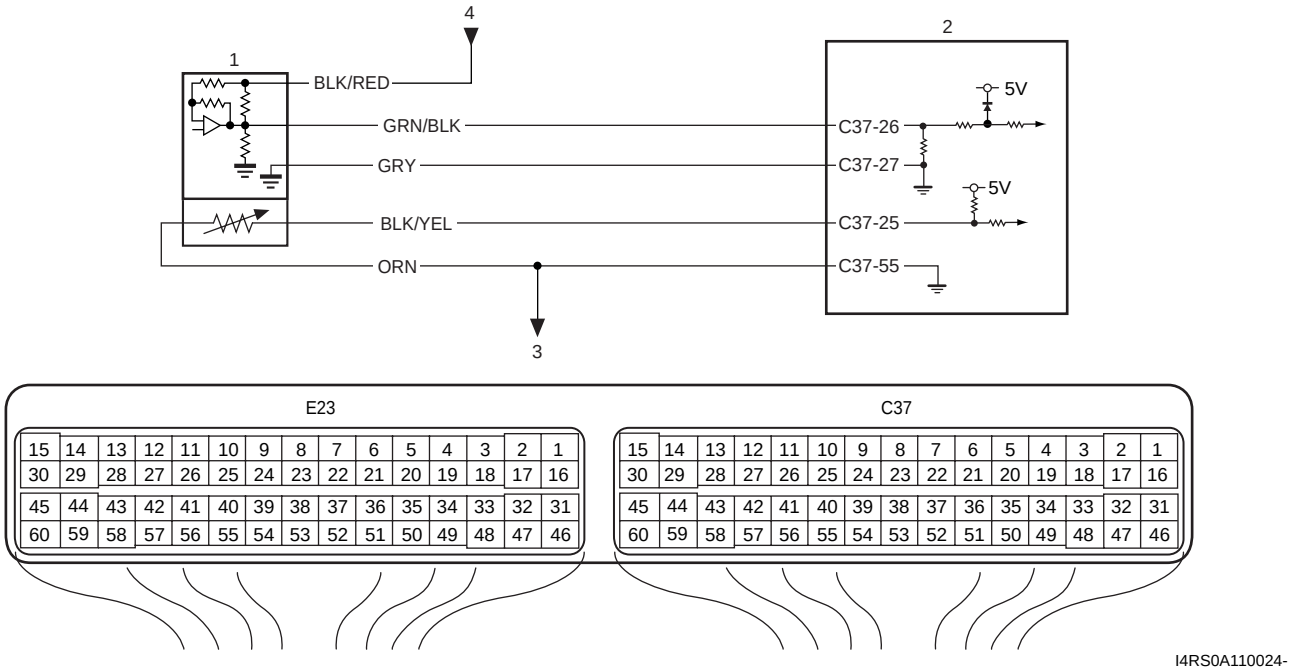
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**IAT sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake air temp. displayed on scan tool. *Is 119 °C (246 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".

Step	Action	Yes	No
3	**ECM voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor at "BLK/YEL" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector (1) and vehicle body ground.  I4RS0A110023- *Is voltage about 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**IAT short circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/YEL" wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"BLK/YEL" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
5	**IAT short circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"BLK/YEL" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**IAT sensor for performance check** 1) Check IAT sensor according to "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0113: Intake Air Temperature Sensor Circuit High

S4RS0A1104020

Wiring Diagram



I4RS0A110024-

1. MAF and IAT sensor	3. To other sensors
2. ECM	4. From main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of IAT sensor output is more than specified value (Low intake air temperature (high voltage / high resistance)) (1 driving cycle detection logic)	• IAT sensor circuit • IAT sensor • ECM

NOTE:

When DTC P0108, P0118 and P0123 are indicated together, it is possible that “ORN” wire circuit open.

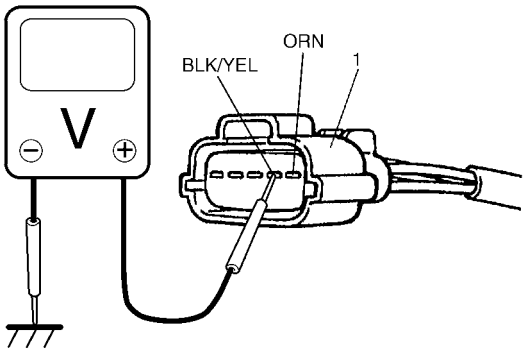
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

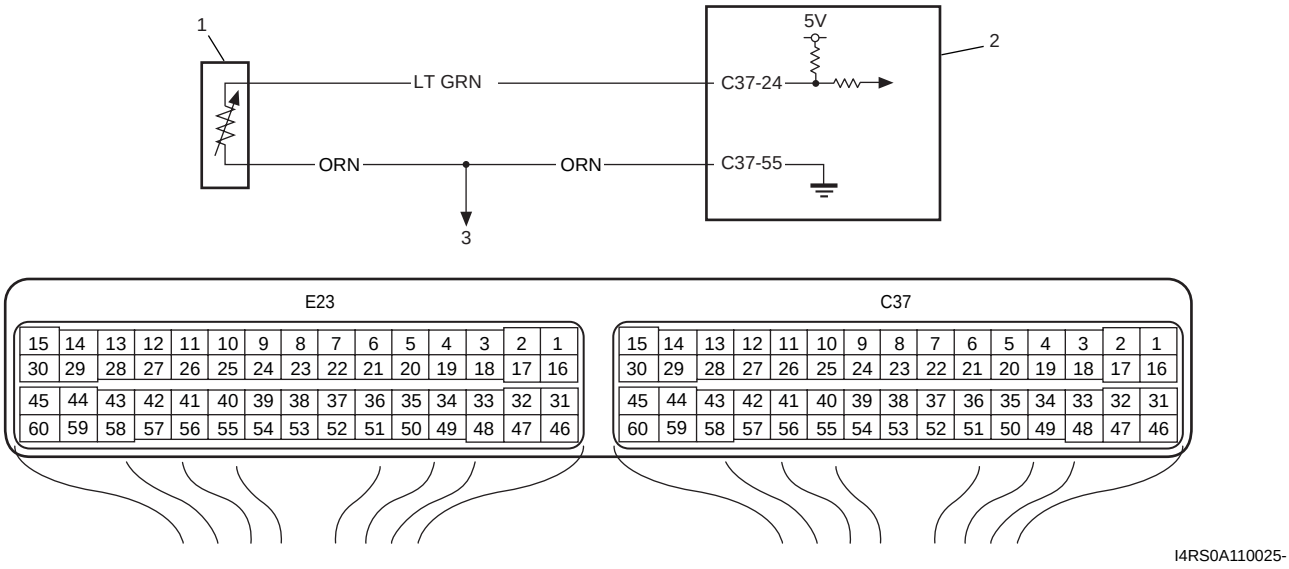
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**IAT sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake air temp. displayed on scan tool. *Is –40 °C (–40 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**IAT sensor voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor at "BLK/YEL" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector (1) and vehicle body ground.  I4RS0A110023- *Is voltage about 4 – 6 V?*	Go to Step 7.	Go to Step 4.
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-25" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-25" terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V?*	"BLK/YEL" wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"BLK/YEL" wire is shorted to other circuits. If wire is OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
6	**Wire circuit check** 1) Measure resistance between “C37-25” terminal of ECM connector and “BLK/YEL” wire terminal of MAF and IAT sensor connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 7.	“BLK/YEL” wire is high resistance circuit.
7	**Ground circuit check** 1) Connect connectors to ECM. 2) Measure resistance between “ORN” wire terminal of MAF and IAT sensor connector and body ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 9.	Go to Step 8.
8	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open circuit or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
9	**IAT sensor for performance check** 1) Check IAT sensor according to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0116: Engine Coolant Temperature Circuit Range / Performance

S4RS0A1104069

Wiring Diagram



1.	ECT sensor
2.	ECM
3.	To other sensors

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
ECT sensor values is less than –5 °C (23 °F) while engine is running under more than specified engine load (more than 1000 rpm) for 2 to 1112 min (depending on ECT at engine start) continuously from engine start. (2 driving cycle detecting logic)	• ECT sensor • ECT sensor circuit • Thermostat • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

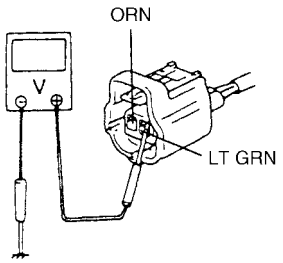
- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch, clear DTC.
3) Start engine.
4) Drive vehicle at 40 mph (60 km/h) or higher for 20 min. or more.
5) Stop vehicle.
6) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

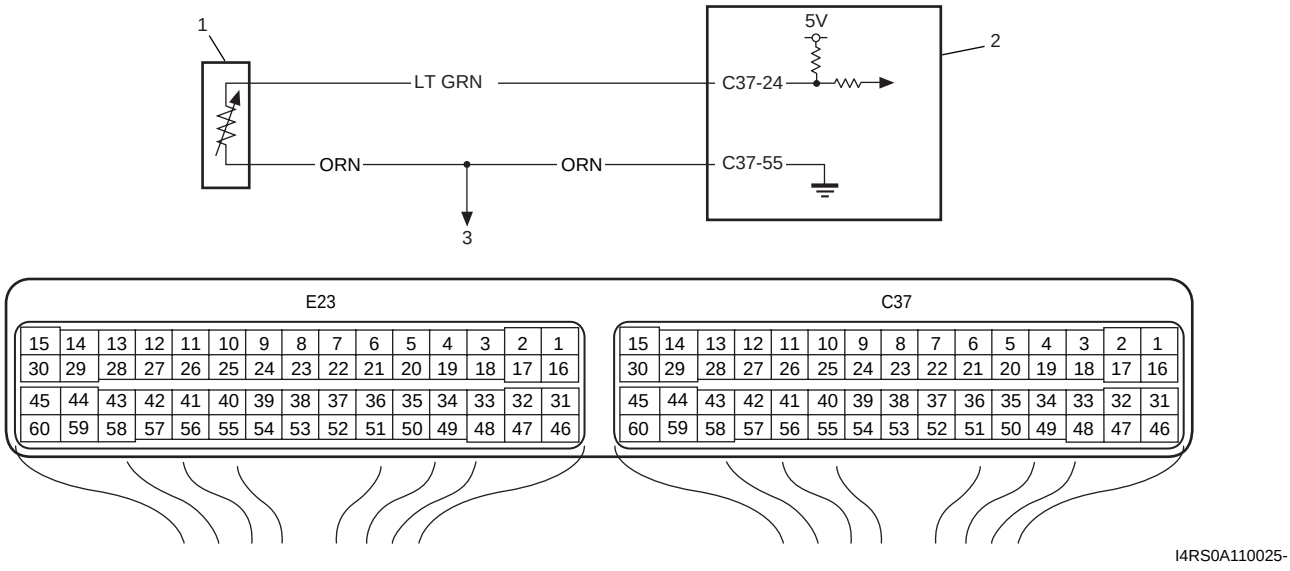
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**DTC check** 1) With ignition switch turned OFF, install scan tool to DLC. 2) Turn ON ignition switch and check DTC with scan tool. *Is DTC P0118 displayed?*	Go to "DTC P0118: Engine Coolant Temperature Circuit High: ".	Go to Step 3.
3	**Engine coolant temp. check** 1) Turn ON ignition switch and check engine coolant temp. displayed on scan tool. 2) Warm up engine to normal operating temp. and check engine coolant temp. displayed on scan tool. *Does engine coolant temp. vary more than 1 °C (1 °F) and rise higher than 70 °C (158 °F)?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 4.
4	**Thermostat check** *Is there a symptom due to thermostat remaining open (it takes a long time before vehicle heater becomes effective or before engine is warmed to normal operating temp., etc.)?*	Check thermostat referring to "Thermostat Inspection: in Section 1F".	Go to Step 5.
5	**Wire harness check** 1) Disconnect ECT sensor connector with ignition switch turned OFF. 2) Check for proper connection to ECT sensor connector at "ORN" and "LT GRN" wire terminals. 3) If OK, then with ignition switch ON, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I2RH01110067- *Is measured voltage applied to "LT GRN" wire terminal about 4 – 6 V?*	Go to Step 9.	Go to Step 6.

Step	Action	Yes	No
6	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-24" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-24" terminal of ECM connector and body ground. *Is voltage about 4 – 6 V?*	"LT GRN" wire is open circuit. If wire and connection are OK, go to Step 7.	Go to Step 7.
7	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and body ground. *Is voltage about 0 V?*	Go to Step 8.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
8	**Wire circuit check** 1) Measure resistance between "C37-24" terminal of ECM connector and "LT GRN" wire terminal of ECT sensor connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 9.	"LT GRN" wire is high resistance circuit.
9	**Ground circuit check** 1) Connect connectors to ECM. 2) Check for proper connection of ECT sensor connector at "ORN" wire terminal. 3) Measure resistance between "ORN" wire terminal of ECT sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 11.	Go to Step 10.
10	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-55" terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	"ORN" wire is open or high resistance circuit. Poor "C37-55" connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
11	**ECT sensor check** 1) Check ECT sensor according to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0117: Engine Coolant Temperature Circuit Low

S4RS0A1104021

Wiring Diagram



I4RS0A110025-

1.	ECT sensor
2.	ECM
3.	To other sensors

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of ECT sensor output is less than specified value (High engine coolant temperature (low voltage / low resistance)) (1 driving cycle detection logic)	• ECT sensor circuit • ECT sensor • ECM

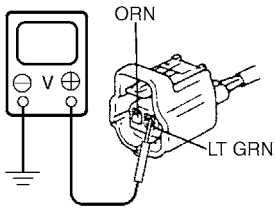
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

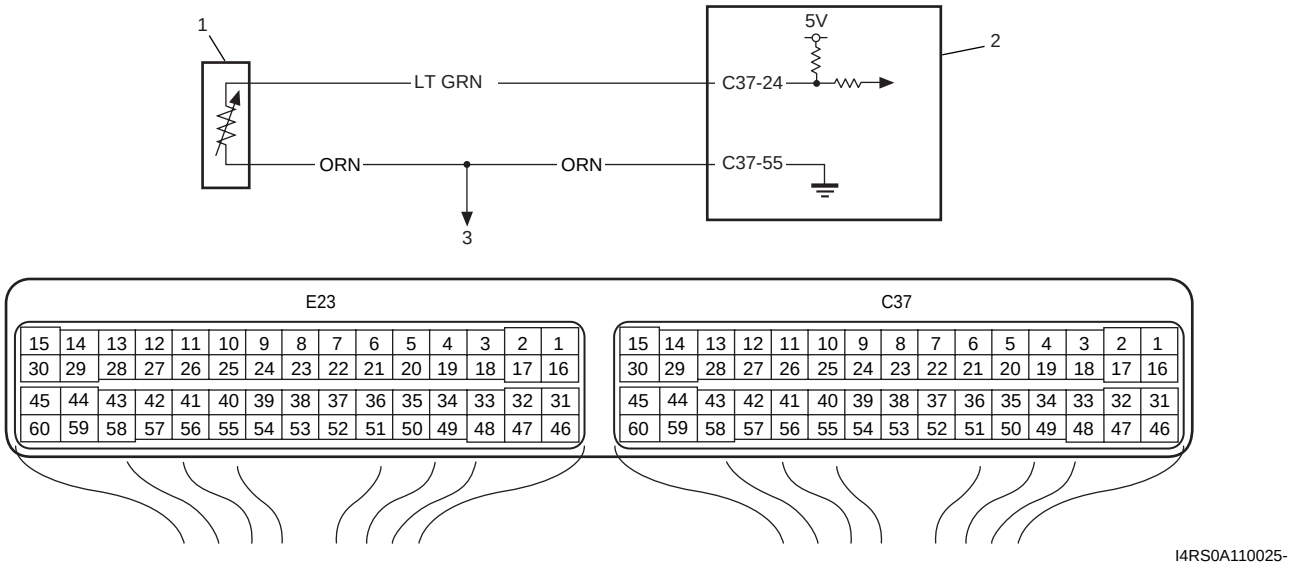
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**ECT sensor and its circuit check** 1) Connect scan tool with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check engine coolant temp. displayed on scan tool. *Is 119 °C (246 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**ECM voltage check** 1) Disconnect connector from ECT sensor with ignition switch turned OFF. 2) Check for proper connection to ECT sensor at "LT GRN" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I4RS0A110026- *Is voltage about 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**ECT sensor short circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"LT GRN" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
5	**ECT sensor short circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**ECT sensor for performance check** 1) Check ECT sensor according to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0118: Engine Coolant Temperature Circuit High

S4RS0A1104022

Wiring Diagram



I4RS0A110025-

1.	ECT sensor
2.	ECM
3.	To other sensors

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of ECT sensor output is more than specified value (Low engine coolant temperature (high voltage / high resistance)) (1 driving cycle detection logic)	• ECT sensor circuit • ECT sensor • ECM

NOTE:

When DTC P0108, P0113 and P0123 are indicated together, it is possible that "ORN" wire circuit open.

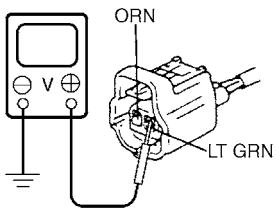
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

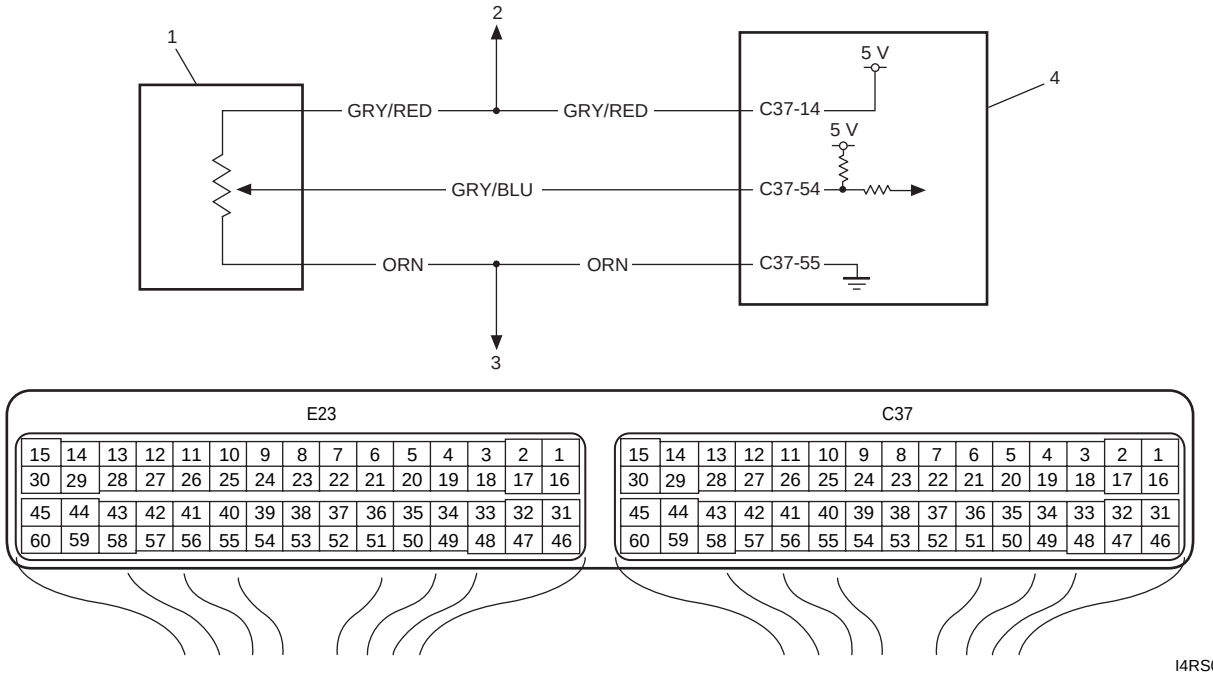
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**ECT sensor and its circuit check** 1) Connect scan tool with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check engine coolant temp. displayed on scan tool. *Is –40 °C (–40 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**ECT voltage check** 1) Disconnect connector from ECT sensor with ignition switch turned OFF. 2) Check for proper connection to ECT sensor at "LT GRN" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I4RS0A110026- *Is voltage about 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-24" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-24" wire terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V?*	"LT GRN" wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.
5	**ECT sensor harness voltage check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**ECT sensor harness resistance check** 1) Measure resistance between "C37-24" terminal of ECM connector and "LT GRN" wire terminal of ECT sensor connector with ignition switch turn OFF. *Is resistance below 5 Ω?*	Go to Step 7.	"LT GRN" wire is high resistance circuit.

Step	Action	Yes	No
7	**ECT sensor ground circuit check** 1) Connect connectors to ECM. 2) Check for proper connection of ECT sensor connector at “ORN” wire terminal. 3) Measure resistance between “ORN” wire terminal of ECT sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 9.	Go to Step 8.
8	**ECT sensor ground circuit check** 1) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open circuit or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
9	**ECT sensor for performance check** 1) Check ECT sensor according to “Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0121: Throttle Position Sensor Circuit Range / Performance

S4RS0A1104023

Wiring Diagram



I4RS0A110027-

1. TP sensor	3. To other sensors
2. To MAP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between actual throttle opening (detected from TP sensor) and opening calculated by ECM (obtained on the basis of engine speed and mass air flow) is out of specified range (–20 degree to 20 degree). (2 driving cycle detection logic)	• Throttle body • TP sensor • TP sensor circuit • ECM • MAF sensor • Idle air control valve • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

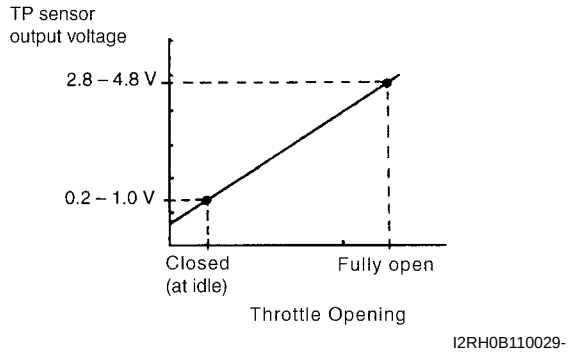
- **Intake air temperature at engine start: –10 °C (14 °C) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °C) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 60 km/h (38 mile/h) at 5th gear or D range.
5) Increase vehicle speed to 65 km/h (40 mile/h) at 5th gear or D range.
6) Release accelerator pedal to decrease vehicle speed to 60 km/h (38 mile/h).
7) Repeat Step 4) to 6) for 3 times.
8) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**TP sensor and its circuit check** 1) Turn OFF ignition switch and connect SUZUKI scan tool to DLC. 2) Turn ON ignition switch and check TP sensor output voltage when throttle valve is at idle position and fully opened.  I2RH0B110029- *Does voltage vary within specified value linearly as shown in the graph?*	Go to Step 14.	Go to Step 3.
3	**TP sensor voltage check** 1) Disconnect connector from TP sensor with ignition switch turned OFF. 2) Check for proper connection to TP sensor connector at "GRY/RED", "GRY/BLU" and "ORN" wire terminals. 3) If OK, then with ignition switch turned ON, check following terminal voltages. • Between "GRY/RED" wire terminal of TP sensor connector and vehicle body ground • Between "GRY/BLU" wire terminal of TP sensor connector and vehicle body ground *Is each terminal voltage about 4 – 6 V?*	Go to Step 11.	Go to Step 4.
4	*Was "GRY/RED" wire terminal voltage in Step 3 within specification?*	Go to Step 7.	Go to Step 5.

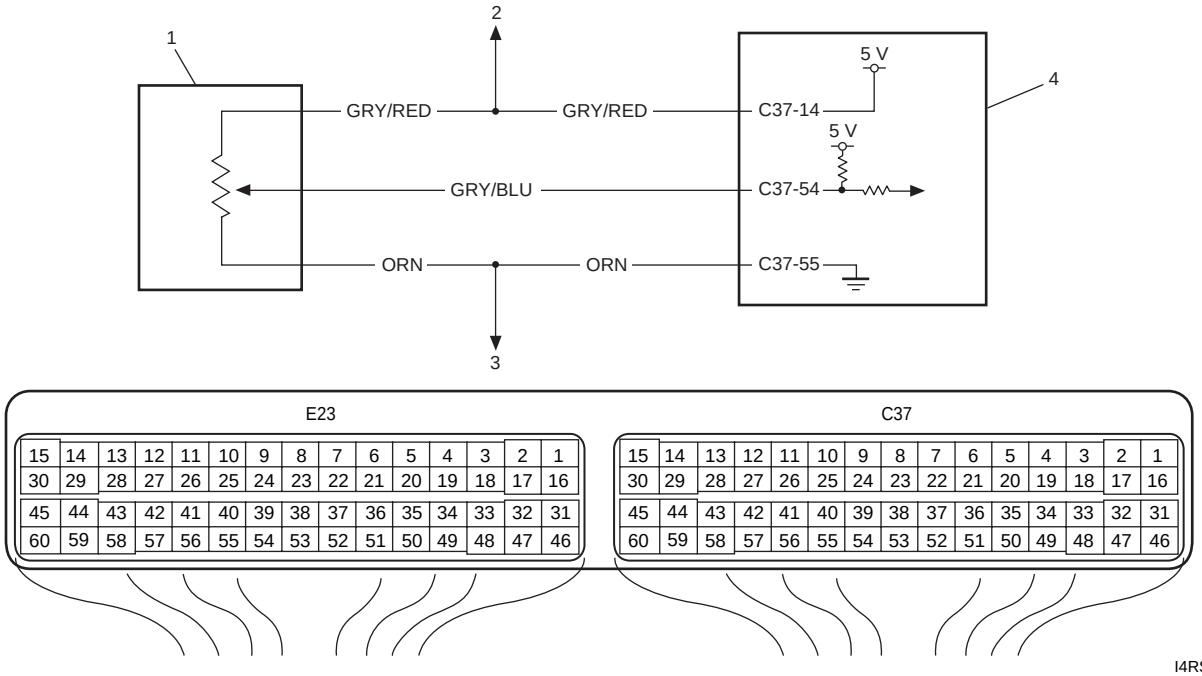
Step	Action	Yes	No
5	**Wire harness check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from MAP sensor and A/C refrigerant pressure sensor. 3) Turn ignition switch to ON position. 4) Measure voltage between “GRY/RED” wire terminal of TP sensor connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	Faulty MAP sensor and/or A/C refrigerant pressure sensor, check MAP sensor and/or A/C refrigerant pressure sensor according to “Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C” or “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: in Section 7B”.	Go to Step 6.
6	**ECM voltage check** 1) Turn ignition switch to OFF position. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at “C37-14” terminal. 4) Turn ignition switch to ON position. 5) Measure voltage between “C37-14” terminal of ECM connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	“GRY/RED” wire is open or high resistance circuit.	Go to Step 8.
7	**ECM voltage check** 1) Turn ignition switch to OFF position. 2) Check for proper connection of ECM connector at “C37-54” terminal. 3) Turn ignition switch to ON position. 4) Measure voltage between “C37-54” terminal of ECM connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	“GRY/BLU” wire is open or high resistance circuit.	Go to Step 8.
8	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “GRY/RED” wire terminal of TP sensor connector and vehicle body ground, between “GRY/BLU” wire terminal of TP sensor connector and body ground and between “GRY/BLU” and “ORN” wire terminals of TP sensor connector. *Is resistance infinity?*	Go to Step 9.	“GRY/RED” and/or “GRY/BLU” wire are shorted to ground circuit and /or “GRY/BLU” wire is shorted to “ORN” wire. If wires are OK, substitute a known-good ECM and recheck.
9	**Wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “GRY/RED” wire terminal of ECM connector and vehicle body ground and between “GRY/BLU” wire terminal of ECM connector and vehicle body ground. *Is voltage about 0 V at each terminal?*	Go to Step 10.	“GRY/RED” and/or “GRY/BLU” wire are shorted to power circuit. If wires are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
10	**Wire circuit check** 1) Measure resistance between “C37-14” terminal of ECM connector and “GRY/RED” wire terminal of TP sensor connector, between “C37-54” terminal of ECM connector and “GRY/BLU” wire terminal of TP sensor connector with ignition switch turned OFF. *Is each resistance below 5 Ω?*	Go to Step 11.	“GRY/RED” and/or “GRY/BLU” wire are high resistance circuit.
11	**Ground circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Measure resistance between “ORN” wire terminal of TP sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 13.	Go to Step 12.
12	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open circuit or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
13	**TP sensor check** 1) Measure resistance between terminals of TP sensor referring to “Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C”. *Are measured values within specifications?*	Go to Step 14.	Replace TP sensor.
14	**MAF sensor for performance check** 1) Check MAF sensor performance referring to Step 3 of “DTC P0101: Mass Air Flow Circuit Range / Performance: ”. *Is it in good condition?*	Go to Step 15.	Repair MAF and IAT sensor circuit or replace MAF and IAT sensor.
15	*Is DTC P0505 detected?*	Go to “DTC P0505: Idle Air Control System: ”.	Go to Step 16.
16	**Idle air control (IAC) valve check** 1) Check idle air control valve referring to “Idle Air Control (IAC) Valve Operation Inspection: in Section 1C”. *Is it in good condition?*	Go to Step 17.	Repair idle air control valve circuit or replace idle air control valve.
17	**Throttle body check** 1) Check throttle body for clog or leak. *Is it OK?*	Substitute a known-good ECM and recheck.	Repair throttle body.

DTC P0122: Throttle Position Sensor Circuit Low

S4RS0A1104024

Wiring Diagram



I4RS0A110027-

1. TP sensor	3. To other sensors
2. To MAP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TP sensor output is less than specified value for 0.5 seconds continuously. (1 driving cycle detection logic)	• TP sensor circuit • TP sensor • MAP sensor • A/C refrigerant pressure sensor • ECM

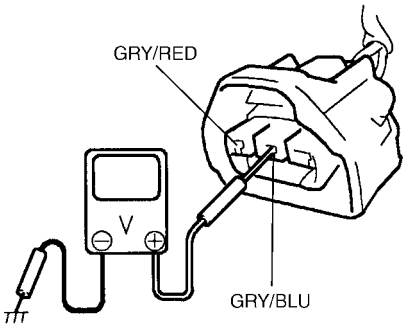
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

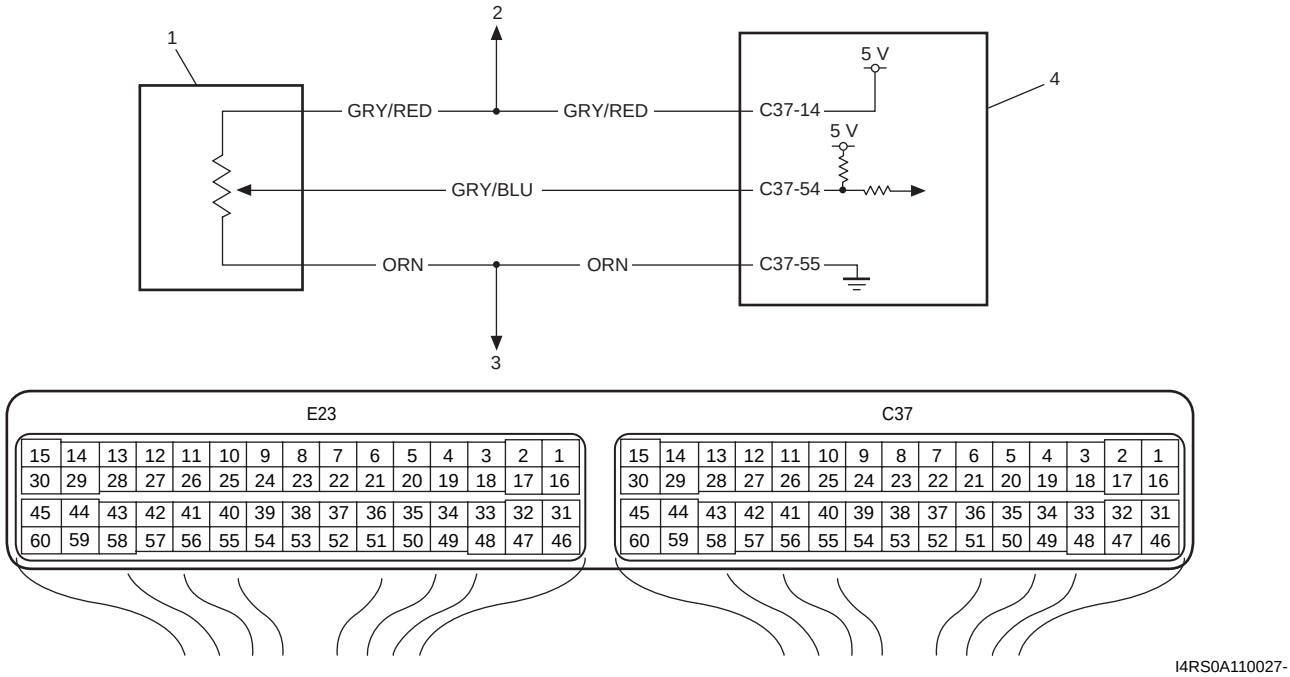
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**TP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF and then turn ON ignition switch. 2) Check throttle valve opening percentage displayed on scan tool. 3) Check throttle valve opening percentage displayed on scan tool while opening throttle valve from idle position to full open position. *Is displayed value 0%?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**Wire harness check** 1) Disconnect connector from TP sensor with ignition switch turned OFF. 2) Check for proper connection to TP sensor at "GRY/RED", "GRY/BLU" and "ORN" wire terminals. 3) If OK, then with ignition switch turned ON, check following terminal voltages. • Between "GRY/RED" wire terminal of TP sensor connector and vehicle body ground • Between "GRY/BLU" wire terminal of TP sensor connector and vehicle body ground  I4RS0A110028- *Is each terminal voltage about 4 – 6 V?*	Go to Step 7.	Go to Step 4.

Step	Action	Yes	No
4	**Wire harness check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from MAP sensor and A/C refrigerant pressure sensor. 3) Turn ignition switch to ON position. 4) Measure voltage between “GRY/RED” wire terminal of TP sensor connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	Faulty MAP sensor and/or A/C refrigerant pressure sensor, check MAP sensor and/or A/C refrigerant pressure sensor according to “Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C” or “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: in Section 7B”.	Go to Step 5.
5	**ECM voltage check** 1) Turn ignition switch to OFF position. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at “C37-14” terminal. 4) Turn ignition switch to ON position. 5) Measure voltage between “C37-14” terminal of ECM connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	“GRY/RED” wire is open or high resistance circuit.	Go to Step 6.
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turn OFF. 2) Measure resistance between “GRY/RED” wire terminal of TP sensor connector and vehicle body ground, between “GRY/BLU” wire terminal of TP sensor connector and vehicle body ground and between “GRY/BLU” and “ORN” wire terminals of TP sensor connector. *Is resistance infinity?*	Go to Step 7.	“GRY/RED” and/or “GRY/BLU” wires are shorted to ground circuit and/or “GRY/BLU” wire is shorted to “ORN” wire. If wires are OK, substitute a known-good ECM and recheck.
7	**TP sensor check** 1) Measure resistance between terminals of TP sensor referring to “Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C”. *Are measured values within specifications?*	Substitute a known-good ECM and recheck.	Replace TP sensor.

DTC P0123: Throttle Position Sensor Circuit High

S4RS0A1104025

Wiring Diagram



I4RS0A110027-

1. TP sensor	3. To other sensors
2. To MAP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TP sensor output is more than specified value for 0.5 seconds continuously. (1 driving cycle detection logic)	• TP sensor circuit • TP sensor • MAP sensor • A/C refrigerant pressure sensor • ECM

DTC Confirmation Procedure

NOTE:

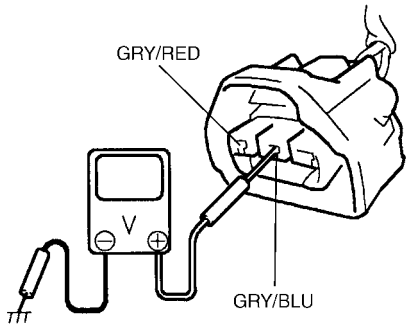
When DTC P0108, P0113 and P0118 are indicated together, it is possible that “ORN” wire circuit open.

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

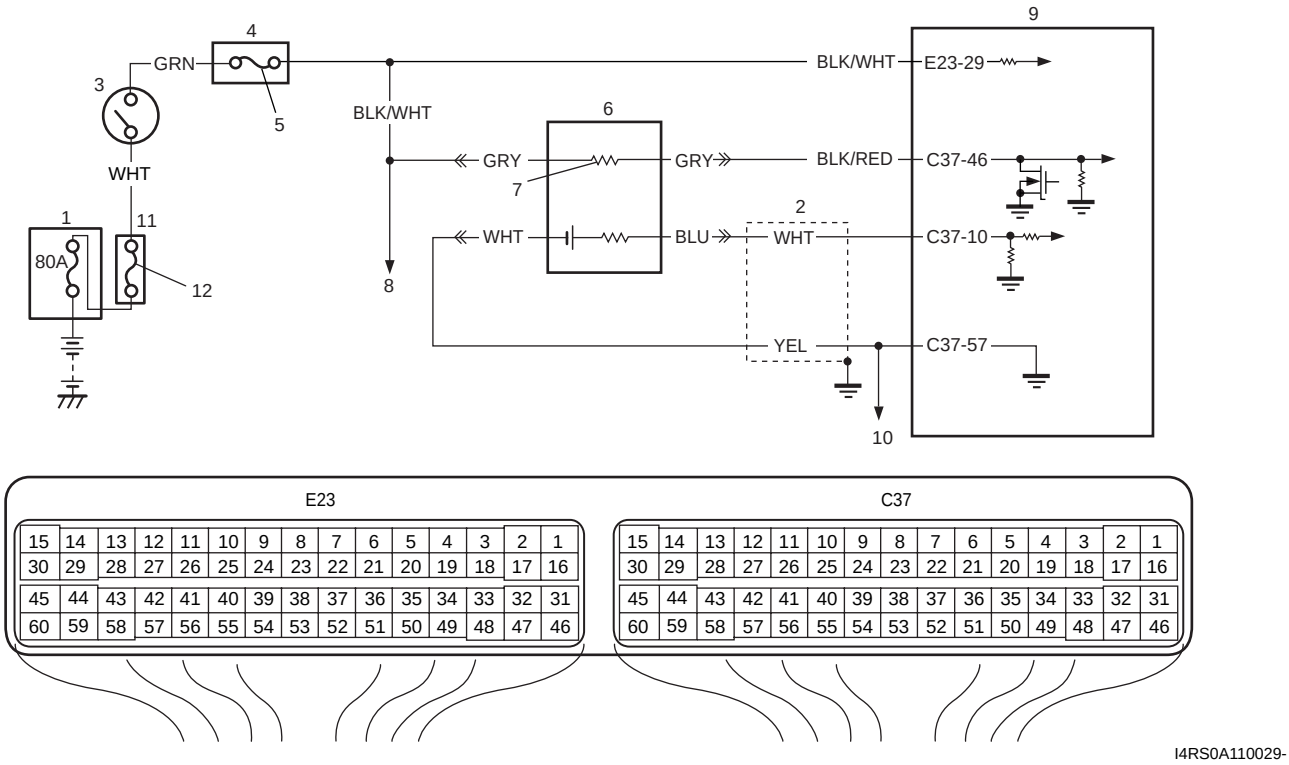
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**TP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF and then turn ON ignition switch. 2) Check throttle valve opening percentage displayed on scan tool. 3) Check throttle valve opening percentage displayed on scan tool while opening throttle valve from idle position to full open position. *Is displayed value 100%?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**Wire harness check** 1) Disconnect connector from TP sensor with ignition switch turned OFF. 2) Check for proper connection to TP sensor at "GRY/RED", "GRY/BLU" and "ORN" wire terminals. 3) If OK, then with ignition switch turned ON, check following terminal voltages. • Between "GRY/RED" wire terminal of TP sensor connector and vehicle body ground • Between "GRY/BLU" wire terminal of TP sensor connector and vehicle body ground  I4RS0A110028- *Is each terminal voltage about 4 – 6 V?*	Go to Step 8.	Go to Step 4.
4	*Was "GRY/RED" wire terminal voltage in Step 3 within specification?*	Go to Step 6.	Go to Step 5.
5	**Wire harness check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Check for proper connection of ECM connector at "C37-14" terminal. 4) Turn ignition switch to ON position. 5) Measure voltage between "GRY/RED" wire terminal of TP sensor connector and vehicle body ground. *Is terminal voltage about 0 V?*	Substitute a known-good ECM and recheck.	"GRY/RED" wire is shorted to power circuit.

Step	Action	Yes	No
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check for proper connection of ECM connector at "C37-54" terminal. 4) Measure voltage between "GRY/BLU" wire terminal of TP sensor connector and vehicle body ground. *Is voltage about 0 V at each terminal?*	Go to Step 7.	"GRY/BLU" wire is shorted to power circuit. If wire is OK, substitute a known-good ECM and recheck.
7	**Wire circuit check** 1) Measure resistance between "C37-54" wire terminal of ECM connector and "GRY/BLU" wire terminal of TP sensor connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 8.	"GRY/BLU" wire is open or high resistance circuit.
8	**Ground circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Measure resistance between "ORN" wire terminal of TP sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 10.	Go to Step 9.
9	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-55" terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	"ORN" wire is open circuit or high resistance circuit. Poor "C37-55" connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
10	**TP sensor check** 1) Measure resistance between terminals of TP sensor referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". *Are measured values within specifications?*	Substitute a known-good ECM and recheck.	Replace TP sensor.

DTC P0131 / P0132: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-1)

S4RS0A1104026

Wiring Diagram



I4RS0A110029-

1. Main fuse box	4. Junction block assembly	7. Heater	10. To other sensors
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-2 heater	11. Relay box
3. Ignition switch	6. HO2S-1	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0131: Maximum HO2S voltage is less than 0.6 V (2 driving cycle detection logic) **DTC P0132:** Minimum HO2S voltage is 0.34 V or more (*2 driving cycle detection logic, monitoring once / 1 driving)	• HO2S-1 circuit • HO2S-1 • Fuel system • ECM • Fuel shortage • Exhaust system • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 72 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 40 mph (60 km/h) or higher. (engine speed: 2500 – 3000 r/min.)
5) Keep above vehicle speed for 6 min. or more. (Throttle valve opening is kept constant in this step.)
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 3 sec. or more) and then stop vehicle.
7) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

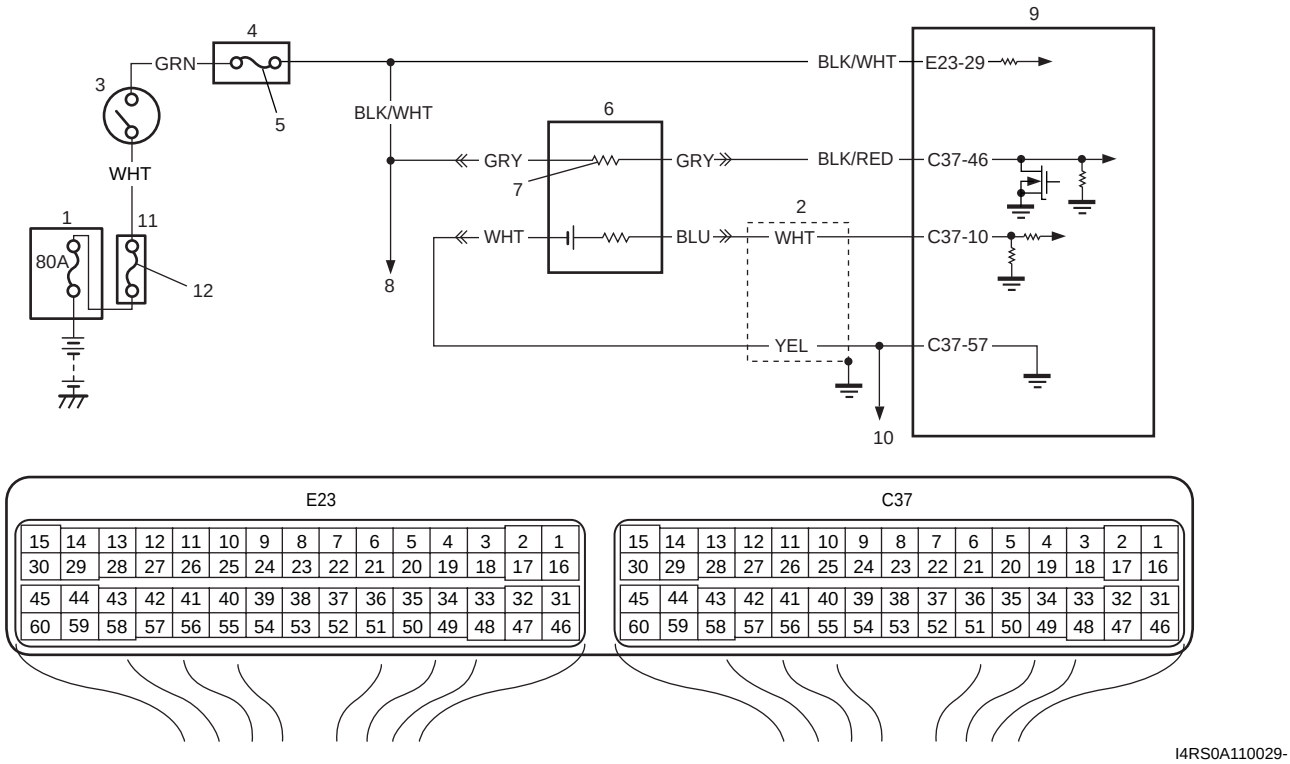
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is there DTC(s) other than HO2S-1?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**HO2S-1 signal check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it). *Does HO2S-1 output voltage deflect between below 0.3 V and over 0.6 V repeatedly?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If check result is OK, go to Step 9.	Go to Step 4.
4	**HO2S-1 ground check** 1) Disconnect connector from HO2S-1 with ignition switch turned OFF. 2) Check for proper connection to HO2S-1 connector at "BLK/RED", "WHT", "BLK/WHT" and "YEL" wire terminals. 3) If connections are OK, measure resistance between "YEL" wire terminal of HO2S-1 connector and engine ground. *Is measured resistance less than 5 Ω?*	Go to Step 5.	"YEL" wire is open circuit or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
5	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between “WHT” wire terminal of HO2S-1 connector and “C37-10” terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 6.	“WHT” wire is high resistance circuit or open circuit. Poor “C37-10” terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turn OFF. 2) Measure resistance between “WHT” wire terminal of HO2S-1 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	“WHT” wire is shorted to ground circuit.
7	**HO2S-1 signal circuit check** 1) Measure voltage between “WHT” wire terminal of HO2S-1 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	“WHT” wire is shorted to other circuits.
8	**HO2S-1 heater circuit check** 1) Check HO2S-1 heater circuit referring to “DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1): ”. *Is circuit in good condition?*	Go to Step 9.	Repair HO2S-1 circuit.
9	**Exhaust system check** 1) Check exhaust system for exhaust gas leakage. *Is it OK?*	Go to Step 4 in “DTC P0171 / P0172: Fuel System Too Lean / Rich: ”. If it is in good condition, go to Step 10.	Repair leakage of exhaust system for leakage.
10	**Air intake system check** 1) Check air intake system for clog or leak. *Is it OK?*	Check HO2S-1 referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C”. If it is in good condition, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0133: O2 Sensor (HO2S) Circuit Slow Response (Sensor-1)

S4RS0A1104027

Wiring Diagram



I4RS0A110029-

1. Battery fuse box	4. Junction block assembly	7. Heater	10. To HO2S-2
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-2 heater	11. Relay box
3. Ignition switch	6. HO2S-1	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Response time (time to change from lean to rich or from rich to lean) of HO2S-1 output voltage is about 1 sec. at minimum or average time of 1 cycle is 5 sec. at minimum. (*2 driving cycle detection logic, monitoring once / 1 driving)	Heated oxygen sensor-1

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this “DTC Confirmation Procedure”.

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 40 mph (60 km/h) or higher. (engine speed: 2500 – 3000 r/min.)

5) Keep above vehicle speed for 6 min. or more. (Throttle valve opening is kept constant in this step.)
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 3 sec. or more) and then stop vehicle.
7) Check if DTC and pending DTC exist by using scan tool. If not, check if oxygen sensor monitoring test has been completed by using scan tool. If not in both of above checks (i.e., no DTC and pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 6).

DTC Troubleshooting

NOTE:

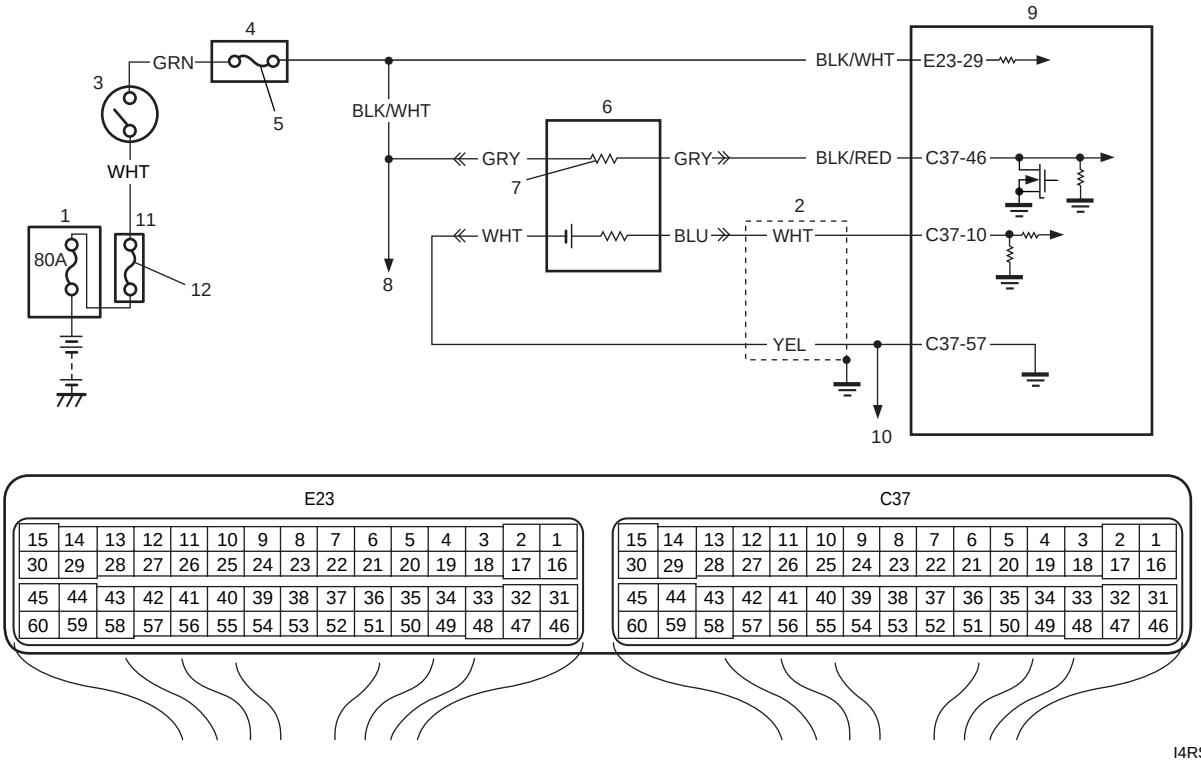
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is there DTC(s) other than HO2S-1 (DTC P0133)?*	Go to applicable DTC diag. flow.	Replace HO2S-1.

DTC P0134: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-1)

S4RS0A1104028

Wiring Diagram



I4RS0A110029-

1. Battery fuse box	4. Junction block assembly	7. Heater	10. To HO2S-2
2. Shield wire	5. "IG COIL" fuse	8. To HO2S-2 heater	11. Relay box
3. Ignition switch	6. HO2S-1	9. ECM	12. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HO2S voltage is higher than 0.6 V for more than 1 min continuously after warming up engine or HO2S voltage is lower than 0.3 V for more than 1 min continuously after warming up engine. (2 driving cycle detection logic)	• HO2S-1 • HO2S-1 circuit • Fuel system • Exhaust gas leakage • ECM • Fuel shortage • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine Coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 40 mph (60 km/h) or higher. (engine speed: 2500 – 3000 r/min.)
5) Keep above vehicle speed for 6 min. or more. (Throttle valve opening is kept constant in this step.)
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 3 sec. or more) and then stop vehicle.
7) Check if DTC and pending DTC exist by using scan tool. If not, check if oxygen sensor monitoring test has been completed by using scan tool. If not in both of above checks (i.e., no DTC and pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 6).

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

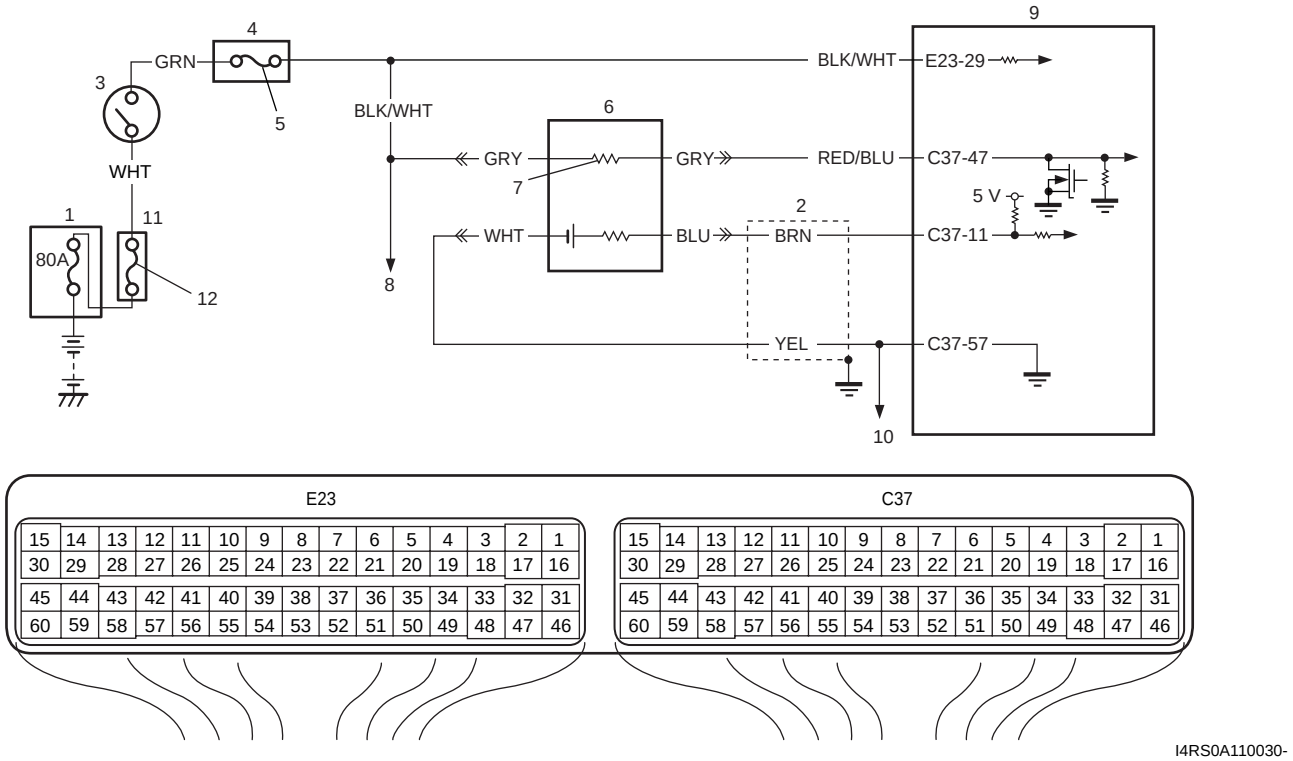
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**HO2S-1 output voltage check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it) and check HO2S output voltages displayed on scan tool. *Is over 0.6 V and below 0.3 V indicated?*	Intermittent trouble, check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If check result is OK, go to Step 3.	Go to Step 3.
3	**HO2S-1 ground check** 1) Disconnect connector from HO2S-1 with ignition switch turned OFF. 2) Check for proper connection to HO2S-1 at "BLK/RED", "WHT", "BLK/WHT" and "YEL" wire terminals. 3) If wire and connection are OK, measure resistance between "YEL" wire terminal of HO2S-1 connector and engine ground. *Is resistance less than 5 Ω?*	Go to Step 4.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
4	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "WHT" wire terminal of HO2S-1 connector and "C37-10" terminal. *Is resistance less than 5 Ω?*	Go to Step 5.	"WHT" wire is high resistance circuit or open circuit. Poor "C37-10" terminal connection of ECM connector. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "WHT" wire terminal of HO2S-1 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"WHT" wire is shorted to ground circuit.
6	**HO2S-1 heater circuit check** 1) Check HO2S-1 heater circuit referring to "DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1): ". *Is it in good condition?*	Go to Step 7.	Repair HO2S-1 circuit.
7	**Exhaust system check** 1) Check exhaust system for exhaust gas leakage. *Is it OK?*	Go to Step 4 in "DTC P0171 / P0172: Fuel System Too Lean / Rich: ". If it is in good condition, go to Step 8.	Repair leakage of exhaust system.

Step	Action	Yes	No
8	**Air intake system check** 1) Check air intake system for clog or leak. *Is it OK?*	Check HO2S-1 referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C”. If it is in good condition, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2)

S4RS0A1104070

Wiring Diagram



I4RS0A110030-

1. Battery fuse box	4. Junction block assembly	7. Heater	10. To other sensors
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-1 heater	11. Relay box
3. Ignition switch	6. HO2S-2	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0137: HO2S-2 voltage is lower than 0.4 V while engine is idling after driving with high engine load (high speed) for specified time. And HO2S-2 max. voltage minus HO2S-2 min. voltage is less than 0.2 V for 40 sec continuously. (2 driving cycle detection logic) **DTC P0138:** HO2S-2 voltage is higher than 0.85 V while engine is idling after driving with high engine load (high speed) for specified time. And HO2S-2 max. voltage minus HO2S-2 min. voltage is less than 0.2 V for 40 sec continuously. (2 driving cycle detection logic)	• HO2S-2 • HO2S-2 circuit • Fuel system • ECM • Fuel shortage • Exhaust system • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine Coolant temperature: 70 °C (158 °F) to 150 °C (302°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Increase vehicle speed to 60 – 80 km/h (37 – 50 mile/h) at 5th gear or D range.
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 4 sec. or more), then stop vehicle and run engine at idle speed for 60 sec. or more.
6) Repeat Step 4).
7) Keep above vehicle speed for 8 min. or more. (Throttle valve opening is kept constant in this step.)
8) Repeat Step 5).
9) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

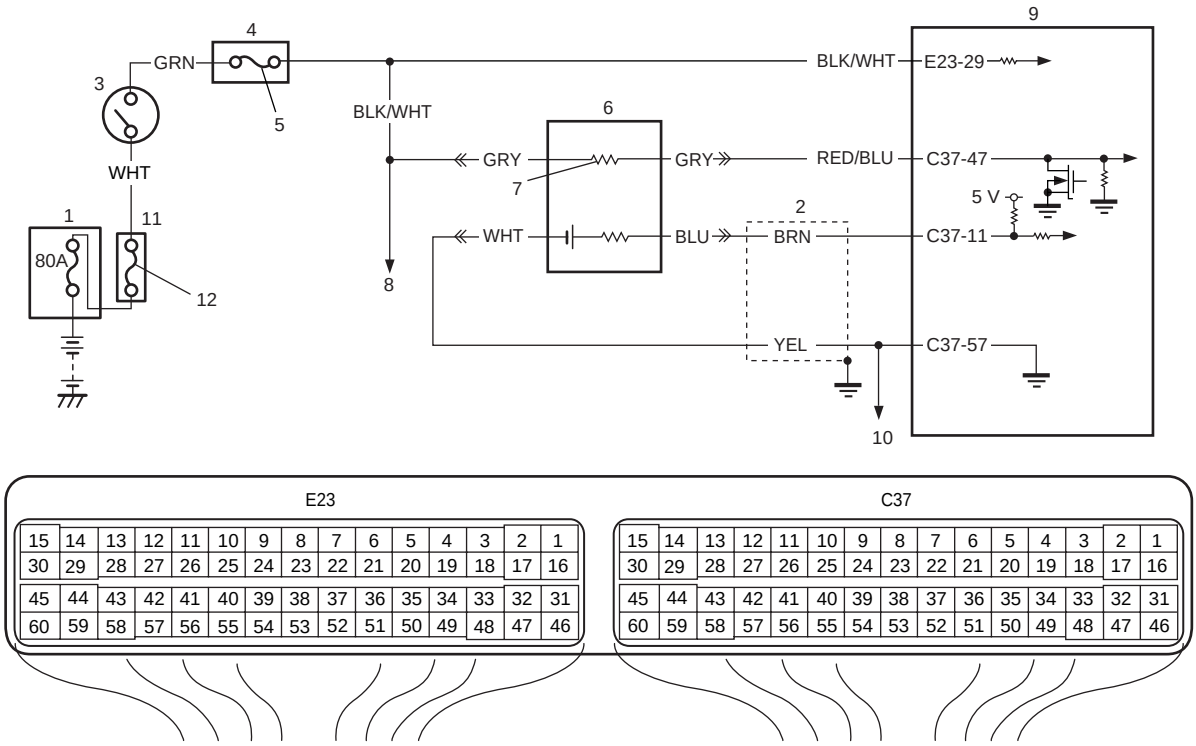
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is there DTC(s) other than fuel system (DTC P0171 / P0172) and HO2S-2 (DTC P0140)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**HO2S-2 and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it). *Does HO2S-2 output voltage indicate deflection between over 0.35 V and below 0.25 V?*	Go to "DTC P0171 / P0172: Fuel System Too Lean / Rich: ".	Go to Step 4.

Step	Action	Yes	No
4	**HO2S-2 ground check** 1) Disconnect connector from HO2S-2 with ignition switch turned OFF. 2) Check for proper connection to HO2S-2 connector at "RED/BLU", "BRN", "YEL" and "BLK/WHT" wire terminals. 3) If connections are OK, measure resistance between "YEL" wire terminal of HO2S-2 connector and engine ground. *Is resistance less than 5 Ω?*	Go to Step 5.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
5	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "BRN" wire terminal of HO2S-2 connector and "C37-11" terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 6.	"BRN" wire is high resistance circuit or open circuit. Poor "C37-11" terminal connection. If they are OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BRN" wire terminal of HO2S-2 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	"BRN" wire is shorted to ground circuit.
7	**HO2S-2 signal circuit check** 1) Measure voltage between "BRN" wire terminal of HO2S-2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	"BRN" wire is shorted to other circuit.
8	**HO2S-2 heater circuit check** 1) Check HO2S-2 heater circuit referring to "DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2): ". *Is circuit in good condition?*	Go to Step 9.	Repair HO2S-2 circuit
9	**Exhaust system check** 1) Check exhaust system for exhaust gas leakage. *Is it OK?*	Go to Step 4 in "DTC P0171 / P0172: Fuel System Too Lean / Rich: ". If it is in good condition, go to Step 10.	Repair leakage of exhaust system.
10	**Air intake system check** 1) Check air intake system for clog or leak. *Is it OK?*	Check HO2S-2 referring to "Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C". If it is in good condition, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0140: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-2)

S4RS0A1104030

Wiring Diagram



I4RS0A110030-

1. Main fuse box	4. Junction block assembly	7. Heater	10. To other sensors
2. Shield wire	5. "IG COIL" fuse	8. To HO2S-1 heater	11. Relay box
3. Ignition switch	6. HO2S-2	9. ECM	12. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HO2S-2 voltage is higher than specified value after warming up engine (circuit open). (2 driving cycle detection logic)	• HO2S-2 • HO2S-2 circuit • ECM • Exhaust gas leakage • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Increase vehicle speed to 60 – 80 km/h (37 – 50 mile/h) at 5th gear or D range.
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 4 sec. or more), then stop vehicle and run engine at idle speed for 60 sec. or more.
6) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**HO2S-2 ground check** 1) Disconnect connector from HO2S-2 with ignition switch turned OFF. 2) Check for proper connection to HO2S-2 connector at "RED/BLU", "BRN", "YEL" and "BLK/WHT" wire terminals. 3) If connections are OK, measure resistance between "YEL" wire terminal of HO2S-2 connector and engine ground. *Is resistance less than 5 Ω?*	Go to Step 3.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
3	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "BRN" wire terminal of HO2S-2 connector and "C37-11" terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 4.	"BRN" wire is high resistance circuit or open circuit. Poor "C37-11" terminal connection. If they are OK, substitute a known-good ECM and recheck.
4	**HO2S-2 signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between "BRN" wire terminal of HO2S-2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 5.	"BRN" wire is shorted to other circuits.
5	**HO2S-2 heater circuit check** 1) Check HO2S-2 heater circuit referring to "DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2): ". *Is circuit in good condition?*	Go to Step 6.	Repair HO2S-2 circuit. If circuit is OK, substitute a known-good ECM and recheck.
6	**HO2S-2 check** 1) Check HO2S-2 referring to "Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace HO2S-2.

DTC P0171 / P0172: Fuel System Too Lean / Rich

S4RS0A1104032

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0171: Total fuel trim is higher than 35% or short term fuel trim is higher than 20% for more than 1 min. continuously. (2 driving cycle detection logic) **DTC P0172:** Total fuel trim is lower than –35% or short term fuel trim is lower than –20% for more than 1 min. continuously. (2 driving cycle detection logic)	• Vacuum leakage • Exhaust gas leakage • Fuel pressure out of specification • Fuel injector malfunction • Heated oxygen sensor-1 malfunction • MAF sensor malfunction • ECT sensor malfunction

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and print freeze frame data or write them down using scan tool.
3) Clear DTC using scan tool.
4) Start engine and warm up to normal operating temperature.
5) Operate vehicle with condition as noted freeze frame data for 5 min.
6) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is there DTC(s) other than fuel system (DTC P0171 / P0172)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Intake system and exhaust system for leakage check** *Are intake system and exhaust system in good condition?*	Go to Step 4.	Repair or replace defective part.
4	**Fuel pressure check** 1) Check fuel pressure referring to "Fuel Pressure Check: ". *Is check result satisfactory?*	Go to Step 5.	Repair or replace defective part.
5	**Fuel injectors and its circuit check** 1) Check fuel injectors referring to "Fuel Injector Inspection: in Section 1G". *Is check result satisfactory?*	Go to Step 6.	Faulty injector(s) or its circuit.
6	**Visual inspection** 1) Check MAF sensor and air intake system. • Objects which block measuring duct and resistor of MAF sensor. • Other air flow which does not pass the MAF sensor. *Are they in good condition?*	Go to Step 7.	Repair or replace detective part.
7	**MAF sensor for performance check** 1) With ignition switch turned OFF, install scan tool. 2) Start engine and warm up to normal operating temperature. 3) Check MAF value using scan tool (Refer to "Scan Tool Data: " for normal value.). *Is each value within specified range?*	Go to Step 8.	Go to "DTC P0101: Mass Air Flow Circuit Range / Performance: ".
8	**ECT sensor for performance check** 1) Check ECT sensor referring to Step 3 and 4 of "DTC P0118: Engine Coolant Temperature Circuit High: ". *Is check result satisfactory?*	Go to Step 9.	Faulty ECT sensor or its circuit.
9	**HO2S-1 for performance check** 1) Check HO2S-1 referring to Step 3 of "DTC P0131 / P0132: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-1): ". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Faulty HO2S-1 or its circuit.

DTC P0300 / P0301 / P0302 / P0303 / P0304: Random Misfire Detected / Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Misfire Detected

S4RS0A1104033

System Description

ECM measures the angle of the crankshaft based on the pulse signal from the CKP sensor and CMP sensor for each cylinder. If it detects a large change in the angle speed of the crankshaft, it concludes occurrence of a misfire. When the number of misfire is counted by ECM beyond the DTC detecting condition, it determines the cylinder where the misfire occurred and output it as DTC.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0300: • Misfire, which causes catalyst to overheat during 200 engine revolutions, is detected at 2 or more cylinders. (MIL flashes as long as this misfire occurs continuously.) or • Misfire, which affects exhaust emission adversely during 1000 engine revolution, is detected at 2 or more cylinders. (2 driving cycle detection logic)	• Ignition system • Fuel injector and its circuit • Fuel pressure • EGR system • Abnormal air drawn in • Engine compression • Valve lash adjuster • Valve timing • Fuel shortage
DTC P0301, P0302, P0303, P0304: • Misfire, which causes catalyst to overheat during 200 engine revolutions, is detected at 1 cylinder. (MIL flashes as long as this misfire occurs continuously.) or • Misfire, which affects exhaust emission adversely during 1000 engine revolution, is detected at 1 cylinder. (2 driving cycle detection logic)	

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temp.: –7 °C, 19.4 °F or higher**
- **Engine coolant temp.: –10 °C, 14 °F or higher**
- **Altitude (barometric pressure): 2500 m, 8200 ft or less (540 mmHg, 72 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and print freeze frame data or write them down using scan tool.
3) Clear DTC using scan tool.
4) Drive vehicle under condition as noted freeze frame data for 1 min. or more.
5) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE:

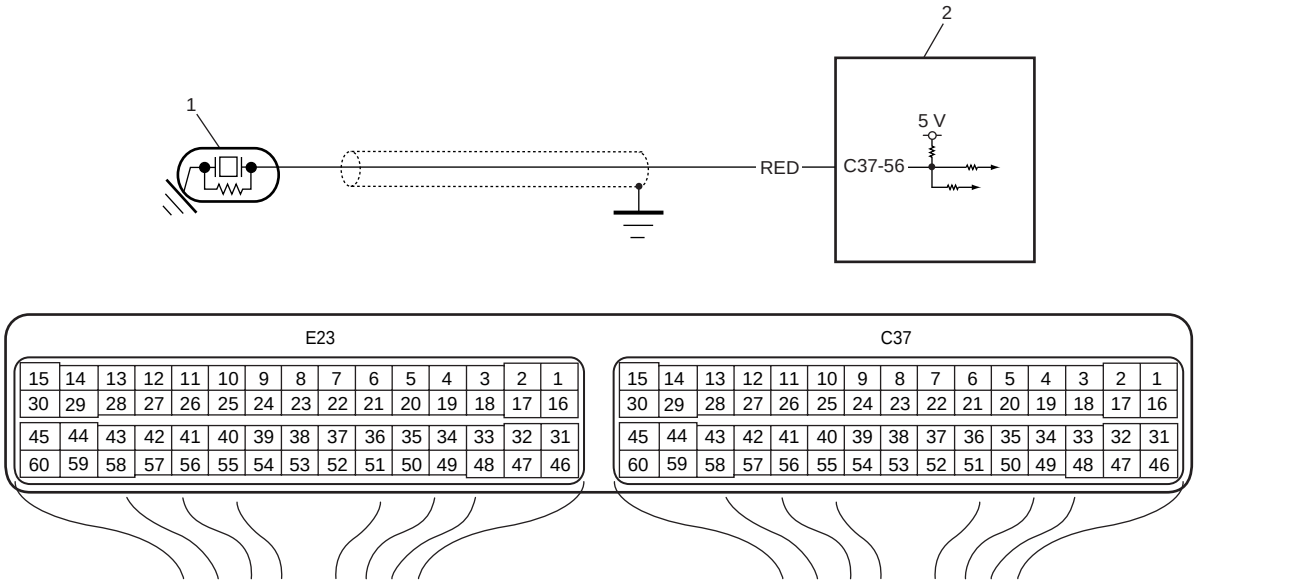
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Does fuel level meter indicate "E" level (empty)?*	Add fuel and recheck.	Go to Step 3.
3	**Ignition system check** 1) Check spark plug and ignition spark of cylinder where misfire occurs, referring to "Spark Plug Inspection: in Section 1H" and "Ignition Spark Test: in Section 1H". *Are they in good condition?*	Go to Step 4.	Faulty ignition coil, wire harness, spark plug or other system parts.
4	**Fuel injector circuit check** 1) Using sound scope, check each injector operating sound at engine cranking or idling. *Do all injectors make operating sound?*	Go to Step 5.	Check coupler connection and wire harness of injector not making operating sound and injector itself. If OK, substitute a known-good ECM and recheck.
5	**Fuel pressure check** 1) Check fuel pressure referring to "Fuel Pressure Check: ". *Is check result satisfactory?*	Go to Step 6.	Repair or replace fuel system.
6	**Fuel injector check** 1) Check fuel injector(s) referring to "Fuel Injector Inspection: in Section 1G". *Is check result satisfactory?*	Go to Step 7.	Replace defective injector.
7	**Ignition timing check** 1) Check ignition timing referring to "Ignition Timing Inspection: in Section 1H". *Is check result satisfactory?*	Go to Step 8.	Check related sensors.
8	**EGR system check** 1) Check EGR system referring to "EGR System Inspection: in Section 1B". *Is check result satisfactory?*	Go to Step 9.	Repair or replace EGR system.
9	**Engine mechanical system check** 1) Check engine mechanical parts or system which can cause engine rough idle or poor performance. • Engine compression (Refer to "Compression Check: in Section 1D".) • Valve lash (Refer to "Valve Lash (Clearance) Inspection: in Section 1D".) • Valve timing (Refer to "Timing Chain and Chain Tensioner Removal and Installation: in Section 1D".) *Are they in good condition?*	Check wire harness and connection of ECM ground, ignition system and fuel injector for intermittent open and short.	Repair or replace defective engine part.

DTC P0327 / P0328: Knock Sensor Circuit Low / High

S4RS0A1104034

Wiring Diagram



I4RS0A110031-

1. Knock sensor
2. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. **DTC P0327:** • Engine is running • Voltage of knock sensor is less than 1.23 V (1 driving cycle detection logic) **DTC P0328:** • Engine is running • Voltage of knock sensor is 3.91 V or more (1 driving cycle detection logic)	• Knock sensor circuit (open or short) • Knock sensor • ECM

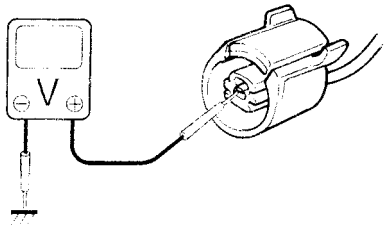
DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC by using scan tool.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

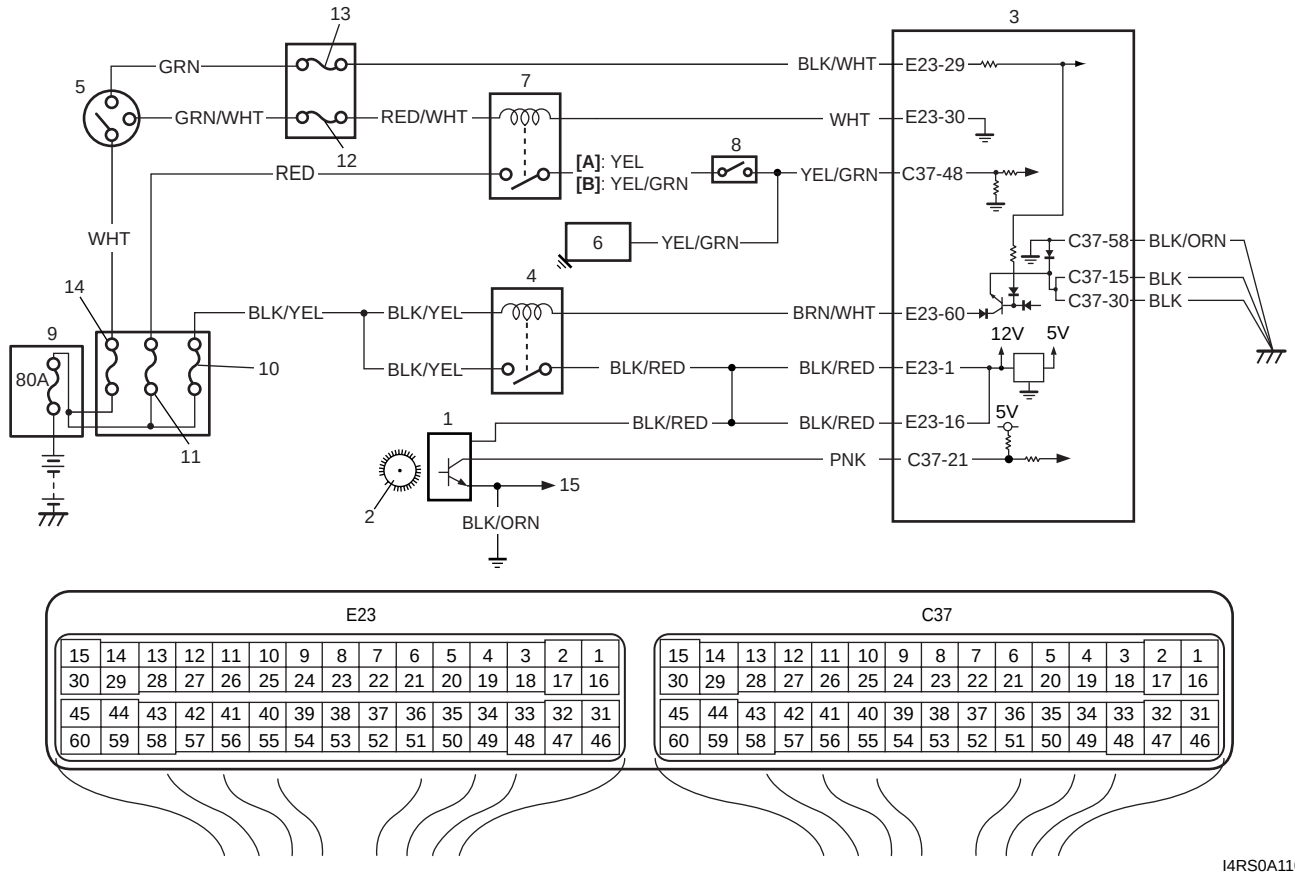
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Knock sensor circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure voltage between "C37-56" terminal of ECM connector and vehicle body ground with engine running. *Is voltage within 1.23 – 3.91 V?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good ECM and recheck.	Go to Step 3.
3	**Knock sensor circuit for open check** 1) Disconnect connector from knock sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "RED" wire of knock sensor connector and engine ground.  I2RH01110089- *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**Knock sensor circuit for open check** 1) Turn ON ignition switch, measure voltage between "C37-56" terminal of ECM connector and engine ground *Is voltage 4 – 6 V?*	"RED" wire is open circuit.	Go to Step 5.
5	**Knock sensor circuit for short check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-56" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"RED" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**Knock sensor circuit for short check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "C37-56" terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 7.	"RED" wire is shorted to other circuit.

Step	Action	Yes	No
7	**Knock sensor circuit for high resistance check** 1) Turn OFF ignition switch, measure resistance between "C37-56" terminal of ECM connector and "RED" wire terminal of knock sensor harness connector. *Is resistance below 5 Ω?*	Faulty knock sensor.	"RED" wire is high resistance circuit.

DTC P0335: Crankshaft Position (CKP) Sensor Circuit

S4RS0A1104035

Wiring Diagram



I4RS0A110032-

[A]: A/T vehicle	5. Ignition switch	11. "ST MOT" fuse
[B]: M/T vehicle	6. Starting motor	12. "ST SIG" fuse
1. CKP sensor	7. Starting motor control relay	13. "IG COIL" fuse
2. Sensor plate on crankshaft	8. Transmission range switch (A/T vehicle)	14. "IG ACC" fuse
3. ECM	9. Battery fuse	15. To CMP sensor
4. Main relay	10. "FI" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No CKP sensor signal for 2 sec. even if starting motor signal is inputted at engine cranking. (1 driving cycle detection logic)	• CKP sensor circuit open or short • Sensor plate teeth damaged • CKP sensor malfunction, foreign material being attached or improper installation • ECM • Engine start signal circuit malfunction

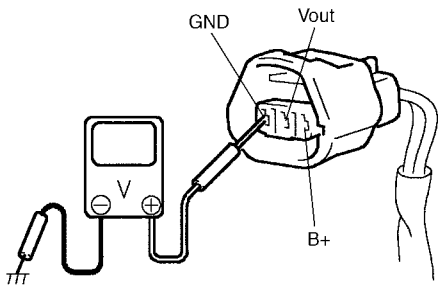
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Crank engine for 3 – 5 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

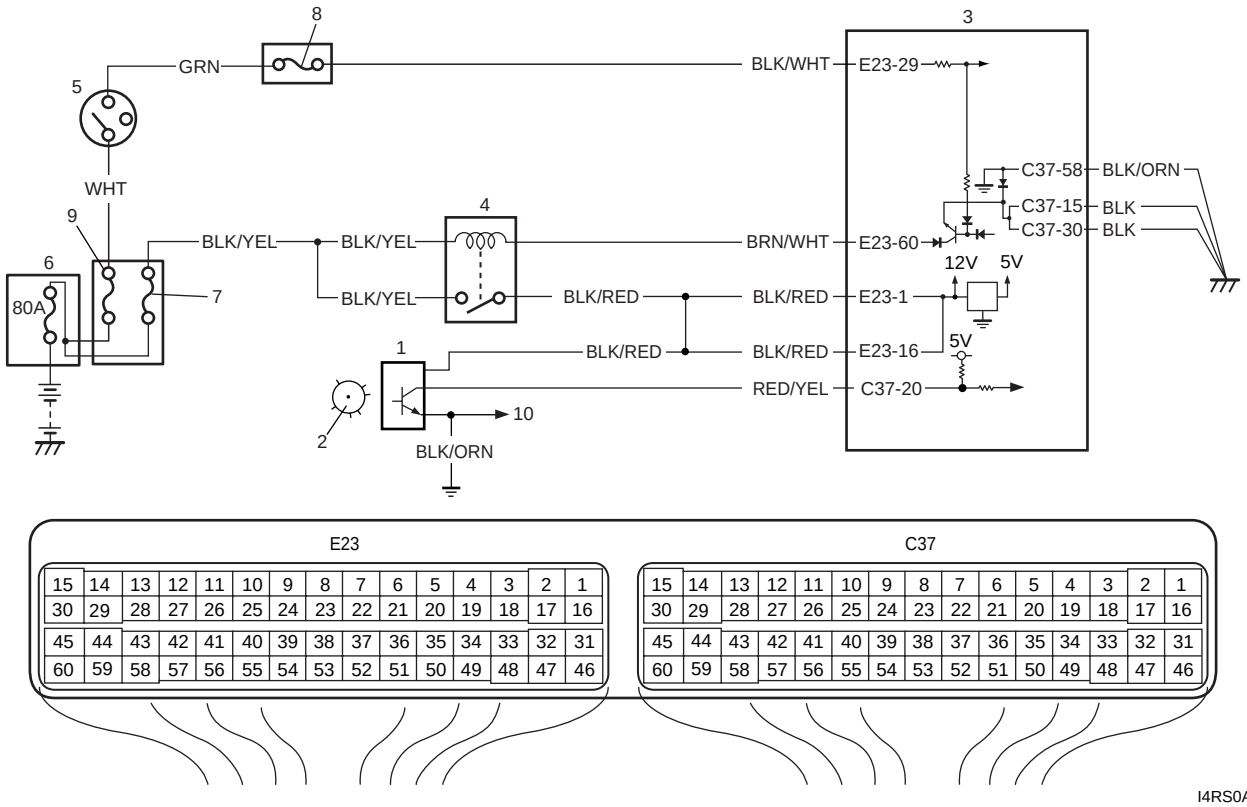
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**CKP sensor and connector for proper installation check** *Is CKP sensor installed properly and connector connected securely?*	Go to Step 3.	Correct.
3	**Wire harness and connection check** 1) Disconnect connector from CKP sensor with ignition switch turned OFF. 2) Check for proper connection to CKP sensor at "BLK/RED", "PNK" and "BLK/ORN" wire terminals. 3) If OK, turn ON ignition switch and check voltage at "BLK/RED", "PNK" and "BLK/ORN" wire terminals of disconnected CKP sensor connector. **CKP sensor voltage** **Terminal "B+": 10 – 14 V** **Terminal "Vout": 4 – 5 V** **Terminal "GND": 0 V**  I2RH0B110048- *Is check result satisfactory?*	Go to Step 6.	Go to Step 4.
4	*Was terminal "Vout" voltage in Step 3 within specification?*	Go to Step 5.	"PNK" wire is open or shorted to ground / power supply circuit. If wire and connection are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
5	**Ground circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between “BLK/ORN” wire terminal of CKP sensor connector and engine ground. *Is measured resistance value less than 3 Ω?*	Go to Step 6.	“BLK/ORN” wire is open or high resistance.
6	*Was terminal “B+” voltage in Step 3 within specification?*	Go to Step 7.	“BLK/RED” wire is open circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
7	**Engine start signal check** 1) Check starting motor circuit for opening and short referring to Step 2 of “DTC P0616: Starter Relay Circuit Low: ” and Step 3 and 4 of “DTC P0617: Starter Relay Circuit High: ”. *Is check result satisfactory?*	Go to Step 8.	Repair or replace.
8	**CKP sensor check** 1) Check CKP sensor and sensor plate tooth referring to “Crankshaft Position (CKP) Sensor Inspection: in Section 1C”. *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace CKP sensor and/or sensor plate.

DTC P0340: Camshaft Position (CMP) Sensor Circuit

S4RS0A1104036

Wiring Diagram



I4RS0A110034-

1. CMP sensor	4. Main relay	7. “FI” fuse	10. To CKP sensor
2. Signal rotor	5. Ignition switch	8. “IG COIL” fuse	
3. ECM	6. Battery fuse	9. “IG ACC” fuse	

System Description
The CMP sensor located on the transmission side of cylinder head consists of the signal generator (magnetic sensor) and signal rotor (intake camshaft portion).
The signal generator generates Reference signal through slits in the slit plate which turns together with the camshaft.

Reference signal
The CMP sensor generates 6 pulses of signals each of which has a different waveform length while the camshaft makes one full rotation. Refer to “Inspection of ECM and Its Circuits: ”.
Based on these signals, ECM judges which cylinder piston is in the compression stroke and the engine speed.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• CMP sensor pulse is less than 20 pulses per crankshaft 8 revolutions • CMP sensor pulse is more than 28 pulses per crankshaft 8 revolutions • CMP sensor pulse is less than 20 pulses between BTDC 155° CA and BTDC 5° CA with crankshaft 8 revolutions from engine start. (1 driving cycle detection logic)	• CMP sensor circuit open or short • Signal rotor teeth damaged • CMP sensor malfunction, foreign material being attached or improper installation • ECM

DTC Confirmation Procedure

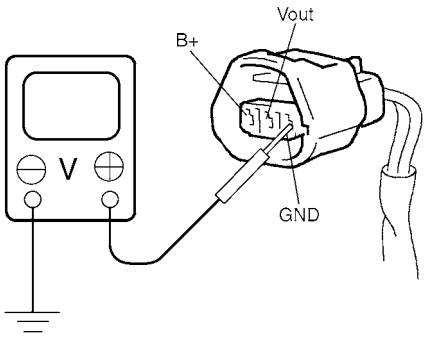
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Crank engine for 5 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

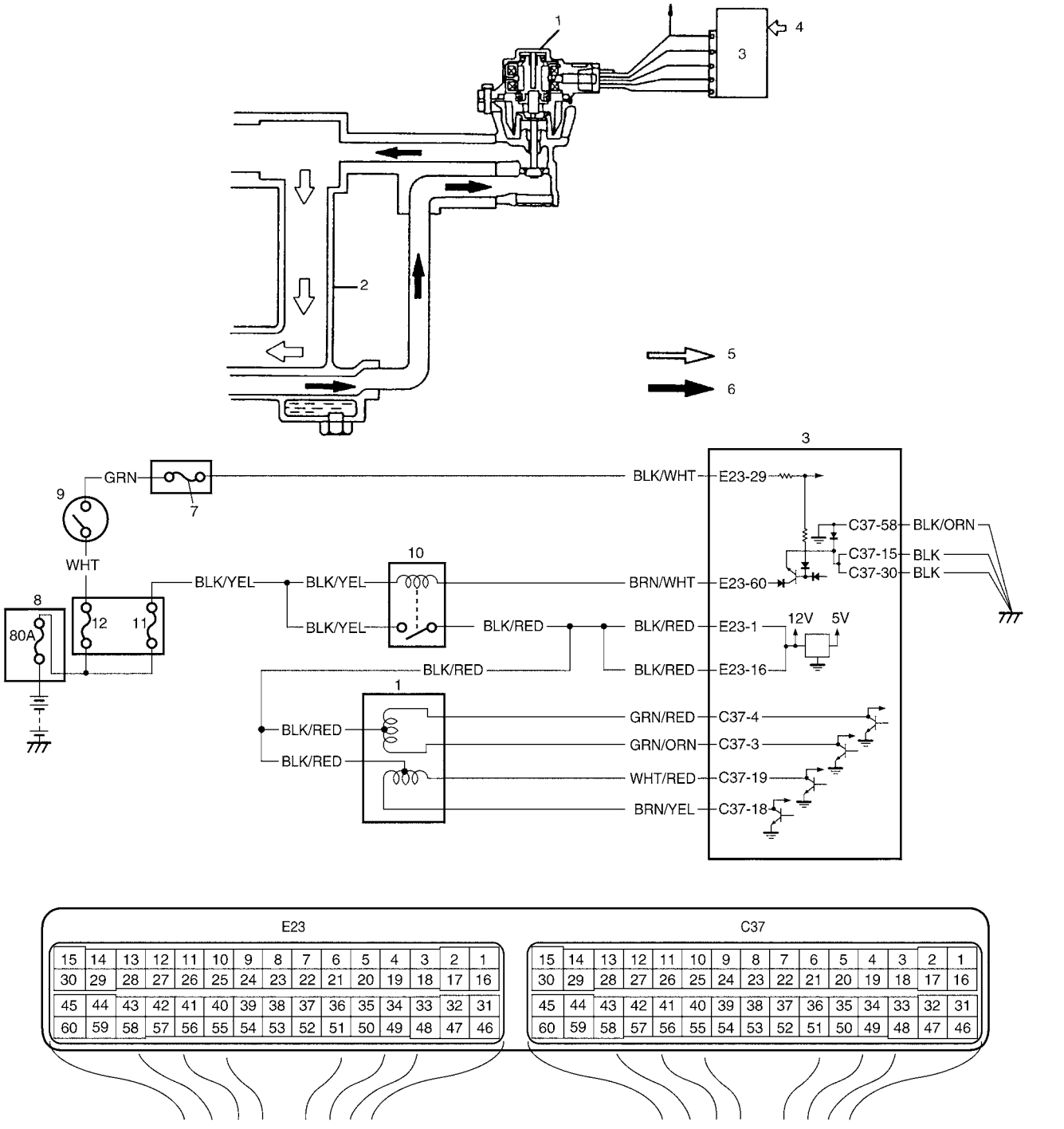
Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.
2	**CMP sensor and connector for proper installation check** *Is CMP sensor installed properly and connector connected securely?*	Go to Step 3.	Correct.

Step	Action	Yes	No
3	**Wire harness and connection check** 1) Disconnect connector from CMP sensor. 2) Check for proper connection to CMP sensor at "BLK/RED", "RED/YEL" and "BLK/ORN" wire terminals. 3) If OK, turn ON ignition switch and check voltage at "BLK/RED", "RED/YEL" and "BLK/ORN" wire terminals of disconnected CMP sensor connector. **CMP sensor voltage** **Terminal "B+": 10 – 14 V** **Terminal "Vout": 4 – 5 V** **Terminal "GND": 0 V**  I3RH0B110006- *Is check result satisfactory?*	Go to Step 7.	Go to Step 4.
4	*Was terminal "Vout" voltage in Step 3 within specification?*	Go to Step 5.	"RED/YEL" wire is open or shorted to ground / power supply circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
5	**Ground circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "BLK/ORN" wire terminal of CMP sensor connector and engine ground. *Is measured resistance value less than 3 Ω?*	Go to Step 6.	"BLK/ORN" wire is open or high resistance circuit.
6	*Was terminal "B+" voltage in Step 3 within specification?*	Go to Step 7.	"BLK/RED" wire is open circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
7	**CMP sensor check** 1) Check CMP sensor and signal rotor tooth referring to "Camshaft Position (CMP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace CMP sensor and/or intake camshaft.

DTC P0401 / P0402: Exhaust Gas Recirculation Flow Insufficient Detected / Excessive Detected

S4RS0A1104037

System and Wiring Diagram



I4RS0A110035-

1. EGR valve	4. Sensed information	7. "IG COIL" fuse	10. Main relay
2. Intake manifold	5. Fresh air	8. Battery fuse box	11. "FI" fuse
3. ECM	6. Exhaust gas	9. Ignition switch	12. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0401: Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is smaller than specified value. (*2 driving cycle detection logic, monitoring once / 1 driving) **DTC P0402:** Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is larger than specified value. (*2 driving cycle detection logic, monitoring once / 1 driving)	• EGR valve • EGR passage • MAP sensor • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC confirmation procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle for 10 min.
5) Drive vehicle and increase engine speed 3000 rpm in 3rd gear.
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 5 sec. or more. (Keep fuel cut condition for 5 sec. or more) If fuel cut condition is not kept for 5 sec. or more, coast down a slope in engine speed 1000 – 3000 rpm for 5 sec. or more.
7) Stop vehicle and run engine at idle.
8) Check DTC and pending DTC by using scan tool.

DTC Troubleshooting

NOTE:

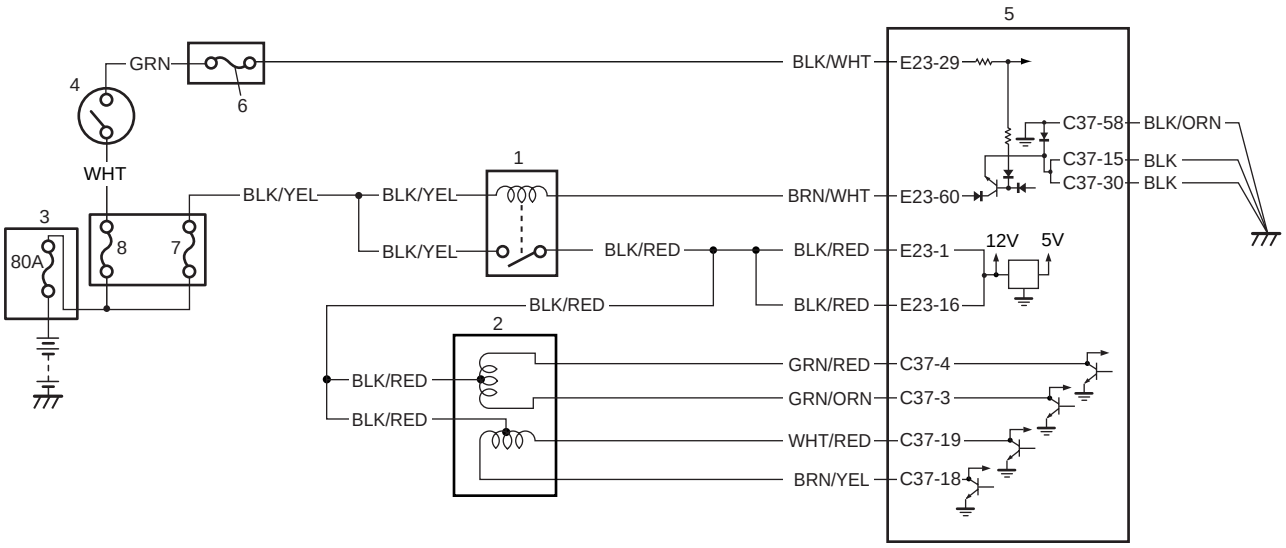
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

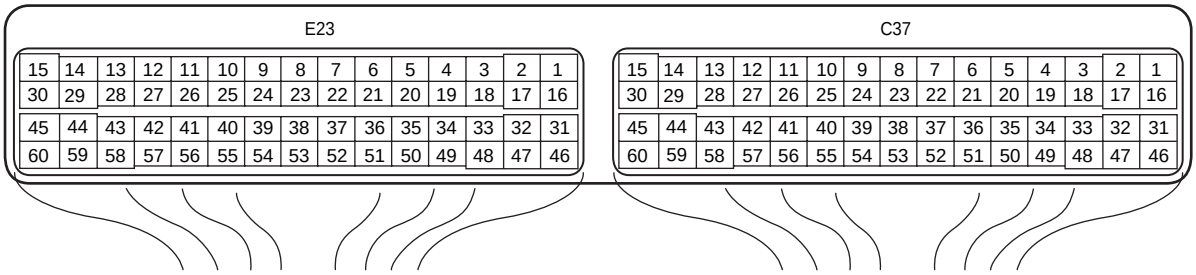
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 5.
3	**EGR valve operation check** 1) With ignition switch turned OFF, install SUZUKI scan tool to DTC. 2) Check EGR system referring to "EGR System Inspection: in Section 1B". *Is it in good condition?*	Go to Step 4.	Go to Step 5.
4	**MAP sensor check** 1) Check MAP sensor for performance referring to "Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Replace MAP sensor.
5	**EGR valve control circuit check** 1) Check that EGR valve control circuits are in good condition referring to Step 2 to 5 of "DTC P0403: Exhaust Gas Recirculation Control Circuit: " *Are circuits in good condition?*	Go to Step 6.	Repair or replace EGR valve control circuit(s).
6	**EGR valve check** 1) Check EGR valve referring to "EGR Valve Inspection: in Section 1B". *Is check result satisfactory?*	Go to Step 7.	Faulty EGR valve.
7	**MAP sensor check** 1) Check MAP sensor for performance referring to "Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	EGR passage clogged. If OK, substitute a known-good ECM and recheck.	Replace MAP sensor.

DTC P0403: Exhaust Gas Recirculation Control Circuit

S4RS0A1104071

Wiring Diagram





I4RS0A110036-

1. Main relay	3. Battery fuse box	5. ECM	7. "FI" fuse
2. EGR valve	4. Ignition switch	6. "IG COIL" fuse	8. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
EGR valve output voltage is different from output command with more than one pole out of 4 poles. (1 driving cycle detection logic)	• EGR valve circuit open • EGR valve • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) With ignition switch turned OFF, connect scan tool to DLC.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm it up to normal operating temperature.
4) Drive vehicle in 2000 – 3500 rpm of engine speed.
5) Keep above vehicle speed for 1 min. (Throttle valve opening is kept constant in this step.)
6) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE:

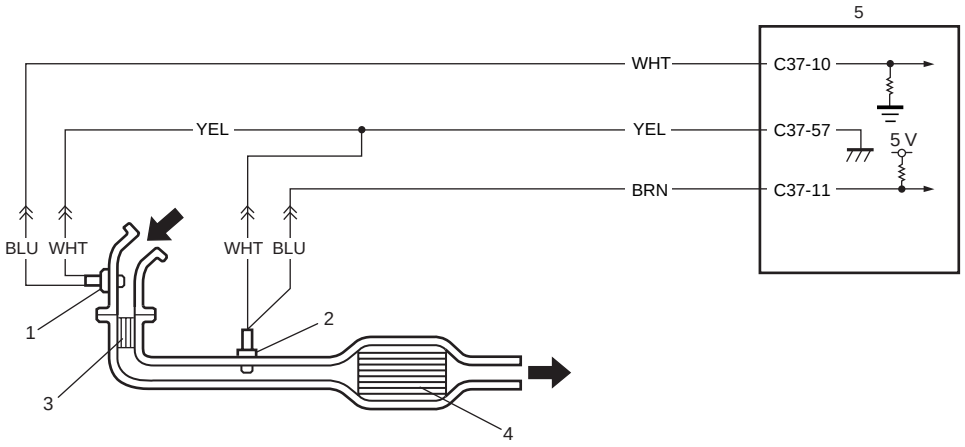
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Description: ".
2	**EGR valve power supply circuit check** 1) Remove air intake pipe. 2) With ignition switch turned OFF, disconnect EGR valve connector. 3) With ignition switch turned ON, measure voltage between "BLK/RED" wire terminal of EGR valve connector and vehicle body ground. *Is check voltage 10 – 14 V?*	Go to Step 3.	"BLK/RED" wire is open circuit.
3	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between engine ground and each "GRN/RED", "GRN/ORN", "WHT/RED", "BRN/YEL" wire terminals of EGR valve connector. *Is each voltage 0 V?*	Go to Step 4.	Faulty wire(s) are shorted to other circuit. If wires are OK, substitute a known-good ECM and recheck.
4	**Wire circuit check** 1) With ignition switch turned OFF, measure resistance between engine ground and each "GRN/RED", "GRN/ORN", "WHT/RED", "BRN/YEL" wire terminals of EGR valve connector. *Is resistance infinity?*	Go to Step 5.	Faulty wire(s) are shorted to ground circuit. If wires are OK, substitute a known-good ECM and recheck.
5	**Short circuit check for EGR valve control circuit** 1) With ignition turned OFF, measure resistance between each EGR valve control circuit wire ("GRN/RED", "GRN/ORN", "WHT/RED" and "BRN/YEL" wire) and each EGR valve control circuit wire. *Is each resistance infinity?*	Go to Step 6.	Faulty wire(s) are short circuit.
6	**EGR valve stepper motor coil circuit check** 1) With ignition switch turned OFF, connect EGR valve connector. 2) Measure resistance between "E23-1/16" and each "C37-4", "C37-3", "C37-19", "C37-18" terminals of ECM connector. *Is each resistance 20 – 31 Ω at 20 °C, 68 °F?*	Faulty ECM. Substitute a known-good ECM and recheck.	Go to Step 7.
7	**EGR valve check** 1) Check EGR valve resistance referring to "EGR Valve Inspection: in Section 1B". *Is resistance within specified value?*	Faulty wire(s) are open or high resistance circuit. If wires are OK, substitute a known-good ECM and recheck.	Faulty EGR valve.

DTC P0420: Catalyst System Efficiency below Threshold

S4RS0A1104039

System and Wiring Diagram



I4RS0A110037-

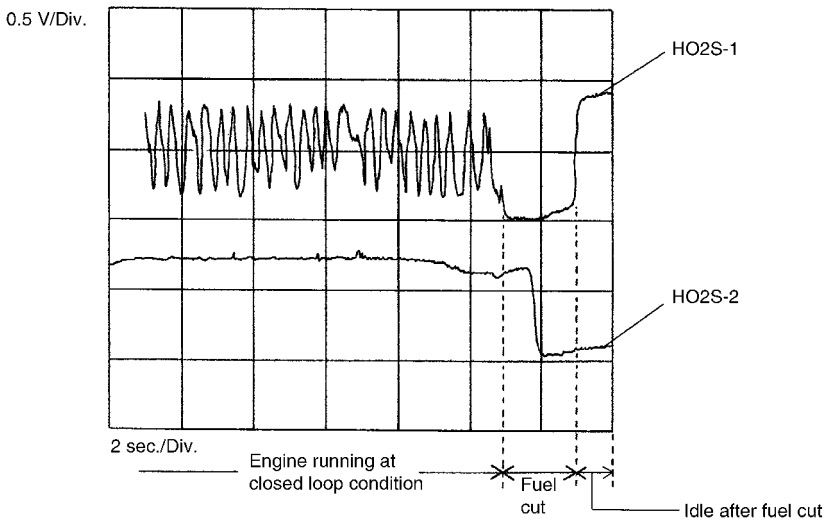
1. HO2S-1	3. Warm up three way catalytic converter	5. ECM
2. HO2S-2	4. Three way catalytic converter	

Circuit Description

ECM monitors oxygen concentration in the exhaust gas which has passed the warm up three way catalytic converter by HO2S-2. When the catalyst is functioning properly, the variation cycle of HO2S-2 output voltage (oxygen concentration) is slower than that of HO2S-1 output voltage because of the amount of oxygen in the exhaust gas which has been stored in warm up three way catalytic converter.

Reference

Oscilloscope waveforms



I2RH01110102-

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• While vehicle running at constant speed under other than high load. • Time from rich or lean switching command is output till HO2S-2 output voltage crosses 0.45 V is less than specified value. (*2 driving cycle detection logic, monitoring once / 1 driving)	• Exhaust gas leak • Warm up three way catalytic converter malfunction • HO2S-2 malfunction • HO2S-1 malfunction

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temp.: –7 °C, 19.4 °F or higher**
- **Engine coolant temp.: 70 °C, 158 °F or higher**
- **Altitude (barometric pressure): 2500 m, 8200 ft or less (540 mmHg, 72 kPa or more)**

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Increase vehicle speed to 50 – 60 mph, 80 – 100 km/h. (engine speed: 2500 – 3000 r/min.)
4) Keep above vehicle speed for 10 min. or more (Throttle valve opening is kept constant in this step).
5) Stop vehicle and check if DTC / pending DTC exists using scan tool. If not, check if catalyst monitoring test has been completed using scan tool. If not in both of above checks (i.e., no DTC / pending DTC and catalyst monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 5).

DTC Troubleshooting

NOTE:

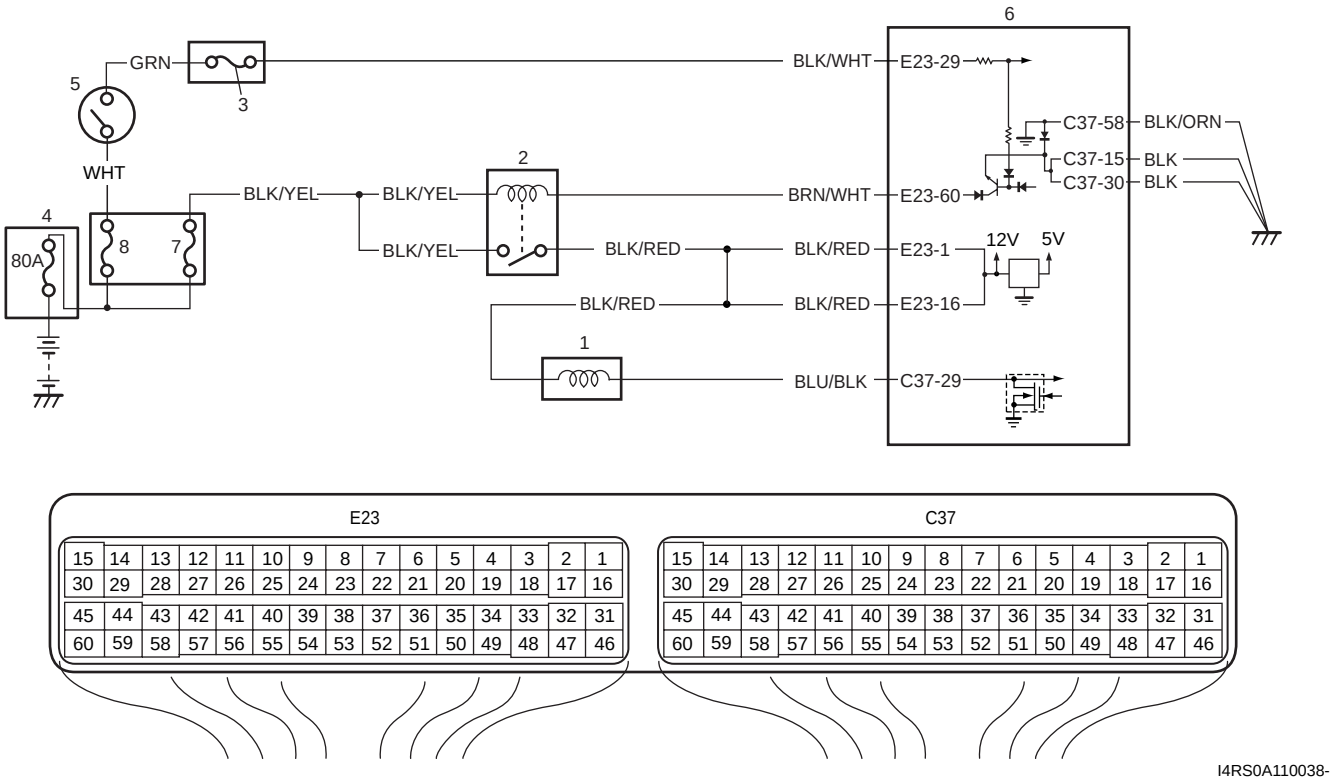
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Exhaust system visual check** 1) Check exhaust system for leaks, damage and loose connection. *Is it in good condition?*	Go to Step 3.	Repair or replace defective part.
3	**HO2S-2 output voltage check** 1) Check output voltage of HO2S-2 referring to "DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2): " and "DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2): ". *Is check result satisfactory?*	Replace exhaust manifold (built in warm up three way catalytic converter) and exhaust center pipe (built in three way catalytic converter).	Check "BRN" and / or "YEL" wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S-2.

DTC P0443: Evaporative Emission System Purge Control Valve Circuit

S4RS0A1104040

Wiring Diagram



I4RS0A110038-

1. EVAP canister purge valve	3. "IG COIL" fuse	5. Ignition switch	7. "FI" fuse
2. Main relay	4. Battery fuse box	6. ECM	6. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of EVAP canister purge valve is different from command signal. (Circuit open or short) (2 driving cycle detection logic)	• EVAP canister purge valve • EVAP canister purge valve circuit • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) With ignition switch OFF, connect scan tool to DLC.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up normal operating temperature.
4) Drive vehicle at more than 40 km/h, 25 mph for 5 min. or more.
5) Check DTC and pending DTC.

DTC Troubleshooting

WARNING:

In order to reduce risk of fire and personal injury, this work must be performed in a well ventilated area and away from any open flames such as gas water heater.

NOTE:

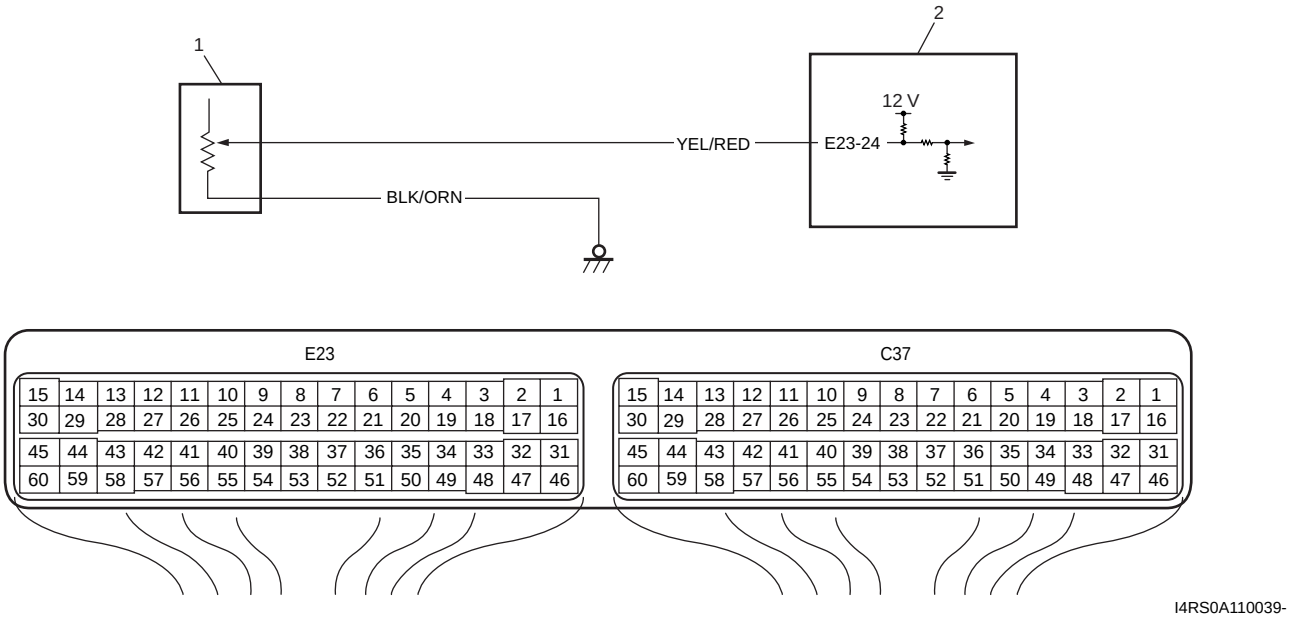
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**EVAP canister purge power supply circuit check** 1) Turn OFF ignition switch and disconnect connector from EVAP canister purge valve. 2) Measure voltage between engine ground and "BLK/RED" wire terminal of EVAP canister purge valve connector with ignition switch turned ON. *Is it voltage 10 – 14 V?*	Go to Step 3.	"BLK/RED" wire is open circuit.
3	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-29" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 4.	"BLU/BLK" wire is shorted to ground circuit.
4	**Wire circuit check** 1) Measure voltage between "C37-29" terminal of ECM connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 5.	"BLU/BLK" wire is shorted to other circuit.
5	**Wire circuit check** 1) Connect connector to purge control valve with ignition switch turned OFF. 2) Turn ON ignition switch and measure voltage between "C37-29" terminal of ECM connector and vehicle body ground. *Is it voltage 10 – 14 V?*	Go to Step 6.	"BLU/BLK" wire is open circuit.
6	**EVAP canister purge control valve check** 1) Check EVAP canister purge control valve referring to "EVAP Canister Purge Valve Inspection: in Section 1B". *Is it in good condition?*	Go to Step 7.	Faulty EVAP canister purge control valve.
7	**EVAP canister purge control circuit check** 1) With ignition switch turn OFF, measure resistance between "E23-1/16" terminal and "C37-29" terminal of ECM connector. *Is resistance below 40 Ω at 20 ℃, 68 ℉?*	Faulty ECM. Substitute a known-good ECM and recheck.	"BLK/RED" and/or "BLU/BLK" wire are high resistance circuit.

DTC P0462: Fuel Level Sensor Circuit Low

S4RS0A1104072

Wiring Diagram



I4RS0A110039-

1.	Fuel level sensor (gauge)
2.	ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Fuel level sensor voltage is lower than 0.45 V for 3 seconds continuously. (1 driving cycle detection logic but MIL does not light up)	• "YEL/RED" circuit short • Fuel level sensor malfunction • ECM and/or its power and ground circuit malfunction • Combination meter malfunction

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 30 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

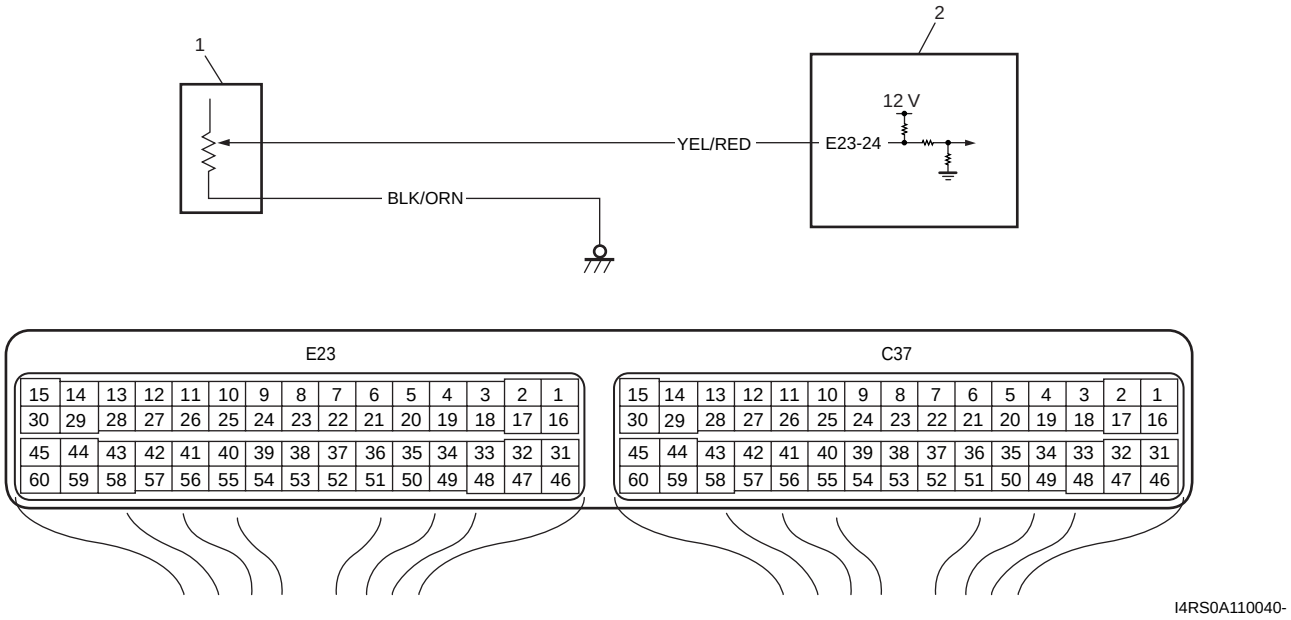
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Do you have SUZUKI scan tool?*	Go to step 3.	Go to step 4.
3	**Fuel level sensor output signal check with SUZUKI scan tool** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check fuel level displayed on SUZUKI scan tool. *Is 100% displayed?*	Go to Step 5.	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
4	**Fuel level sensor output signal check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connector connected. 3) Turn ON ignition switch and measure voltage between "E23-24" terminal of ECM connector and vehicle body ground. *Is voltage about 3.5 V or less?*	Go to Step 5.	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**Fuel level sensor output signal circuit check** 1) Disconnect fuel pump connector referring to "Fuel Tank Removal and Installation: in Section 1G". 2) Disconnect connectors from ECM with ignition switch turned OFF. 3) Measure resistance between "E23-24" terminal of ECM connector and vehicle body ground. *Is it infinity?*	Go to Step 6.	"YEL/RED" wire is shorted to ground circuit.
6	**Fuel level sensor output signal circuit check** 1) Connect connectors to ECM. 2) Measure voltage between "E23-24" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 10 – 14 V?*	Go to Step 7.	Substitute a known-good ECM and recheck.
7	**Fuel level sensor check** 1) Check fuel level sensor referring to "Fuel Level Sensor Inspection: in Section 9C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty fuel level sensor.

DTC P0463: Fuel Level Sensor Circuit High

S4RS0A1104073

Wiring Diagram



I4RS0A110040-

1.	Fuel level sensor (gauge)
2.	ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Fuel level sensor voltage is higher than 4.95 V for 3 seconds continuously. (1 driving cycle detection logic but MIL does not light up)	• "YEL/RED" or "BLK/ORN" circuit open • Fuel level sensor malfunction • ECM and/or its power and ground circuit malfunction • Combination meter faulty

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 30 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Does fuel level meter in combination meter indicate "E" (empty)?*	Replenish fuel tank with fuel and go to Step 3.	Go to Step 3.
3	*Do you have SUZUKI scan tool?*	Go to Step 4.	Go to Step 5.

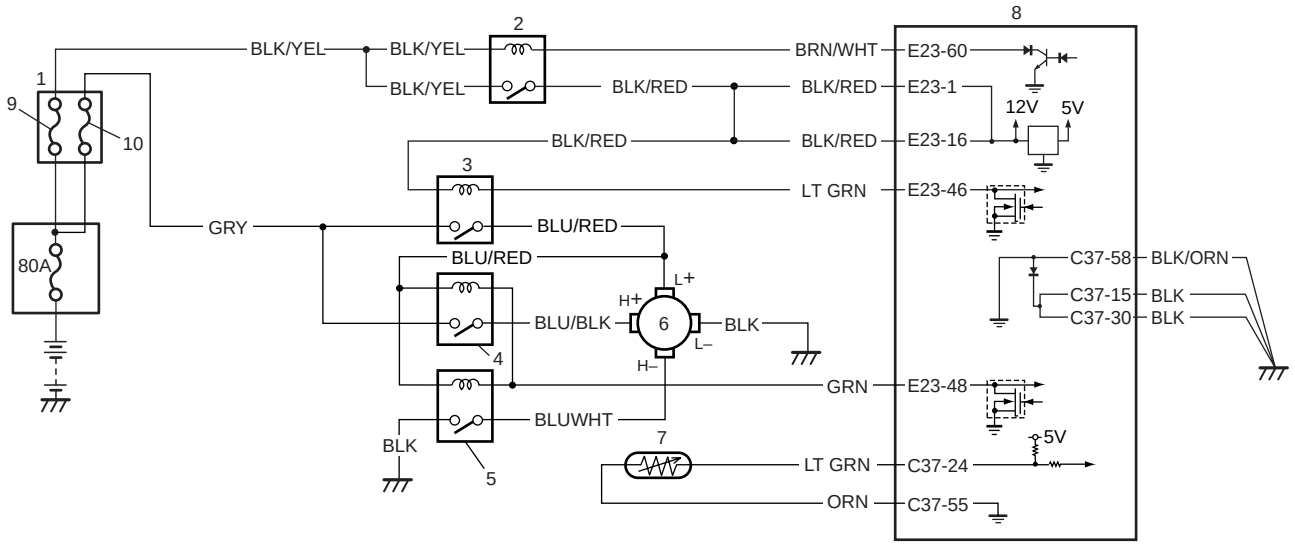
Step	Action	Yes	No
4	**Fuel level sensor output signal check with SUZUKI scan tool** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check fuel level displayed on SUZUKI scan tool. *Is it 3% or less?*	Go to Step 6.	Intermittent trouble or faulty ECM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.
5	**Fuel level sensor output signal check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Turn ON ignition switch and measure voltage between “E23-24” terminal of ECM connector and vehicle body ground. *Is voltage about 3.5 V or more?*	Go to Step 6.	Intermittent trouble or faulty ECM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.
6	**Fuel level sensor circuit resistance check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection to “E23-24” terminal of ECM connector. 3) If OK, measure resistance between “E23-24” terminal of ECM connector and vehicle body ground. *Is resistance below 280 Ω?*	Go to Step 7.	Go to Step 8.
7	**Short circuit check for fuel level sensor output signal circuit** 1) Turn ON ignition switch and measure voltage between “E23-24” terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	“YEL/RED” wire is shorted to power supply circuit.
8	**Open circuit check for fuel level sensor output signal circuit** 1) Disconnect fuel pump connector referring to “Fuel Tank Removal and Installation: in Section 1G”. 2) Check for proper connection to “YEL/RED” and “BLK/ORN” wire terminals of fuel pump connector. 3) Connect connectors to ECM. 4) Turn ON ignition switch, measure voltage between “YEL/RED” wire terminal of disconnected fuel pump connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 10.	Go to Step 9.
9	**Open circuit check for fuel level sensor output signal circuit** 1) Measure voltage between “E23-24” terminal of ECM connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 10.	“YEL/RED” wire is open circuit.
10	**Fuel level sensor ground circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between “BLK/ORN” wire terminal of fuel pump connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 11.	“BLK/ORN” wire is open or high resistance circuit.

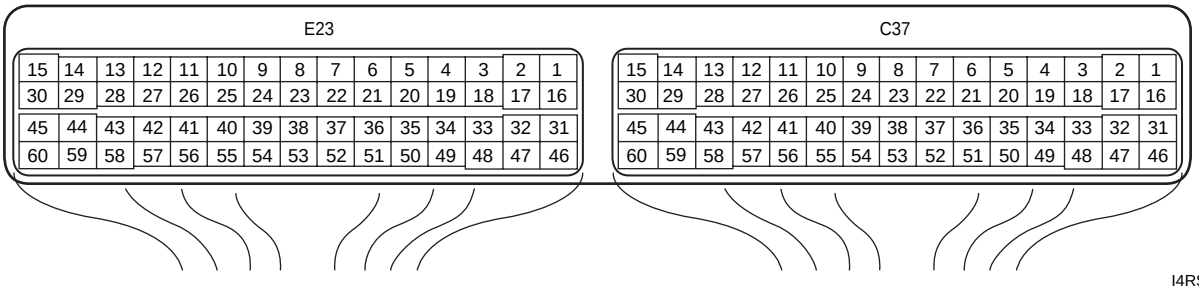
Step	Action	Yes	No
11	**High resistance circuit check for fuel level sensor circuit** 1) Disconnect connectors from ECM. 2) Measure resistance between “YEL/RED” wire terminal of fuel pump connector and “E23-24” wire terminal of ECM connector. *Is resistance below 5 Ω?*	Go to Step 12.	“YEL/RED” wire is high resistance circuit.
12	**Fuel level sensor check** 1) Check fuel level sensor referring to “Fuel Level Sensor Inspection: in Section 9C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty fuel level sensor.

DTC P0480: Fan 1 (Radiator Cooling Fan) Control Circuit

S4RS0A1104074

Wiring Diagram





I4RS0A110041-

1. Relay box	5. Radiator cooling fan relay No. 3	9. “FI” fuse
2. Main relay	6. Radiator cooling fan motor	10. “RDTR FAN” fuse
3. Radiator cooling fan relay No. 1	7. ECT sensor	
4. Radiator cooling fan relay No. 2	8. ECM	

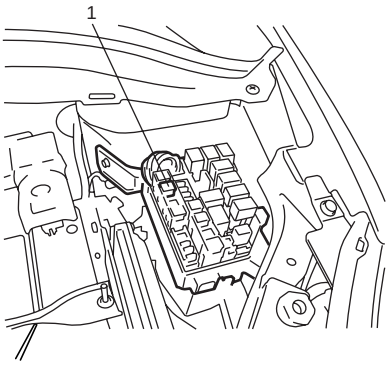
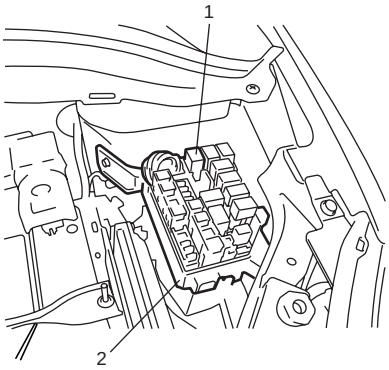
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of radiator cooling fan relay is different from command signal. (1 driving cycle detection logic)	• Radiator cooling fan relay circuit malfunction • Radiator cooling fan relay malfunction • ECM malfunction

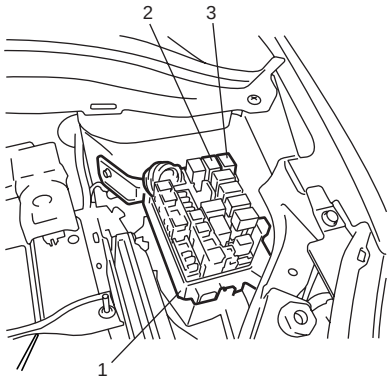
DTC Confirmation Procedure

1) Turn OFF ignition switch turned.
2) Clear DTC with ignition switch turned ON.
3) Run engine at idle speed.
4) Check pending DTC in “ON BOARD TEST” or “PENDING DTC” mode and DTC in “DTC” mode.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.
2	**Circuit fuse check** 1) Check “RDTR FAN” fuse (1) in relay box with ignition switch turned OFF.  I4RS0A110022- *Is “RDTR FAN” fuse in good condition?*	Go to Step 3.	Check for short in circuits connected to this fuse.
3	**Wire circuit check** 1) Disconnect radiator cooling fan relay No. 1 (1) from relay box (2) with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between each engine ground to “BLK/RED” and “GRY” wire terminal.  I4RS0A110042- *Is voltage 10 – 14 V?*	Go to Step 4.	“BLK/RED” and/or “GRY” wire are open circuit.

Step	Action	Yes	No
4	**Wire circuit check** 1) Connect radiator cooling fan relay No. 1 to relay box with ignition switch turned OFF. 2) Remove ECM from its bracket with ECM connectors connected. 3) Turn ON ignition switch, measure voltage between vehicle body ground and “E23-46” terminal of ECM connector when engine coolant temp. is below 97.5 °C, 207.5 °F. *Is voltage 10 – 14 V?*	Go to Step 8.	Go to Step 5.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Disconnect radiator cooling fan relay No. 1 from relay box. 3) Measure resistance between “E23-46” terminal of ECM connector and vehicle ground. *Is resistance infinity?*	Go to Step 6.	“LT GRN” wire is shorted to ground circuit.
6	**Wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “E23-46” terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 7.	“LT GRN” wire is shorted to other circuit.
7	**Radiator cooling fan relay No. 1 check** 1) Check radiator cooling fan relay No. 1 referring to “Radiator Cooling Fan Relay Inspection: in Section 1F”. *Is check result satisfactory?*	“LT GRN” wire is open circuit.	Replace relay.
8	**Radiator cooling fan control No. 1 check** 1) Run engine until ECT is over 97.5 °C, 207.5 °F. 2) Measure voltage between vehicle body ground and “E23-46” terminal of ECM connector. *Is voltage lower than 1.5 V?*	Go to Step 9.	Faulty ECM. Substitute a known-good ECM and recheck.

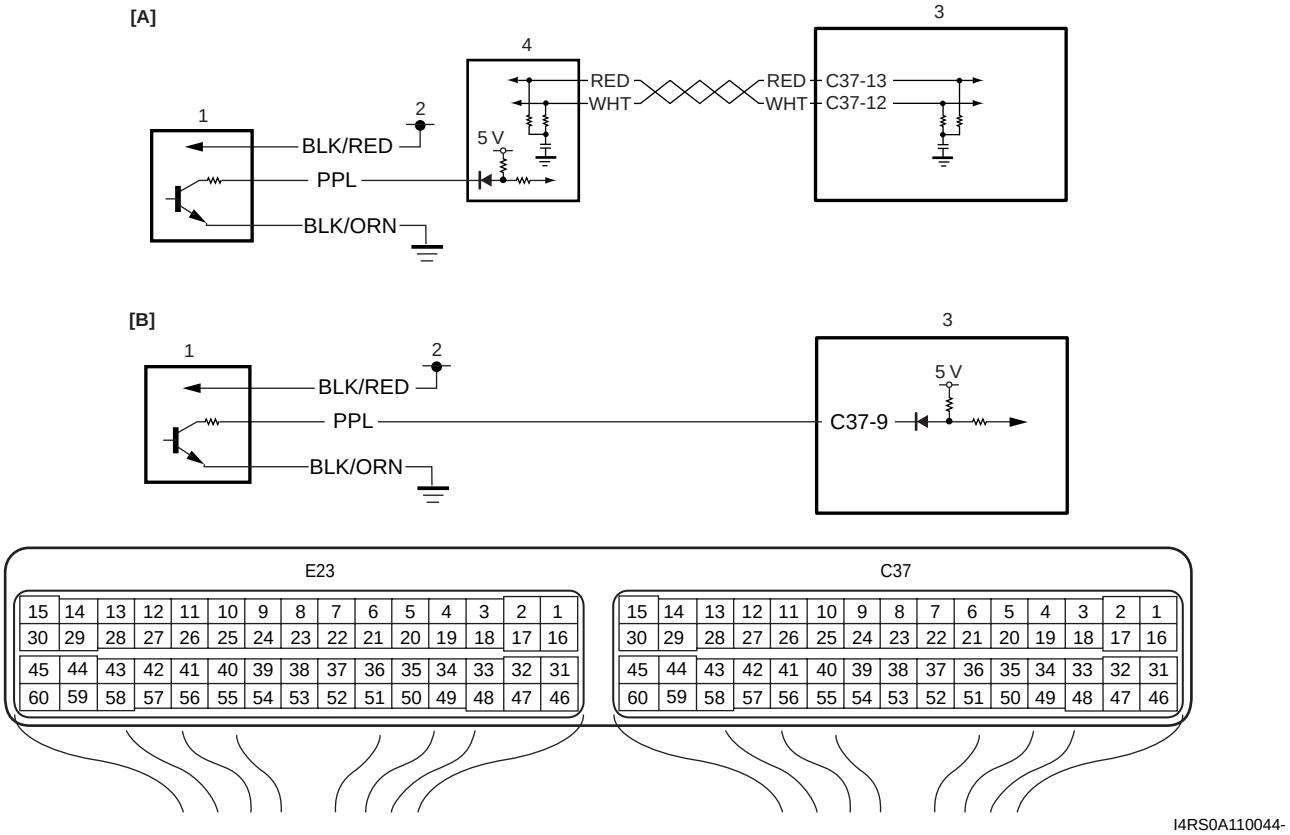
Step	Action	Yes	No
9	**Radiator cooling fan control check** 1) Disconnect radiator cooling fan relay No. 2 (2) and No. 3 (3) from relay box (1) with ignition switch turned OFF. 2) Run engine until ECT is over 97.5 °C, 207.5 °F. 3) Measure voltage between vehicle body ground and each “BLU/RED” wire terminal of radiator cooling fan control relay No. 2 and No. 3 connectors.  I4RS0A110043- *Is voltage 10 – 14 V?*	Go to Step 10.	“BLU/RED” wire is open circuit.
10	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Connect radiator cooling fan relay No. 2 to relay box. 3) Using service wire, ground “E23-46” and “E23-60” terminals of ECM connector. 4) Turn ON ignition switch, measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage 10 – 14 V?*	Go to Step 11.	Go to Step 12.
11	**Wire circuit check** 1) Disconnect radiator cooling fan relay No. 2 and then connect radiator cooling fan relay No. 3 to relay box with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage 10 – 14 V?*	Go to Step 15.	Go to Step 12.
12	**Wire circuit check** 1) Disconnect radiator cooling fan control relay No. 2 and No. 3 from relay box with ignition switch turned OFF. 2) Measure resistance between “E23-48” terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 13.	“GRN” wire is shorted to ground circuit.
13	**Wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “E23-48” terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 14.	“GRN” wire is shorted to power supply circuit.

Step	Action	Yes	No
14	**Radiator cooling fan relay No. 2 and No. 3 check** 1) Check radiator cooling fan relay No. 2 and No. 3 referring to “Radiator Cooling Fan Relay Inspection: in Section 1F”. *Are relays in good condition?*	“GRN” wire is open circuit.	Replace relay.
15	**Radiator cooling fan control No. 2 and No. 3 check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Connect radiator cooling fan relay No. 2 to relay box. 3) Run engine until ECT is over 102.5 °C, 216.5 °F. 4) Measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage lower than 1.5 V?*	Intermittent trouble. Check for intermittent refer to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good ECM and recheck.	Faulty ECM.

DTC P0500: Vehicle Speed Sensor (VSS) Malfunction

S4RS0A1104045

Wiring Diagram



I4RS0A110044-

[A]: A/T vehicle	1. VSS	3. ECM
[B]: M/T vehicle	2. To main relay	4. TCM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• Vehicle speed signal is not input while fuel is cut at deceleration for 4 seconds continuously at 3600 rpm or less. • Vehicle speed signal is not input even if engine is running with more than 3000 rpm at D-Range for 4 sec (for A/T model). (2 driving cycle detection logic)	• "BLK/ORN" circuit open • "PPL" or "BLK/RED" circuit open or short • VSS malfunction • TCM malfunction • ECM malfunction

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester.**

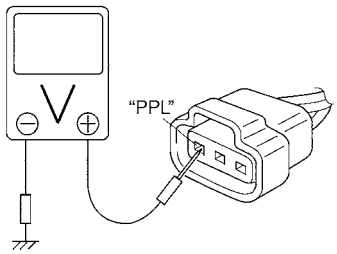
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Warm up engine to normal operating temperature.
4) Drive vehicle at 4000 rpm (engine speed) with 3rd gear (for M/T vehicle) or "3" range (for A/T vehicle) or more.
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 6 sec. or more (fuel cut condition for 5 sec. or more) and stop vehicle.
6) For A/T vehicle, drive vehicle at more than 3600 rpm for 10 sec.
7) Check pending DTC and DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Vehicle speed signal check** *Is vehicle speed displayed on scan tool in Step 4) and 5) of "DTC Confirmation Procedure"?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 3.
3	**Vehicle spec check** *Is vehicle equipped with A/T?*	Go to Step 4.	Go to Step 5.
4	**DTC check in TCM** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check TCM for DTC. *Is there DTC P0722 in TCM?*	Go to applicable DTC diag. flow.	Substitute a known-good ECM and recheck.

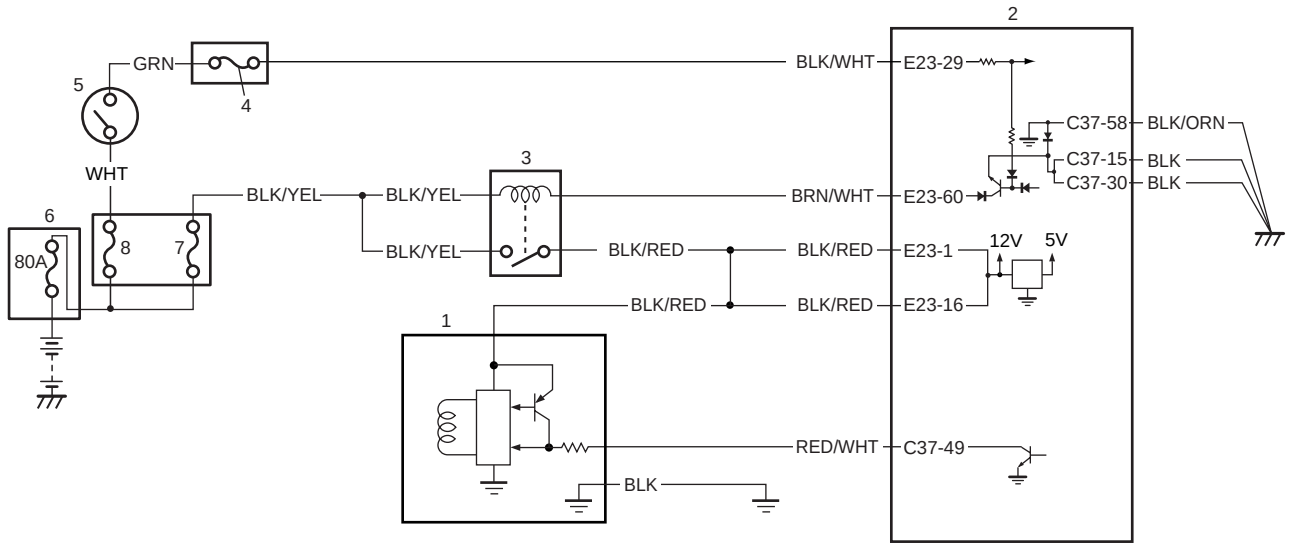
Step	Action	Yes	No
5	**Power supply circuit check** 1) With ignition switch turned OFF, disconnect connector from VSS. 2) Check for proper connection to “BLK/RED”, “PPL” and “BLK/ORN” wire terminals of VSS connector. 3) If wires are OK, turn ON ignition switch, measure voltage between engine ground and “BLK/RED” wire terminal of VSS connector. *Is voltage 10 – 14 V?*	Go to Step 6.	“BLK/RED” wire is open circuit.
6	**Ground circuit check** 1) Measure resistance between engine ground and “BLK/ORN” wire terminal of VSS connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 7.	“BLK/ORN” wire is open or high resistance circuit.
7	**Wire circuit check** 1) Turn ON ignition switch, measure voltage between engine ground and “PPL” wire terminal of VSS connector.  I4RS0A110087- *Is measured voltage 4 – 5 V?*	Go to Step 11.	Go to Step 8.
8	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM form its bracket with ECM connectors connected. 3) Turn ON ignition switch, measure voltage between vehicle body ground and “C37-9” terminal of ECM connector. *Is measured voltage 4 – 5 V?*	“PPL” wire is open circuit.	Go to Step 9.
9	**Short circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and “C37-9” terminal of ECM connector. *Is it voltage 0 V?*	Go to Step 10.	“PPL” wire is shorted to power supply circuit.
10	**Short circuit check** 1) Measure resistance between engine ground and “C37-9” terminal of ECM connector with ignition switch turned OFF. *Is resistance infinity?*	Go to Step 11.	“PPL” wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.

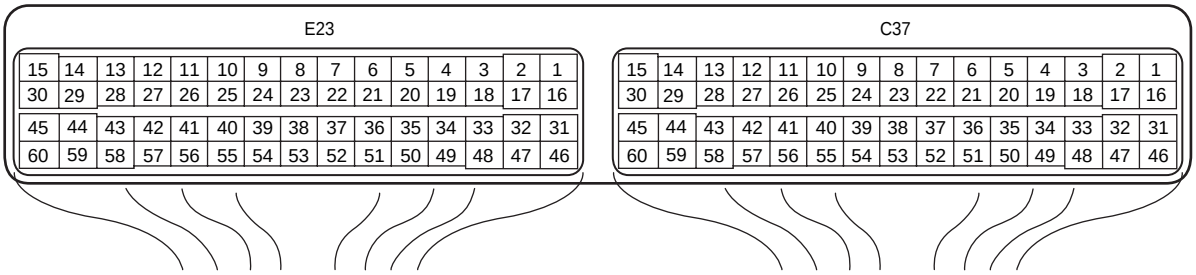
Step	Action	Yes	No
11	**VSS check** 1) Check VSS and signal rotor tooth referring to “Vehicle Speed Sensor (VSS) Inspection (M/T model): in Section 1C”. *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace VSS or signal rotor.

DTC P0505: Idle Air Control System

S4RS0A1104046

Wiring Diagram





I4RS0A110045-

1. IAC valve	4. “IG COIL” fuse	7. “FI” fuse
2. ECM	5. Ignition switch	8. “IG ACC” fuse
3. Main relay	6. Battery fuse box	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
IAC control duty pulse is not detected in its monitor signal. (2 driving cycle detection logic)	• Idle air control valve and / or its circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Run engine at idle speed (more than 600 rpm) for 1 min. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

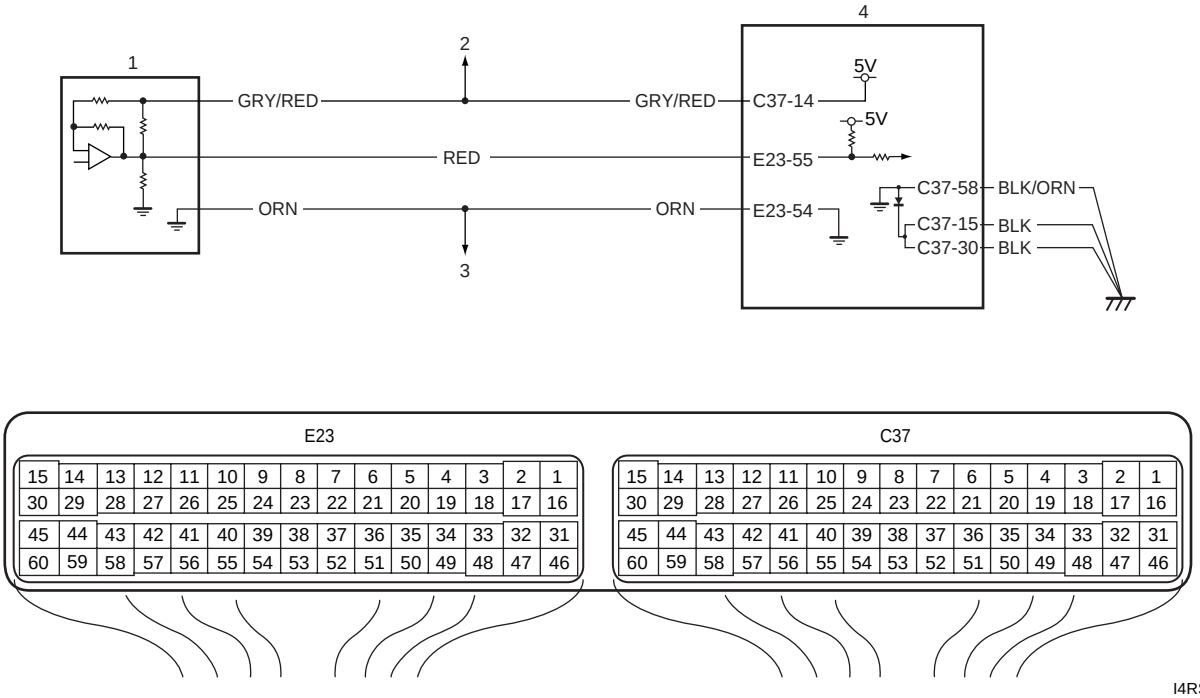
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Idle speed check** 1) Check idle speed / idle air control duty referring to "Idle Speed / Idle Air Control (IAC) Duty Inspection: ". *Is check result as specified?*	Go to Step 3.	Go to Step 4.
3	**Idle air control valve operation check** 1) Check idle air control valve for operation referring to "Idle Air Control (IAC) Valve Operation Inspection: in Section 1C". *Is check result as specified?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good ECM and recheck.	Go to Step 4.
4	**Idle air control valve circuit check** 1) Disconnect connector from idle air control valve with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "BLK/RED" wire terminal of idle air control valve connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 5.	"BLK/RED" wire is open or high resistance circuit.
5	**Idle air control valve circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "RED/WHT" wire terminal of idle air control valve connector and "C37-49" terminal of ECM connector. *Is resistance 2 Ω or less?*	Go to Step 6.	"RED/WHT" wire is open or high resistance circuit.
6	**Idle air control valve circuit check** 1) Measure resistance between each "C37-49" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	"RED/WHT" wire is shorted to ground circuit.
7	**Idle air control valve circuit check** 1) Connect connectors to ECM. 2) Turn ON ignition switch, measure voltage between "C37-49" terminal of ECM connector and vehicle body ground. *Is each voltage 0 V?*	Go to Step 8.	"RED/WHT" wire is shorted to power circuit.

Step	Action	Yes	No
8	**Idle air control valve circuit check** 1) Measure resistance between “BLK” wire terminal of idle air control valve connector and vehicle body ground with ignition switch turned OFF. *Is resistance continuity?*	Go to Step 9.	“BLK” wire is open circuit.
9	**Idle air control valve signal check** 1) Connect connector to idle air control valve. 2) Using oscilloscope, check that idle air control valve duty pulse is outputted referring to “Reference waveform No.19” and “Reference waveform No.20” of “Inspection of ECM and Its Circuits: ”. *Is duty pulse outputted at “C37-49” terminal of ECM connector?*	Replace idle air control valve.	Go to Step 10.
10	**Idle air control valve circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Using service wire, ground “E23-60” terminal of ECM connector because of main relay turned ON. 3) Measure voltage between “C37-49” terminal of ECM connector and vehicle body ground with ignition switch turned ON. *Is voltage 10 – 14 V?*	Substitute a known-good ECM and recheck.	Replace idle air control valve.

DTC P0532: A/C Refrigerant Pressure Sensor Circuit Low

S4RS0A1104075

Wiring Diagram



I4RS0A110046-

1. A/C refrigerant pressure sensor	3. To other sensors
2. To TP sensor and MAP sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is less than 0.15 V for 0.5 sec. continuously. (1 driving detection logic but MIL does not light up)	• A/C refrigerant pressure sensor circuit • A/C refrigerant pressure sensor • TP sensor • MAP sensor • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

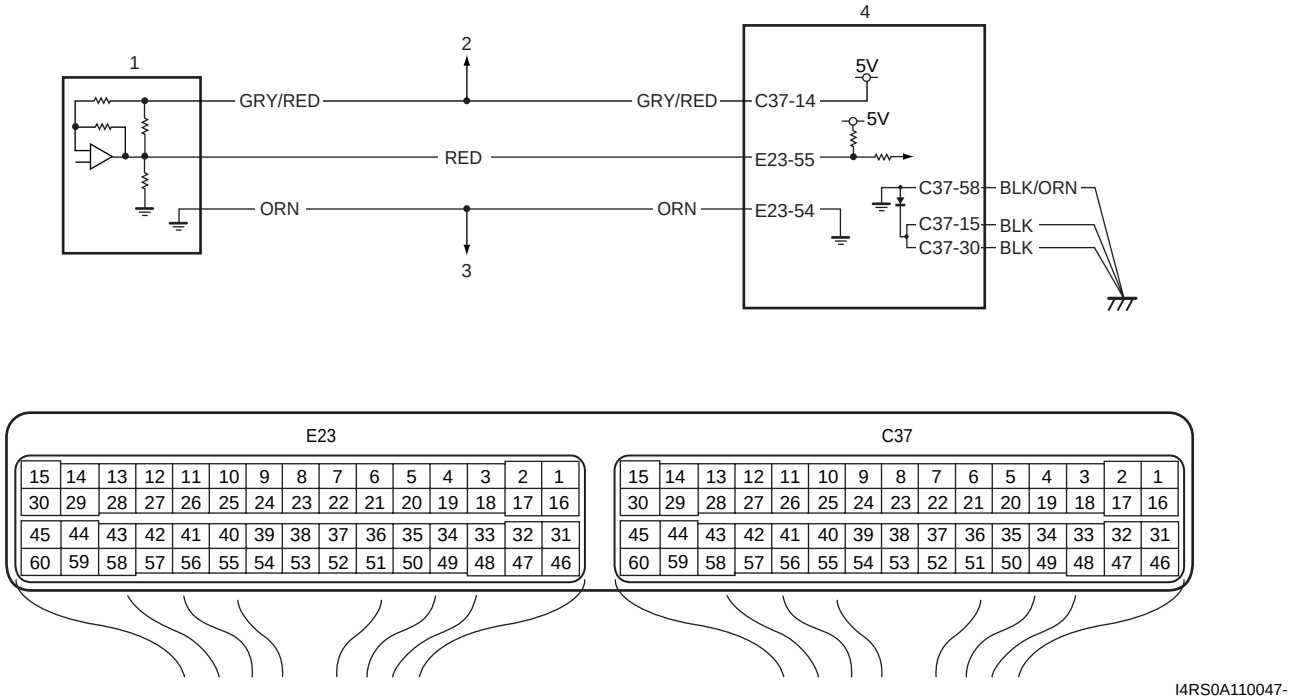
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connector from A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Check for proper connection of A/C refrigerant pressure sensor at "GRY/RED", "RED" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 3.
3	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connectors from TP sensor and MAP sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or MAP sensor.	Go to Step 4.
4	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and "C37-14" terminal of ECM connector. *Is resistance infinity?*	Go to Step 6.	"GRY/RED" wire is shorted to ground circuit.

Step	Action	Yes	No
5	**A/C refrigerant pressure sensor signal circuit check** 1) Connect connectors to ECM. 2) Turn ON ignition switch, measure voltage between engine ground and “RED” wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 7.	Go to Step 6.
6	**A/C refrigerant pressure sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and “E23-55” terminal of ECM connector. *Is resistance infinity?*	Go to Step 7.	“RED” wire is shorted to ground circuit.
7	**A/C refrigerant pressure sensor check** 1) Check A/C refrigerant pressure sensor referring to “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: in Section 7B” *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty A/C refrigerant pressure sensor.

DTC P0533: A/C Refrigerant Pressure Sensor Circuit High

S4RS0A1104076

Wiring Diagram



I4RS0A110047-

1. A/C refrigerant pressure sensor	3. To other sensors
2. To TP sensor and MAP sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is higher than 4.93 V for 0.5 sec. continuously. (1 driving detection logic but MIL does not light up)	• A/C refrigerant pressure sensor circuit • A/C refrigerant pressure sensor • TP sensor • MAP sensor • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: "
2	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connector from A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Check for proper connection of A/C refrigerant pressure sensor at "GRY/RED", "RED" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 4.	Go to Step 3.
3	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connectors from TP sensor and MAP sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or MAP sensor.	"GRY/RED" wire is open or shorted to power circuit.
4	**A/C refrigerant pressure sensor signal circuit check** 1) Turn ON ignition switch, measure voltage between engine ground and "RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 5.
5	**A/C refrigerant pressure sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "RED" wire terminal of A/C refrigerant pressure sensor connector and "E23-55" terminal of ECM connector. *Is resistance below 2 Ω?*	"RED" wire is shorted to power supply circuit.	"RED" wire is open or high resistance circuit.
6	**A/C refrigerant pressure sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between engine ground and "ORN" wire terminal of A/C refrigerant pressure sensor connector. *Is resistance below 5 Ω?*	Go to Step 8.	Go to Step 7.

Step	Action	Yes	No
7	**ECM ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between engine ground and "E23-54" terminal of ECM connector. *Is resistance below 5 Ω?*	"ORN" wire is open or high resistance circuit.	ECM grounds "C37-58", "C37-15" and/or "C37-30" is open or high resistance circuit.
8	**A/C refrigerant pressure sensor check** 1) Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection: in Section 7B" *Is it good condition?*	Substitute a known-good ECM and recheck.	Faulty A/C refrigerant pressure sensor.

DTC P0601 / P0602: Internal Control Module Memory Check Sum Error / Control Module Programming Error

S4RS0A1104052

System Description

Internal control module is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0601: Data write error or check sum error (1 driving cycle detection logic) **DTC P0602:** Data programming error (1 driving cycle detection logic)	ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it at idle if possible.
4) Check DTC and pending DTC by using scan tool.

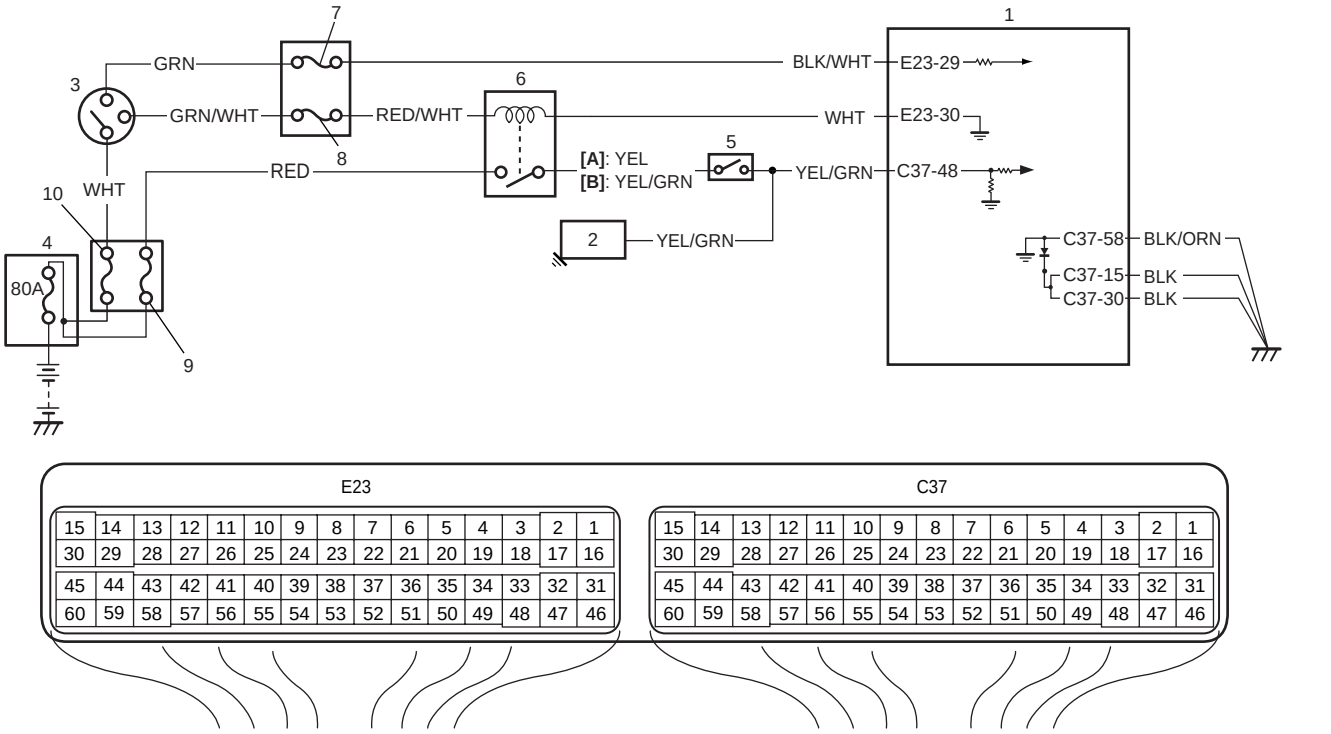
DTC Troubleshooting

Step	Action	Yes	No
1	**DTC recheck** 1) Clear DTC referring to "DTC Clearance: ". 2) Turn OFF ignition switch. 3) Turn ON ignition switch and check DTC. *Is DTC P0601 or P0602 still indicated?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00"
2	**ECM power and ground circuit check** 1) Check that ECM power supply and ground circuit is in good condition referring to "ECM Power and Ground Circuit Check: ". 2) Check that ECM ground is in good condition. *Are check results OK?*	Substitute a known-good ECM and recheck.	Repair ECM power or ground circuit.

DTC P0616: Starter Relay Circuit Low

S4RS0A1104077

Wiring Diagram



I4RS0A110048-

[A]: A/T vehicle	3. Ignition switch	7. "IG COIL" fuse
[B]: M/T vehicle	4. Battery fuse box	8. "ST SIG" fuse
1. ECM	5. Transmission range switch (A/T vehicle)	9. "ST MOT" fuse
2. Starter motor	6. Starting motor control relay	10. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Engine starts even though vehicle is at stop and engine starter signal is low voltage. (2 driving cycle detection logic)	• Engine starter signal circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

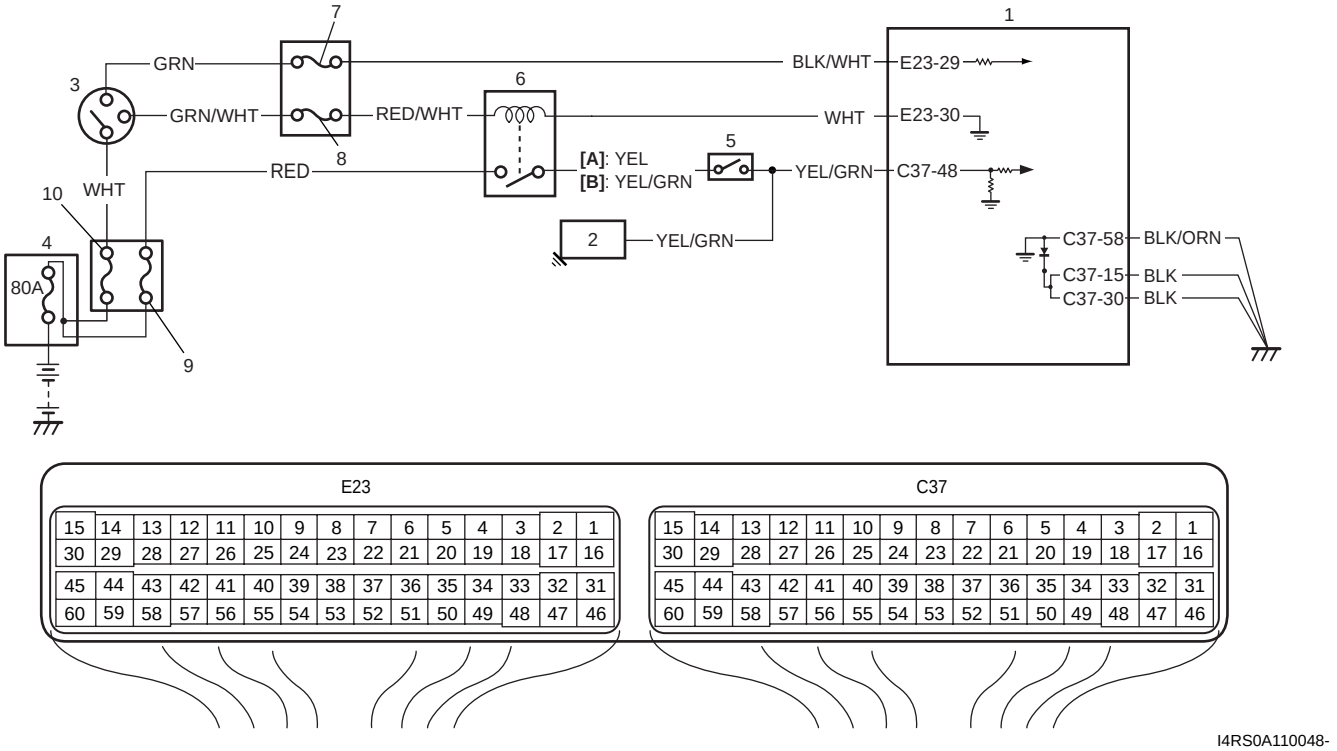
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".

Step	Action	Yes	No
2	**Signal circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure voltage at terminal "C37-48" of ECM connector, under following condition. **Voltage at terminal "C37-48" of ECM connector** **While engine cranking: 6 – 14 V** **After starting engine: 0 – 1 V** *Is each voltage within specified range?*	Poor "C37-48" connection or intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If wire and connections are OK, substitute a known-good ECM and recheck.	"YEL/GRN" wire is open or high resistance circuit.

DTC P0617: Starter Relay Circuit High

S4RS0A1104078

Wiring Diagram



I4RS0A110048-

[A]: A/T vehicle	3. Ignition switch	7. "IG COIL" fuse
[B]: M/T vehicle	4. Battery fuse box	8. "ST SIG" fuse
1. ECM	5. Transmission range switch (A/T vehicle)	9. "ST MOT" fuse
2. Starter motor	6. Starting motor control relay	10. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Engine starter signal is high voltage for 180 seconds continuously while engine is running. (2 driving cycle detection logic)	• Engine starter signal circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it at idle for 3 min. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

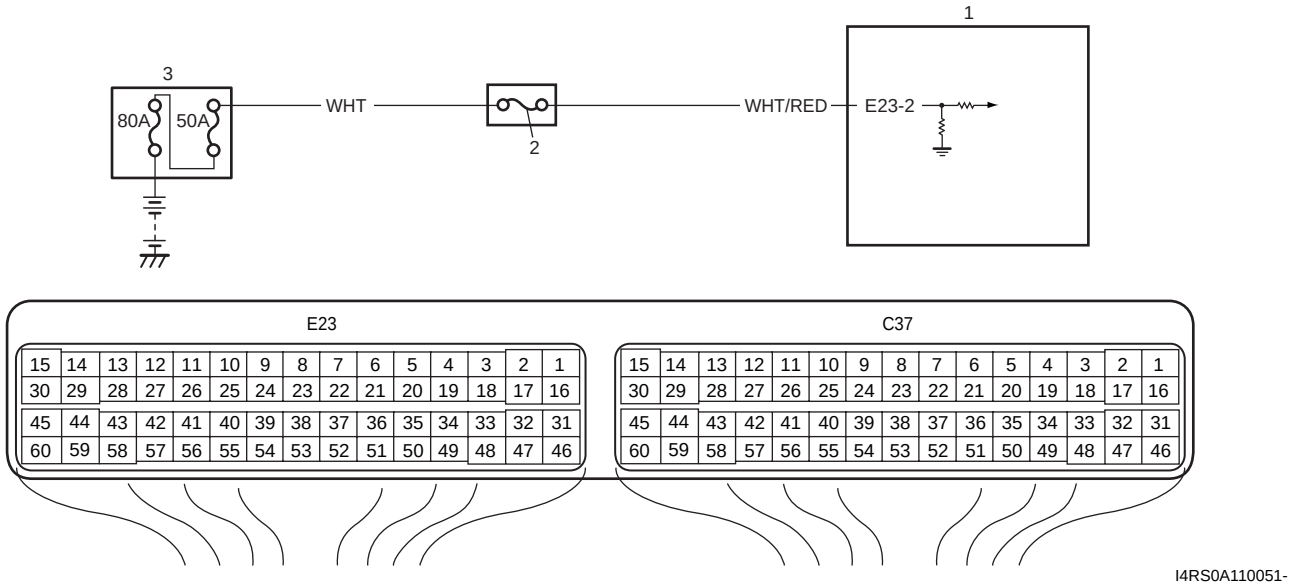
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Starter signal check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Start engine, measure voltage between "C37-48" terminal of ECM connector and vehicle body ground. *Is voltage 0 – 1 V?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good ECM and recheck.	Go to Step 3.
3	**Wire circuit check** 1) Disconnect starting motor control relay in relay box with ignition switch turned OFF. 2) Check for proper connection to starting motor control relay at "RED/WHT", "RED", "WHT", "YEL" (A/T vehicle) and "YEL/GRN" (M/T vehicle) wire terminals. 3) Disconnect connectors from starting motor. 4) Check for proper connection to ECM at "C37-48" terminal. 5) Measure voltage between "C37-48" terminal of ECM connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 – 1 V?*	Go to Step 4.	For A/T vehicle, "YEL" or "YEL/GRN" wire is shorted to power circuit. For M/T vehicle, "YEL/GRN" wire is shorted to power circuit. If wires are OK, substitute a known-good ECM and recheck.
4	**Wire circuit check** 1) Measure voltage between "RED/WHT" wire terminal of starting motor control relay connector and vehicle body ground wire ignition switch turned ON. *Is voltage 0 – 1 V?*	Go to Step 5.	Faulty ignition switch, check ignition switch referring to "Ignition Switch Inspection: in Section 9C". If ignition switch is OK, check for short circuit between ignition switch and starting motor control relay to power circuit.
5	**Starting motor control relay check** 1) Check starting motor control relay referring to "Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace starting motor control relay.

DTC P1510: ECM Back-Up Power Supply Malfunction

S4RS0A1104053

Wiring Diagram



I4RS0A110051-

1.	ECM
2.	“RADIO” fuse
3.	Battery fuse box

Circuit Description

Battery voltage is supplied so that DTC memory, values for engine control learned by ECM, etc. are kept in ECM even when the ignition switch is turned OFF.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Back-up power circuit voltage is less than 70% battery voltage for 5 seconds continuously while engine is running. (1 driving cycle detection logic)	Battery voltage supply circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool and run engine at idle speed for 1 min.
3) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

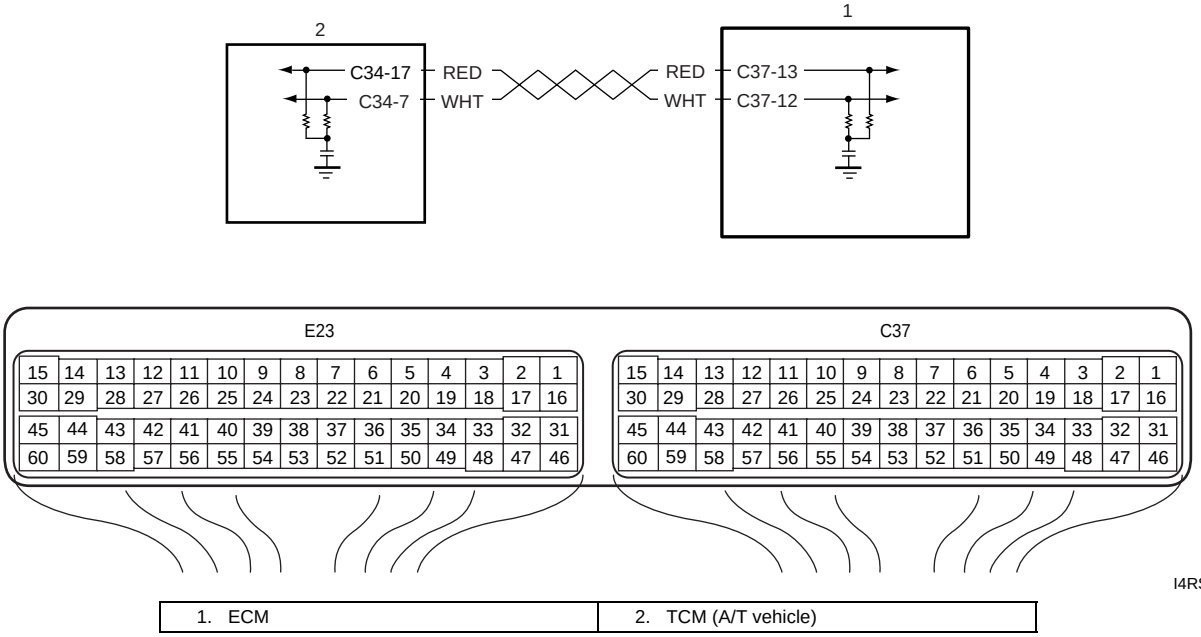
Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.

Step	Action	Yes	No
2	**Battery voltage supply circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) With engine running, measure voltage between “E23-2” terminal of ECM connector and engine ground. *Is voltage 10 – 14 V?*	Poor “E23-2” connection or intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If wire and connections are OK, substitute a known-good ECM and recheck.	“RADIO” fuse blown, “WHT” or “WHT/RED” wire is open or short circuit.

DTC P1603: TCM Trouble Code Detected

S4RS0A1104065

Wiring Diagram



I4RS0A110053-

1. ECM	2. TCM (A/T vehicle)

DTC Detecting Condition

When ECM receives a trouble code from TCM, which indicates that some problem occurred in sensor circuits and its calculated values used for operations such as idle speed control, engine power control, and so on by TCM, ECM sets DTC P1603. (TCM outputs the trouble code to ECM when TCM can not compute the engine control signal due to malfunctions of sensor circuits used for gear shift control.)

DTC Troubleshooting

NOTE:

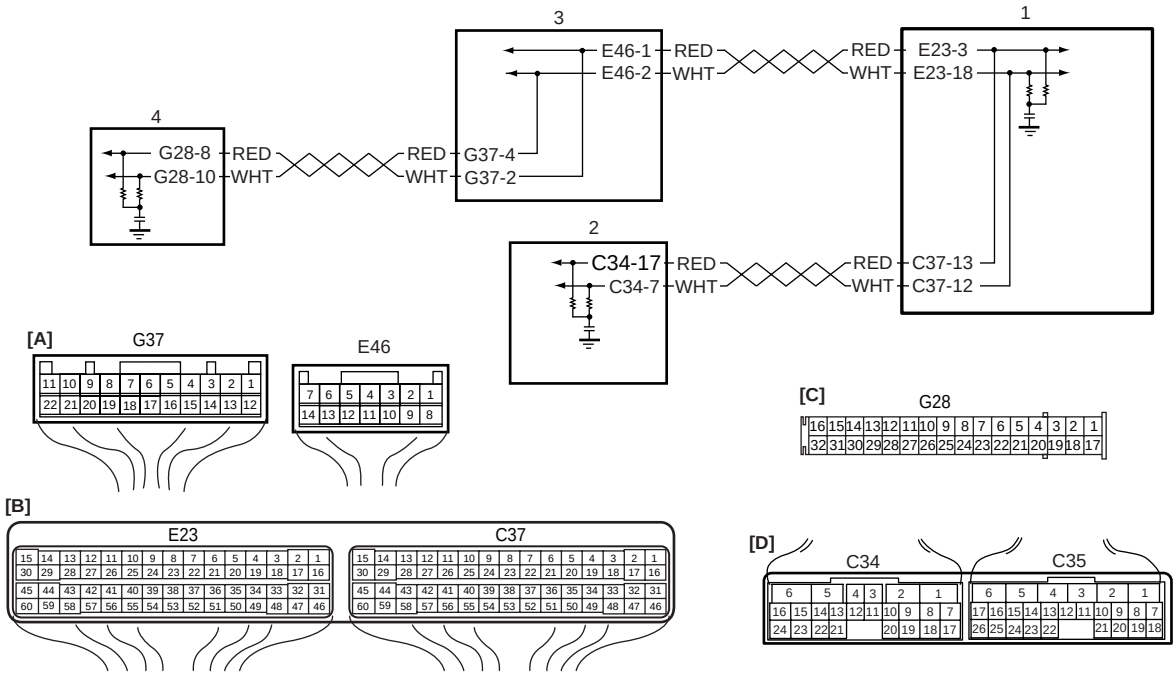
- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**DTC check** 1) Check DTC of TCM referring to "DTC Check: in Section 5A". *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good ECM and recheck.

DTC P1674: CAN Communication (Bus Off Error)

S4RS0A1104080

Wiring Diagram



I4RS0A110052-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. BCM
[B]: ECM connector (viewed from harness side)	1. ECM	4. Combination meter
[C]: Combination meter connector (viewed from harness side)	2. TCM (equipped with A/T)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously. (1 driving detection logic)	• ECM • BCM • TCM (equipped with A/T) • Combination meter • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (equipped with A/T) and BCM for DTC. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (equipped with A/T) and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**ECM, TCM (equipped with A/T), BCM and combination meter connectors check** 1) Check for proper connection at each ECM, TCM (equipped with A/T), BCM and combination meter connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1674?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00"
4	**ECM power and ground circuit check** 1) Check ECM power and ground circuit referring to "ECM Power and Ground Circuit Check: ". *Are they in good condition?*	Go to Step 5.	Repair ECM power and/or ground circuits.
5	**DTC check in BCM and TCM (equipped with A/T) (bus off)** 1) Check DTC(s) in TCM (equipped with A/T) and BCM. *Is there DTC(s) P1774 in TCM (equipped with A/T) and/or U1073 in BCM?*	Go to Step 6.	Go to Step 7.
6	**DTC check in ECM (bus off)** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check TCM (equipped with A/T) and BCM for DTC(s). *Is there DTC(s) P1774 in TCM (equipped with A/T) and/or U1073 in BCM?*	Go to Step 7.	Substitute a known-good ECM and recheck.
7	**DTC check in ECM** 1) Connect connectors to ECM and disconnect connectors from TCM (equipped with A/T) with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 8.	Substitute a known-good TCM (equipped with A/T) and recheck.

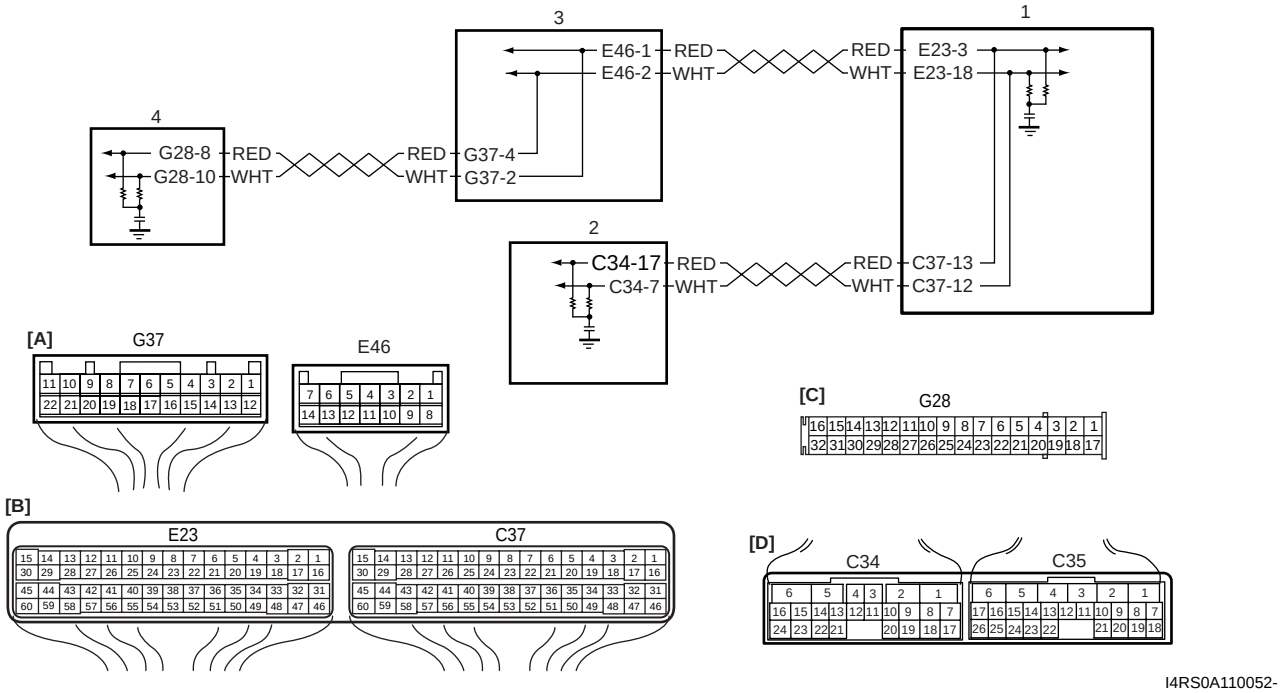
Step	Action	Yes	No
8	**DTC check in ECM** 1) Disconnect connector from combination meter with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 9.	Substitute a known-good combination meter and recheck.
9	**CAN communication line circuit insulation check** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance between “G37-2” and “G37-4” terminals of BCM connector. *Is resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”
10	**CAN communication line circuit insulation check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “E23-3” and “E23-18” terminals of ECM connector. *Is resistance infinity?*	Go to Step 11.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**CAN communication line circuit insulation check (equipped with A/T)** 1) Measure resistance between “C37-13” and “C37-12” terminals of ECM connector. *Is resistance infinity?*	Go to Step 12.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
12	**CAN communication line circuit continuity check** 1) Measure resistance at following connector terminals. • Between “E23-3” terminal of ECM connector and “E46-1” terminal of BCM connector • Between “E23-18” terminal of ECM connector and “E46-2” terminal of BCM connector • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector (equipped with A/T) • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector (equipped with A/T) • Between “G37-4” terminal of BCM connector and “G28-8” terminal of combination meter connector • Between “G37-2” terminal of BCM connector and “G28-10” terminal of combination meter connector *Is each resistance below 1 Ω?*	Go to Step 13.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”

Step	Action	Yes	No
13	**CAN communication line circuit ground short check** 1) Measure resistance at following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 14.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”
14	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Substitute a known-good BCM (included in junction block assembly) and recheck. If DTC is still detected, substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”

DTC P1675: CAN Communication (Transmission Error)

S4RS0A1104081

Wiring Diagram



I4RS0A110052-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. BCM
[B]: ECM connector (viewed from harness side)	1. ECM	4. Combination meter
[C]: Combination meter connector (viewed from harness side)	2. TCM (equipped with A/T)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for ECM is detected for longer than specified time continuously. (1 driving detection logic)	• ECM • BCM • TCM (equipped with A/T) • Combination meter • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: "
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (equipped with A/T) and BCM for DTC. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (equipped with A/T) and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**CAN communication error check for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): "	Go to Step 4.
4	**CAN communication error check for BCM and TCM (equipped with A/T)** 1) Check BCM and TCM (equipped with A/T) for DTC(s). *Are there DTC U1073 in BCM and DTC P1774 in TCM (equipped with A/T)?*	Go to applicable DTC diag. flow.	Go to Step 5.
5	**ECM, TCM (equipped with A/T), BCM and combination meter connectors check** 1) Check for proper connection at each ECM, TCM (equipped with A/T), BCM and combination meter connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1675?*	Go to Step 6.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00"
6	**ECM power and ground circuit check** 1) Check ECM power and ground circuits referring to "ECM Power and Ground Circuit Check: ". *Are they in good condition?*	Go to Step 7.	Repair ECM power and/or ground circuits.
7	**DTC check in ECM** 1) Check ECM for DTC(s). *Are there DTCs P1676 and P1678?*	Go to Step 8.	Go to Step 10.
8	**DTC check in TCM (equipped with A/T) and BCM** 1) Check TCM (equipped with A/T) and BCM for DTC(s). *Are there DTCs P1777, P1778 in TCM (equipped with A/T) and DTCs U1100, U1101 in BCM?*	Go to Step 10.	Go to Step 9.

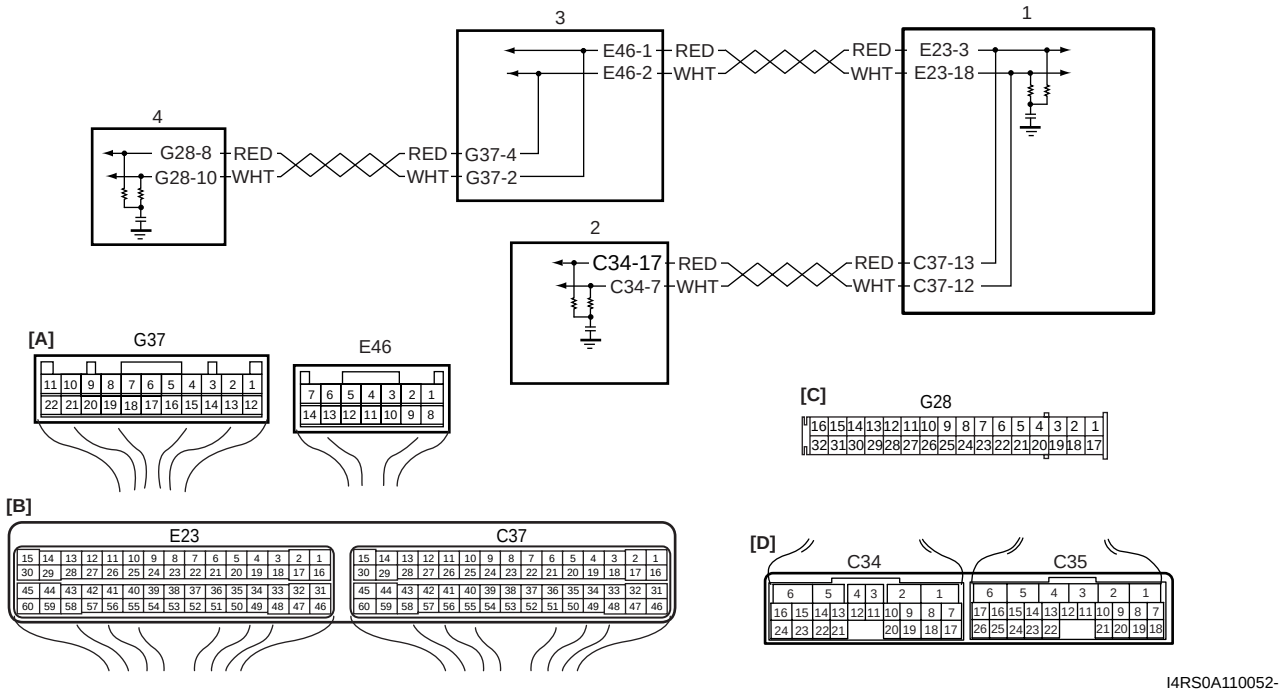
Step	Action	Yes	No
9	**Combination meter operation check** 1) Check combination meter operation for seat belt warning lamp (fastening and unfastening driver side seat belt) and shift position indicator lamp (equipped with A/T) with ignition switch turned ON. *Are they OK?*	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly), TCM (equipped with A/T) and recheck.
10	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM, BCM, TCM (equipped with A/T) and combination meter with ignition switch turned OFF. 2) Measure resistance at following connector terminals. • Between “E23-3” terminal of ECM connector and “E46-1” terminal of BCM connector • Between “E23-18” terminal of ECM connector and “E46-2” terminal of BCM connector • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector (equipped with A/T) • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector (equipped with A/T) • Between “G37-4” terminal of BCM connector and “G28-8” terminal of combination meter connector • Between “G37-2” terminal of BCM connector and “G28-10” terminal of combination meter connector *Is each resistance below 1 Ω?*	Go to Step 11.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”
11	**CAN communication line circuit insulation check** 1) Measure resistance at following connector terminals. • Between “E23-3” and “E23-18” terminals of ECM connector • Between “C37-13” and “C37-12” terminals of ECM connector (equipped with A/T) • Between “G37-4” and “G37-2” terminals of BCM connector *Is each resistance infinity?*	Go to Step 12.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”
12	**CAN communication line circuit ground short check** 1) Measure resistance at following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 13.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”

Step	Action	Yes	No
13	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”

DTC P1676: CAN Communication (Reception Error for TCM)

S4RS0A1104082

Wiring Diagram



I4RS0A110052-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (viewed from harness side)	3. BCM
[B]: ECM connector (viewed from harness side)	1. ECM	4. Combination meter
[C]: Combination meter connector (viewed from harness side)	2. TCM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for TCM is detected for longer than specified time continuously (1 driving detection logic)	• ECM • TCM • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

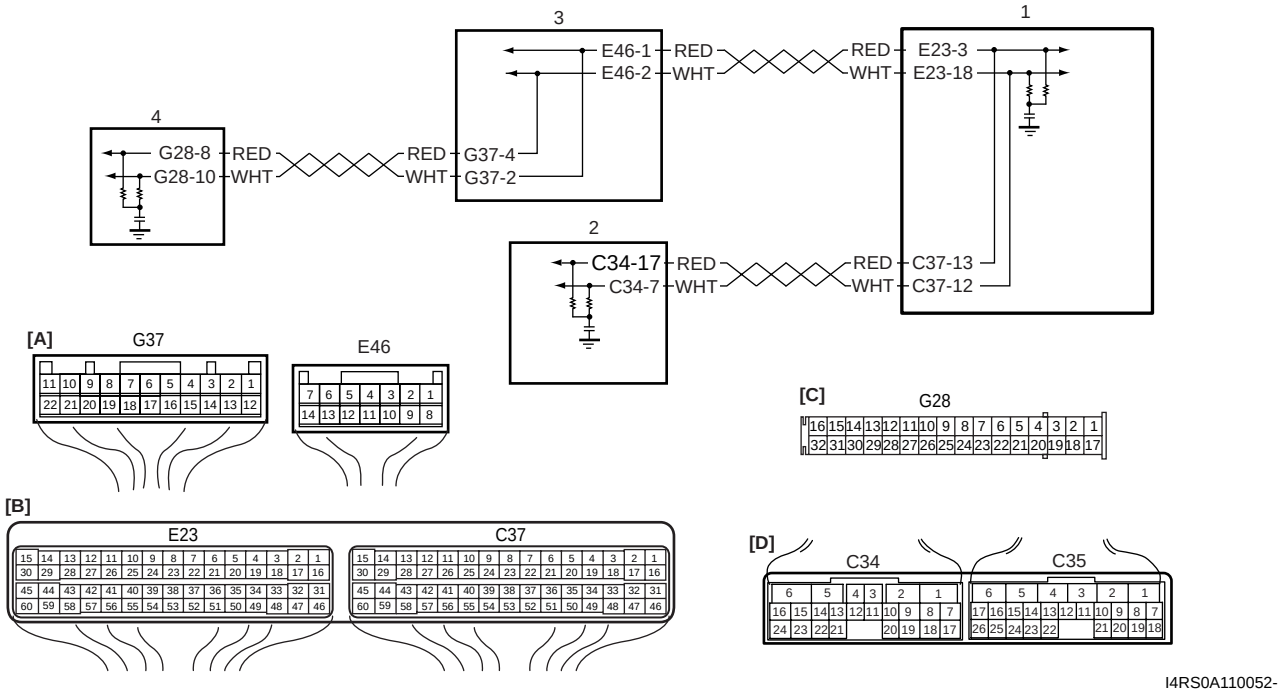
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM and BCM for DTC. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check CAN communication error for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): ".	Go to Step 4.
4	**ECM and TCM connector check** 1) Check for proper connection at each ECM and TCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1676?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**ECM power and ground circuit check** 1) Check ECM power and ground circuits referring to "ECM Power and Ground Circuit Check: ". *Are they in good condition?*	Go to Step 6.	Repair ECM power and/or ground circuits.
6	**DTC check in TCM** 1) Check DTC P1774 in TCM. *Is it indicated?*	Go to"DTC P1774: Control Module Communication Bus Off: in Section 5A"	Go to Step 7.
7	**DTC check in BCM** 1) Check DTC U1101 in BCM. *Is it indicated?*	Go to "DTC U1101 (No.1101): Lost communication with TCM: in Section 10B".	Go to Step 8

Step	Action	Yes	No
8	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM and TCM with ignition switch turned OFF. 2) Measure resistance at following connector terminals. • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector *Is each resistance below 1 Ω?*	Go to Step 9.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
9	**CAN communication line circuit insulation check** 1) Measure resistance between “C37-13” and “C37-12” terminals of ECM connector. *Is resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
10	**CAN communication line circuit ground short check** 1) Measure resistance at following connector terminals. • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 11.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at following connector terminals with ignition switch turned ON. • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 12.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
12	**ECM circuit check** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Connect connectors to ECM. 3) Measure resistance at following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connectors • Between “E23-18” and “C37-12” terminals of ECM connectors *Is resistance below 1 Ω?*	Substitute a known-good TCM and recheck.	Substitute a known-good ECM and recheck.

DTC P1678: CAN Communication (Reception Error for BCM)

S4RS0A1104083

Wiring Diagram



I4RS0A110052-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. BCM
[B]: ECM connector (viewed from harness side)	1. ECM	4. Combination meter
[C]: Combination meter connector (viewed from harness side)	2. TCM (equipped with A/T)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for BCM is detected for longer than specified time continuously (1 driving detection logic but MIL does not light up)	• ECM • BCM • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.

Step	Action	Yes	No
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (equipped with A/T) and BCM for DTC. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (equipped with A/T) and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**CAN communication error check for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): ".	Go to Step 4.
4	**ECM, TCM (equipped with A/T) and BCM connector check** 1) Check for proper connection at each ECM, TCM (equipped with A/T) and BCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1678?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**ECM power and ground circuit check** 1) Check ECM power and ground circuits referring to "ECM Power and Ground Circuit Check: ". *Are they in good condition?*	Go to Step 6.	Repair ECM power and/or ground circuits.
6	**DTC check in BCM** 1) Check DTC U1073 in BCM. *Is it indicated?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: in Section 10B".	Go to Step 7.
7	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM and BCM with ignition switch turned OFF. 2) Measure resistance at following connector terminals. • Between "E23-3" terminal of ECM connector and "E46-1" terminal of BCM connector • Between "E23-18" terminal of ECM connector and "E46-2" terminal of BCM connector *Is each resistance below 1 Ω?*	Go to Step 8.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".
8	**CAN communication line circuit insulation check** 1) Measure resistance between "E23-3" and "E23-18" terminals of ECM connector. *Is resistance infinity?*	Go to Step 9.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".
9	**CAN communication line circuit ground short check** 1) Measure resistance at following connector terminals. • Between "E23-3" terminal of ECM connector and vehicle body ground • Between "E23-18" terminal of ECM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 10.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".

Step	Action	Yes	No
10	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 11.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Vehicle spec check** *Is vehicle equipped with A/T?*	Go to Step 12.	Go to Step 14.
12	**DTC check in TCM (equipped with A/T)** 1) Connect connectors to ECM and BCM with ignition switch turned OFF. 2) Check DTC P1778 in TCM (equipped with A/T). *Is it indicated?*	Go to Step 13.	Substitute a known-good ECM and recheck.
13	**ECM circuit check** 1) Disconnect connectors from BCM and TCM (equipped with A/T) with ignition switch turned OFF. 2) Measure resistance at following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connector • Between “E23-18” and “C37-12” terminals of ECM connector *Is resistance below 1 Ω?*	Substitute a known-good BCM (included in junction block assembly) and recheck.	Substitute a known-good ECM and recheck.
14	**Combination meter operation check** 1) Check combination meter operation for seat belt warning lamp by fastening and unfastening driver side seat belt with ignition switch turned ON. *Is check result satisfactory?*	Go to Step 15.	Substitute a known-good BCM (included in junction block assembly) and recheck.
15	**BCM circuit check** 1) Disconnect connectors from combination meter with ignition switch turned OFF. 2) Connect connectors to BCM. 3) Measure resistance at following connector terminals. • Between “E46-1” and “G37-2” terminals of BCM connector • Between “E46-2” and “G37-2” terminals of BCM connector *Is resistance below 1 Ω?*	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly) and recheck.

DTC P2227 / P2228 / P2229: Barometric Pressure Circuit Malfunction

S4RS0A1104054

DTC P2227: Barometric Pressure Circuit Range / Performance
DTC P2228: Barometric Pressure Circuit Low
DTC P2229: Barometric Pressure Circuit High

System Description
Barometric pressure sensor is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P2227: Difference of barometric pressure value and intake manifold pressure value is higher than specified value while engine is cranking. (2 driving cycle detection logic)	• Manifold absolute pressure sensor performance problem • Barometric pressure sensor in ECM
DTC P2228: Barometric pressure signal less than specified value is detected. (1 driving cycle detection logic)	• Barometric pressure sensor in ECM
DTC P2229: Barometric pressure signal more than specified value is detected. (1 driving cycle detection logic)	

DTC Confirmation Procedure

DTC P2227:

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine to normal operating temperature.
3) Check DTC and pending DTC by using scan tool.

DTC P2228 / P2229:

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch, clear DTC by using scan tool and run engine for 1 min.
3) Check DTC and pending DTC by using scan tool.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is DTC P2227 set?*	Go to Step 3.	Substitute a known-good ECM and recheck.
3	**MAP sensor check** 1) Check MAP sensor and its circuit referring to "DTC P0107: Manifold Absolute Pressure Circuit Low Input: "and/or "DTC P0108: Manifold Absolute Pressure Circuit High Input: ". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	MAP sensor or its circuit malfunction.

Inspection of ECM and Its Circuits

S4RS0A1104055

ECM and its circuits can be checked by measuring voltage, pulse signal and resistance with special tool connected.

CAUTION:

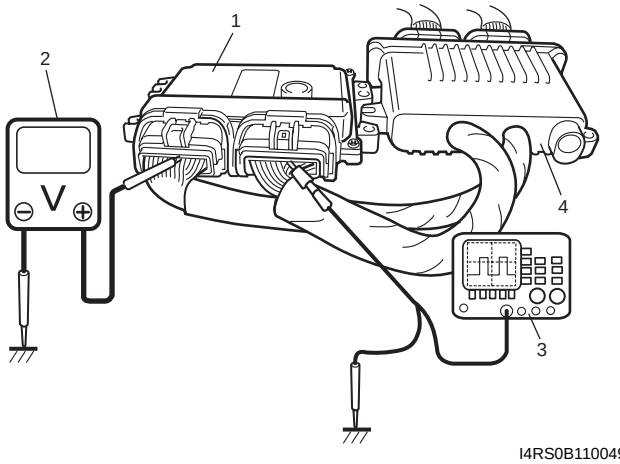
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with ECM connectors disconnected from it.

Voltage Check

1) Remove ECM (1) from its bracket referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.
2) Connect special tool (4) between ECM and ECM connectors securely.
3) Check voltage and/or pulse signal using voltmeter (2) and oscilloscope (3).

NOTE:

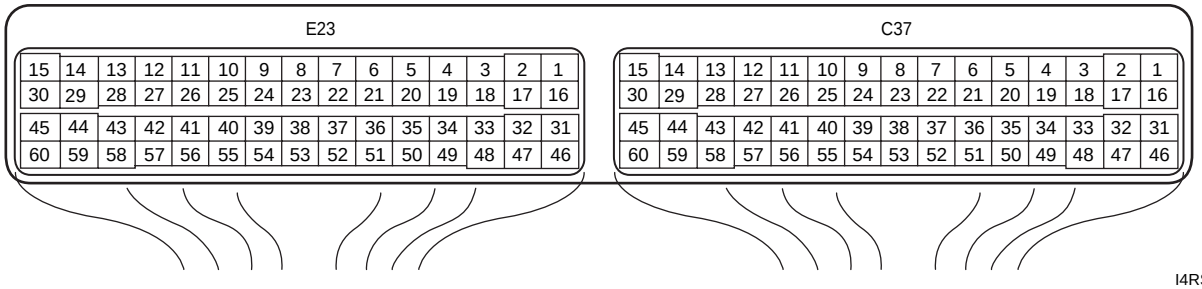
- **As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is turned ON.**
- **Voltage with asterisk (*) cannot be measured with voltmeter because it is pulse signal. Use oscilloscope for its check if necessary.**



I4RS0B110049-

- **Before performed this inspection, be sure to read the “Precautions of ECM Circuit Inspection: ”.**

Viewed from harness side



I4RS0A110055-

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-1	BLU/YEL	Fuel injector No.1 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: ”, “Reference waveform No.2: ” and “Reference waveform No.30: ”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-2	BLU/WHT	Fuel injector No.2 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: ” and “Reference waveform No.3: ”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-3	GRN/ORN	EGR valve (stepper motor coil 2) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: ”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-4	GRN/RED	EGR valve (stepper motor coil 1) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: ”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-5	GRN/WHT	Ignition coil No.2 and No.3 output	0 – 0.6 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 3 – 5 V (“Reference waveform No.5: ” and “Reference waveform No.6: ”)	Engine running at idle after warmed up engine.	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C37-6	GRN/YEL	Ignition coil No.1 and No.4 output	0 – 0.6 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 3 – 5 V (“Reference waveform No.6: ”, “Reference waveform No.7: ” and “Reference waveform No.30: ”)	Engine running at idle after warmed up engine.	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C37-7	—	—	—	—	—
C37-8	—	—	—	—	—
C37-9	PPL	Vehicle speed sensor signal (for M/T)	*0 – 1 V ↑↓ 4 – 5 V (“Reference waveform No.8: ” (M/T))	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (69 pulses (M/T) are generated per sec. at 30 km/h, 19 mph.) (8232 pulses/km (M/T))

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-10	WHT	Oxygen signal of heated oxygen sensor-1	0 – 1 V	Ignition switch turned ON.	—
			*Deflects between over 0.5 V and under 0.45 V (“Reference waveform No.9: ” and “Reference waveform No.10: ”)	While engine running at 2,000 r/min. for 1 min. or longer after warmed up.	
C37-11	BRN	Oxygen signal of heated oxygen sensor-2	4 – 5 V	Ignition switch turned ON.	—
			*Deflects between over 0.5 V and under 0.45 V (“Reference waveform No.11: ”)	While engine running at 2,000 r/min. or more after vehicle running over 30 km/h, 19 mph for 5 min.	
C37-12	WHT	CAN (low) (communication line (active low signal) to TCM (for A/T)	*0.5 – 2.5 V (“Reference waveform No.12: ”)	Ignition switch turned ON with engine stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
C37-13	RED	CAN (high) communication line (active high signal) to TCM (for A/T)	*2.5 – 4.5 V (“Reference waveform No.12: ”)		
C37-14	GRY/ RED	Output of 5 V power source for TP sensor, MAP sensor, A/C refrigerant pressure sensor	4.5 – 5.5 V	Ignition switch turned ON.	—
C37-15	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-16	BLU/ RED	Fuel injector No.3 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: ” and “Reference waveform No.13: ”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-17	BLU/ ORN	Fuel injector No.4 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: ” and “Reference waveform No.14: ”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-18	BRN/ YEL	EGR valve (stepper motor coil 4) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: ”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-19	WHT/ RED	EGR valve (stepper motor coil 3) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: ”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-20	RED/ YEL	CMP sensor signal	0 – 1 V or 4 – 5 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 4 – 5 V (“Reference waveform No.15: ” and “Reference waveform No.16: ”)	Engine running at idle after warmed up engine.	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (6 pulses are generated per 1 camshaft revolution.)
C37-21	PNK	CKP sensor signal	0 – 1 V or 4 – 5 V	Ignition switch turned ON.	—
			*4 – 5 V ↑↓ 0 – 0.6 V (“Reference waveform No.15: ” and “Reference waveform No.16: ”)	Engine running at idle after warming up engine.	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (30 (36 – 6) pulses are generated per 1 crankshaft revolution.)
C37-22	—	—	—	—	—
C37-23	—	—	—	—	—
C37-24	LT GRN	Engine coolant temp. (ECT) sensor signal	3.3 – 3.8 V	Ignition switch turned ON, ECT at 0 °C, 32 °F.	—
			1.38 – 1.72 V	Ignition switch turned ON, ECT at 50 °C, 122 °F.	
			0.40 – 0.53 V	Ignition switch turned ON, ECT at 100 °C, 212 °F.	
C37-25	BLK/ YEL	Intake air temp. (IAT) sensor signal	3.18 – 3.67 V	Ignition switch turned ON, IAT at 0 °C, 32 °F.	—
			1.32 – 1.65 V	Ignition switch turned ON, IAT at 40 °C, 104 °F.	
			0.46 – 0.60 V	Ignition switch turned ON, IAT at 80 °C, 176 °F.	
C37-26	GRN/ BLK	Mass air flow (MAF) sensor signal	0.5 – 1.5 V	Ignition switch turned ON with engine at stop.	—
			1.5 – 2.0 V (“Reference waveform No.17: ”)	When engine running at specified idle speed after warmed up.	
C37-27	GRY	Ground for MAF sensor	Below 0.3 V	Ignition switch turned ON.	—
C37-28	—	—	—	—	—
C37-29	BLU/ BLK	EVAP canister purge valve output	10 – 14 V	Ignition switch turned ON with engine at stop.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.18: ”)	Set EVAP canister purge valve at 52% by using “Misc Test” of scan tool.	Output signal is active low duty pulse. Duty ratio varies depending on vehicle condition.
C37-30	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-31	—	—	—	—	—
C37-32	—	—	—	—	—
C37-33	—	—	—	—	—
C37-34	—	—	—	—	—
C37-35	—	—	—	—	—
C37-36	—	—	—	—	—
C37-37	—	—	—	—	—
C37-38	—	—	—	—	—
C37-39	—	—	—	—	—
C37-40	—	—	—	—	—
C37-41	—	—	—	—	—
C37-42	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-43	—	—	—	—	—
C37-44	—	—	—	—	—
C37-45	—	—	—	—	—
C37-46	BLK/RED	Heater output of heated oxygen sensor-1	10 – 14 V	Ignition switch turned ON.	—
			*0 – 2 V ↑↓ 10 – 14 V (“Reference waveform No.9: ” and “Reference waveform No.10: ”)	Engine running at idle after warmed up engine.	Output signal is active low duty pulse. Duty ratio varies depending on engine condition.
C37-47	RED/BLU	Heater output of heated oxygen sensor-2	10 – 14 V	Ignition switch turned ON.	—
			0 – 1 V (“Reference waveform No.11: ”)	Engine running at idle after vehicle running over 30 km/h, 19 mph for 5 min.	
C37-48	YEL/GRN	Starting motor signal	0 – 1 V	Ignition switch turned ON.	—
			6 – 14 V	While engine cranking.	
C37-49	RED/WHT	IAC valve output	*0 – 2 V ↑↓ 8 – 14 V (“Reference waveform No.19: ”)	Ignition switch turned ON.	Ignition switch turned ON.
			*0 – 2 V ↑↓ 8 – 14 V (“Reference waveform No.20: ”)	Engine running at idle after warmed up engine.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-50	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-51	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-52	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-53	RED/BLK	Manifold absolute pressure (MAP) sensor signal	Approx. 4 V (“Reference waveform No.21: ”)	Ignition switch turned ON with barometric pressure at 100 kPa, 760 mmHg.	—
			0.4 – 2.0 V (“Reference waveform No.22: ”)	While engine running at specified idle speed after warmed up with barometric pressure at 100 kPa, 760 mmHg.	
C37-54	GRY/BLU	Throttle position (TP) sensor signal	0.5 – 1.0 V	Ignition switch turned ON and throttle valve at idle position after warmed up engine.	—
			3.4 – 4.7 V	Ignition switch turned ON and throttle valve at full open position after warmed up engine.	
C37-55	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—
C37-56	RED	Knock sensor signal	2 – 3 V (“Reference waveform No.23: ” and “Reference waveform No.24: ”)	Ignition switch turned ON.	—
				Engine running at 4000 r/min. after warmed up.	
C37-57	YEL	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—
C37-58	BLK/ORN	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-59	YEL/ GRN	Oil control valve ground	Below 1.3 V	Ignition switch turned ON.	—
C37-60	YEL/ RED	Oil control valve output	*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.25: ” and “Reference waveform No.26: ”)	At the moment of ignition switch turned ON.	Output signal is active high pulse. Duty ratio varies depending on vehicle condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-1	BLK/ RED	Main power supply	10 – 14 V	Ignition switch turned ON.	—
E23-2	WHT/ RED	Power source for ECM internal memory	10 – 14 V	Ignition switch turned ON.	—
E23-3	RED	CAN (high) communication line (active high signal) for BCM, combination meter	*2.5 – 4.5 V (“Reference waveform No.27: ”)	Ignition switch turned ON with engine at stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency with varies depending on engine condition.
E23-4	BRN	Engine revolution signal output for EPS control module	0 – 0.8 V	Ignition switch turned ON with engine at stop.	—
			*0 – 1 V ↑↓ 8 – 14 V (“Reference waveform No.28: ” and “Reference waveform No.29: ”)	While engine running.	Output signal is pulse. Pulse frequency varies depending on engine speed. (2 pulses are generated per 1 crankshaft revolution.) (3000 r/min. = 100 Hz)
E23-5	PPL/ WHT	Serial communication line of data link connector 12 V	8 – 14 V	Ignition switch turned ON.	—
E23-6	—	—	—	—	—
E23-7	—	—	—	—	—
E23-8	—	—	—	—	—
E23-9	—	—	—	—	—
E23-10	—	—	—	—	—
E23-11	—	—	—	—	—
E23-12	—	—	—	—	—
E23-13	YEL/ RED	Clock signal for immobilizer coil antenna	10 – 14 V	Ignition switch turned ON.	—
E23-14	—	—	—	—	—
E23-15	GRN/ WHT	Fuel pump relay output	0 – 2.5 V	For 3 sec. from the time ignition switch is turned ON or while engine is running.	—
			10 – 14 V	On and after 3 sec. from the time ignition switch is turned ON or while engine is at stop.	
E23-16	BLK/ RED	Main power supply	10 – 14 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-17	—	—	—	—	—
E23-18	WHT	CAN (low) communication line (active low signal) for BCM, combination meter	*0.5 – 2.5 V (“Reference waveform No.27: ”)	Ignition switch turned ON with engine at stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
E23-19	BLU/ WHT	Electric load signal for heater blower motor	10 – 14 V	Ignition switch turned ON, blower fan selector at OFF position.	—
			0 – 1 V	Ignition switch turned ON, blower fan selector at 2nd speed position or more.	
E23-20	GRN/ WHT	Stop lamp switch signal	0 – 1 V	Ignition switch turned ON, stop lamp not lit up.	—
			10 – 14 V	Ignition switch turned ON, stop lamp lit up.	
E23-21	—	—	—	—	—
E23-22	—	—	—	—	—
E23-23	—	—	—	—	—
E23-24	YEL/ RED	Fuel level sensor signal	0 – 6 V	Ignition switch turned ON. Voltage varies depends on fuel level.	—
E23-25	PPL	Vehicle speed signal output for EPS control module	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.8: ”)	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (21 pulses are generated per sec. at 30 km/h (2561 pulses/km), 19 mph.)
E23-26	RED/ BLU	EPS signal	10 – 14 V	Ignition switch turned ON.	—
			0 – 1 V	With engine running at idle speed, and steering wheel turned to the right or left as far as it stops.	
E23-27	—	—	—	—	—
E23-28	YEL/ BLK	Serial communication line for immobilizer coil antenna	10 – 14 V	Ignition switch turned ON.	—
E23-29	BLK/ WHT	Ignition switch signal	0 – 1 V	Ignition switch turned OFF.	—
			10 – 14 V	Ignition switch turned ON.	
E23-30	WHT	Starting motor control relay output	0 – 1 V	Ignition switch turned ON.	—
			0 – 1 V	Ignition switch is turned to ST (engine cranking) position.	
E23-31	—	—	—	—	—
E23-32	—	—	—	—	—
E23-33	—	—	—	—	—
E23-34	—	—	—	—	—
E23-35	—	—	—	—	—
E23-36	—	—	—	—	—
E23-37	—	—	—	—	—
E23-38	—	—	—	—	—
E23-39	—	—	—	—	—
E23-40	—	—	—	—	—
E23-41	—	—	—	—	—
E23-42	—	—	—	—	—

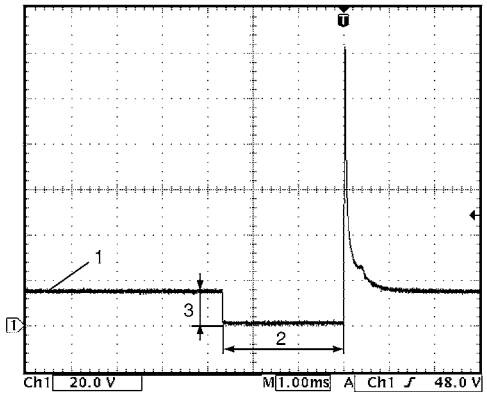
Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-43	—	—	—	—	—
E23-44	—	—	—	—	—
E23-45	—	—	—	—	—
E23-46	LT GRN	Radiator cooling fan relay No.1 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 95 °C (203 °F), or A/C refrigerant pressure: below 600 kPa (87 psi) with A/C switch turned ON while engine is running.	—
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 97.5 °C (207.5 °F) or higher, or A/C refrigerant pressure: 1100 kPa (159.5 psi) or higher with A/C switch turned ON while engine is running.	
E23-47	GRY	A/C compressor relay output	10 – 14 V	Engine running, A/C switch OFF and blower selector at OFF position.	—
			0 – 1 V	Engine running, A/C switch ON and blower selector at 1st position or more.	
E23-48	GRN	Radiator cooling fan relay No.2 and No.3 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 100 °C (212 °F), or A/C refrigerant pressure: below 1200 kPa (174 psi) with A/C switch turned ON while engine is running.	—
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 102.5 °C (216.5 °F) or higher, or A/C refrigerant pressure: 1500 kPa (217.5 psi) or higher with A/C switch turned ON while engine is running.	
E23-49	—	—	—	—	—
E23-50	—	—	—	—	—
E23-51	—	—	—	—	—
E23-52	—	—	—	—	—
E23-53	—	—	—	—	—
E23-54	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-55	RED	A/C refrigerant pressure sensor signal	1.38 – 1.52 V	Engine running, A/C switch OFF and blower selector at OFF position, A/C refrigerant pressure: 800 kPa (116 psi)	—
			2.15 – 2.38 V	Engine running, A/C switch ON and blower selector at 1st position or more, A/C refrigerant pressure: 1400 kPa (203 psi)	
			2.67 – 2.95 V	Engine running, A/C switch ON and blower selector at 1st position or more, A/C refrigerant pressure: 1800 kPa (261 psi)	
E23-56	—	—	—	—	—
E23-57	WHT/ BLK	A/C evaporator outlet air temp. sensor signal	3.4 – 3.7 V	Ignition switch turned ON at A/C evaporator outlet temperature 0 °C (32 °F).	—
			2.5 – 2.8 V	Ignition switch turned ON at A/C evaporator outlet temperature 15 °C (59 °F).	
			1.7 – 2.0 V	Ignition switch turned ON at A/C evaporator outlet temperature 30 °C (86 °F).	
E23-58	—	—	—	—	—
E23-59	—	—	—	—	—
E23-60	BRN/ WHT	Main power supply relay output	10 – 14 V	Ignition switch turned OFF.	—
			0 – 2 V	Ignition switch turned ON.	

Reference waveform No.1

Fuel injector signal (1) with engine idling

Measurement terminal	CH1: “C37-2” to “C37-58”
Oscilloscope setting	CH1: 20 V/DIV TIME: 1 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



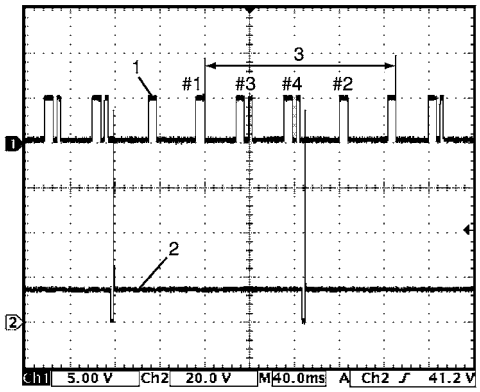
I4RS0B110050-

2. Fuel injection pulse width: 2-4 msec.
3. 10 – 14 V

Reference waveform No.2

No.1 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-1” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



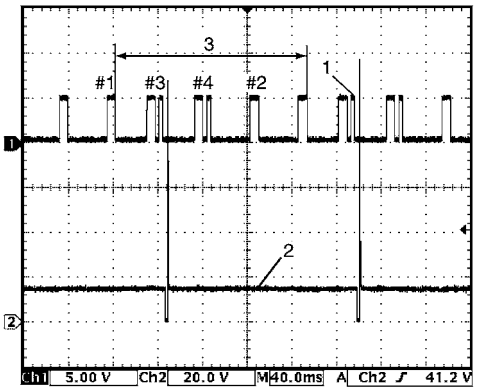
I4RS0A110088-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.3

No.2 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-2” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



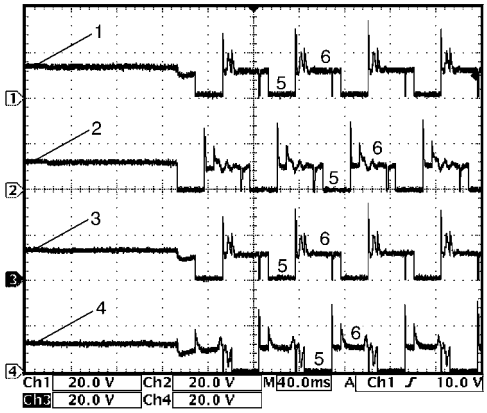
I4RS0A110089-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.4

EGR valve signal

Measurement terminal	CH1: “C37-4” to “C37-58” CH2: “C37-3” to “C37-58” CH3: “C37-19” to “C37-58” CH4: “C37-18” to “C37-58”
Oscilloscope setting	CH1: 20 V/DIV, CH2: 20 V/DIV CH3: 20 V/DIV, CH4: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	Engine at cranking



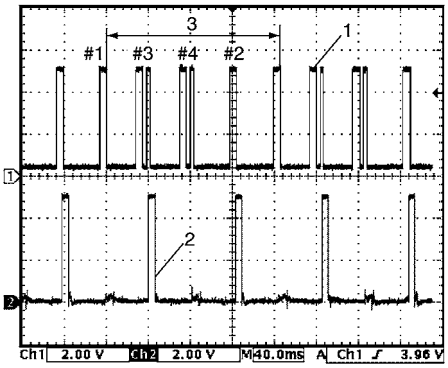
I4RS0B110053-

1. EGR valve stepper motor coil 1 signal
2. EGR valve stepper motor coil 2 signal
3. EGR valve stepper motor coil 3 signal
4. EGR valve stepper motor coil 4 signal
5. ON signal
6. OFF signal

Reference waveform No.5

Ignition coil No.2 and No.3 signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-5” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



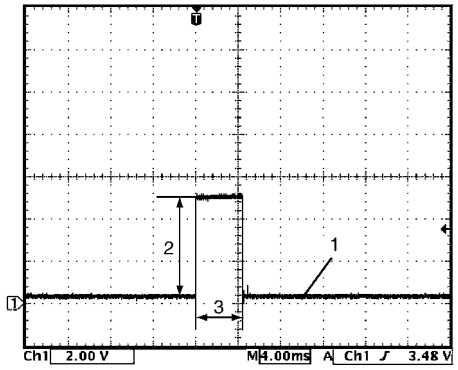
I4RS0A110090-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.6

Ignition coil signal (1) with engine idling

Measurement terminal	CH1: “C37-6” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV TIME: 4 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



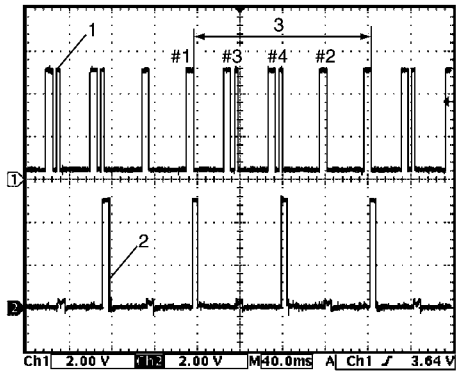
I4RS0B110055-

2. 4 – 6 V
3. Ignition coil pulse width: 4 – 5 msec.

Reference waveform No.7

Ignition coil No.1 and No.4 signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



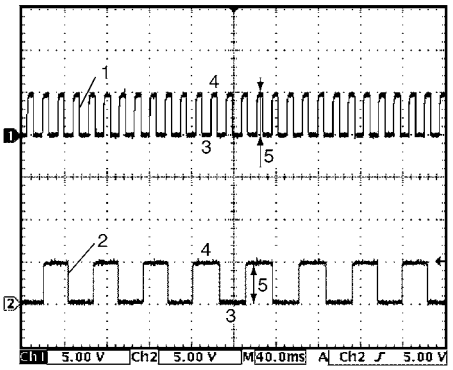
I4RS0A110091-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.8

VSS signal at 30 km/h (19 mph) (for M/T model)

Measurement terminal	CH1: “C37-9” to “C37-58” CH2: “E23-25” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 30 km/h (19 mph)



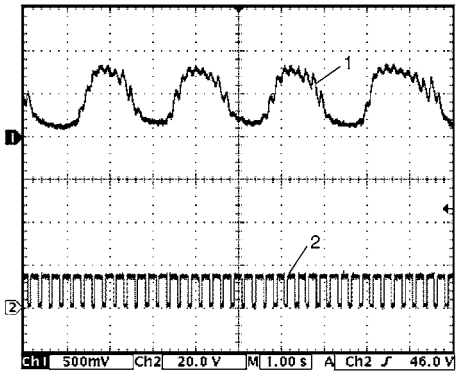
I4RS0B110057-

1. VSS signal (M/T)
2. VSS signal for EPS control module
3. ON
4. OFF
5. 4 – 5 V

Reference waveform No.9

Heated oxygen sensor-1 signal (1) with engine idling

Measurement terminal	CH1: “C37-10” to “C37-57” CH2: “C37-46” to “C37-58”
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 20 V/DIV TIME: 1 s/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



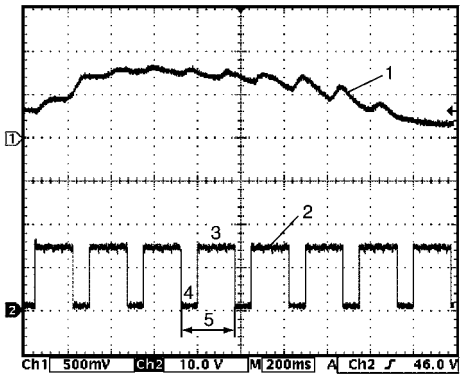
I4RS0B110058-

2. Heated oxygen sensor-1 heater signal

Reference waveform No.10

Heated oxygen sensor-1 heater signal (2) with engine idling

Measurement terminal	CH1: “C37-10” to “C37-57” CH2: “C37-46” to “C37-58”
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



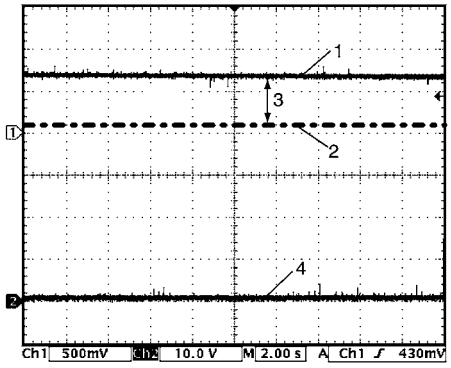
I4RS0B110059-

1.	Heated oxygen sensor-1 signal
3.	OFF signal
4.	ON signal
5.	One duty cycle

Reference waveform No.11

Heated oxygen sensor-2 heater signal (4) with engine idling

Measurement terminal	CH1: “C37-11” to “C37-57” CH2: “C37-47” to “C37-58”
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 10 V/DIV TIME: 2 s/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 60 km/h (37 mph) for 10 min. • Engine at specified idle speed



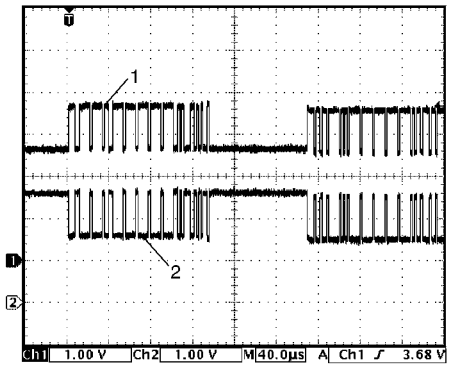
I4RS0B110060-

1.	Heated oxygen sensor-2 signal upper limit
2.	Heated oxygen sensor-2 signal lower limit
3.	Normal waveform range

Reference waveform No.12

CAN communication line signal from TCM (for A/T or AMT model) with ignition switch turned ON

Measurement terminal	CH1: “C37-13” to “C37-58” CH2: “C37-12” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μs/DIV
Measurement condition	Ignition switch turned ON (Signal pattern is depending on engine condition)



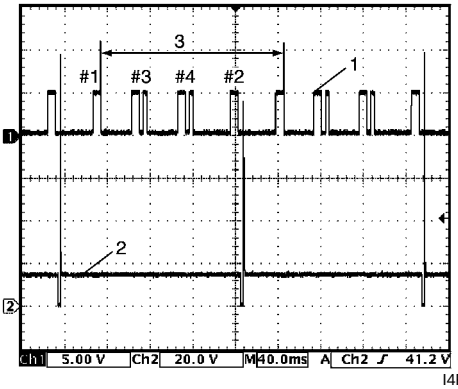
I4RS0B110061-

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

Reference waveform No.13

No.3 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-16” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



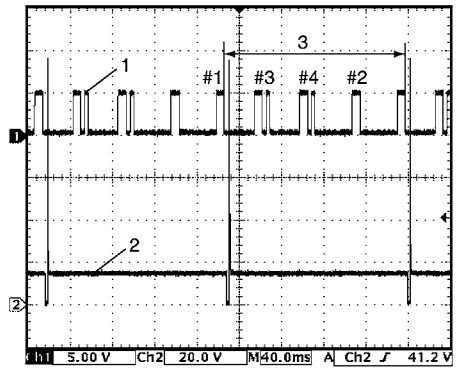
I4RS0A110092-

1.	Cylinder reference signal (CMP reference signal)
3.	720° crank angle

Reference waveform No.14

No.4 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-17” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



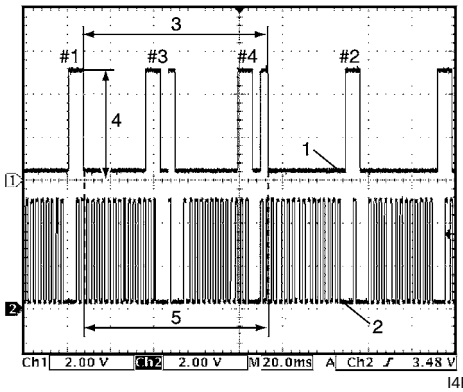
I4RS0A110093-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.15

CMP sensor signal with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-21” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 20 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



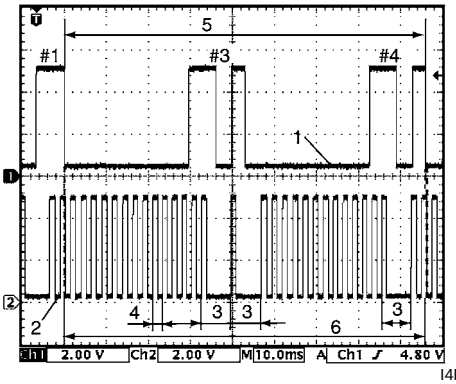
I4RS0A110094-

1. Cylinder reference signal (CMP reference signal)
2. CKP signal
3. 360° crank angle
4. 4 – 5 V
5. 36 – 6 = 30 CKP pulse

Reference waveform No.16

CMP sensor signal with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-21” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



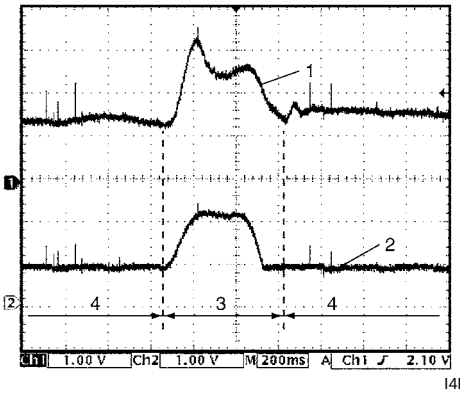
I4RS0A110095-

1. Cylinder reference signal (CMP reference signal)
2. CKP signal
3. 30° crank angle
4. 10° crank angle
5. 360° crank angle
6. 36 – 6 = 30 CKP pulse

Reference waveform No.17

Mass air flow sensor signal (1) with engine racing

Measurement terminal	CH1: “C37-26” to “C37-27” CH2: “C37-54” to “C37-55”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine racing

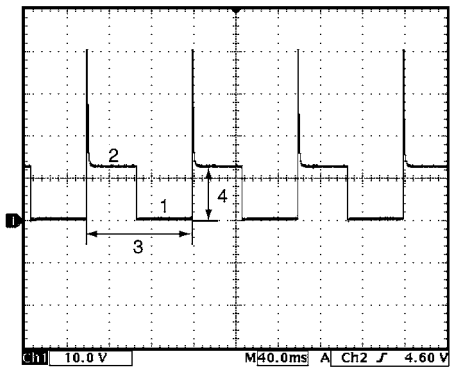


I4RS0B110066-

2. Throttle position sensor signal
3. Racing
4. Idle

Reference waveform No.18
EVAP canister purge valve signal

Measurement terminal	CH1: “C37-29” to “C37-58”
Oscilloscope setting	CH1: 10 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Set EVAP canister purge valve at 52% by using “Misc Test” of scan tool

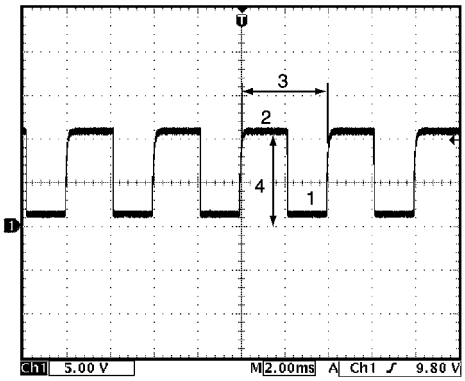


I4RS0B110067-

1. ON signal
2. OFF signal
3. One duty cycle
4. 10 – 14 V

Reference waveform No.19
IAC valve signal with ignition switch turned ON

Measurement terminal	CH1: “C37-49” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Ignition switch turned ON

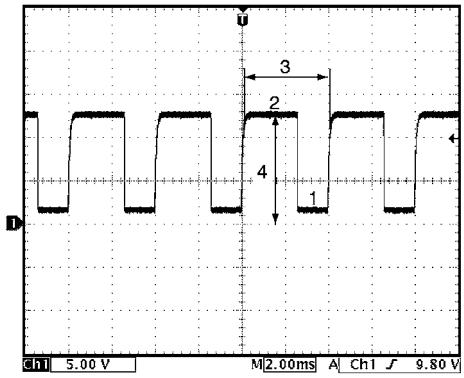


I4RS0B110068-

1. ON signal
2. OFF signal
3. One duty cycle (Approx. 4 msec.)
4. 8 – 14 V

Reference waveform No.20
IAC valve signal

Measurement terminal	CH1: “C37-49” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

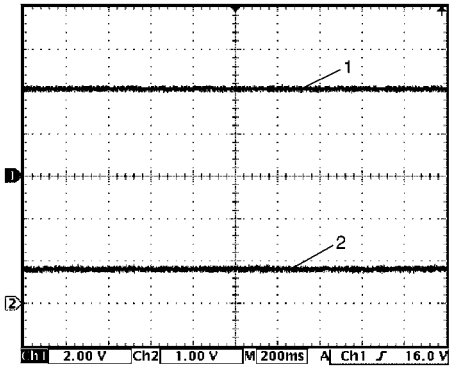


I4RS0B110069-

1. ON signal
2. OFF signal
3. One duty cycle (Approx. 4 msec.)
4. 8 – 14 V

Reference waveform No.21
Manifold absolute pressure sensor signal (1) with ignition switch turned ON

Measurement terminal	CH1: “C37-53” to “C37-55” CH2: “C37-54” to “C37-55”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Ignition switch turned ON



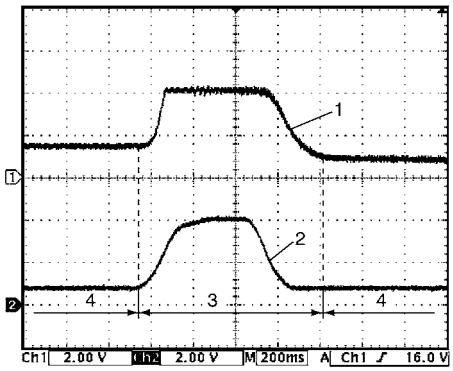
I4RS0B110070-

2. Throttle position sensor signal

Reference waveform No.22

Manifold absolute pressure sensor signal (1) with engine racing

Measurement terminal	CH1: “C37-53” to “C37-55” CH2: “C37-54” to “C37-55”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine racing



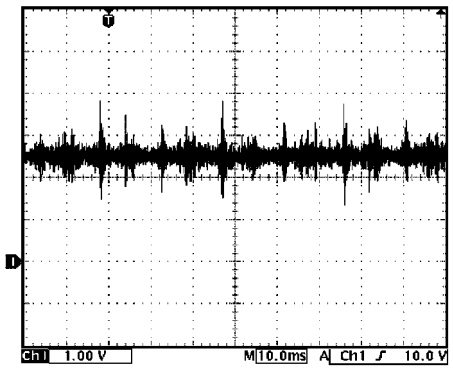
I4RS0B110071-

2. Throttle position sensor signal
3. Racing
4. Idle

Reference waveform No.23

Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: “C37-56” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Run engine at 4000 r/min.

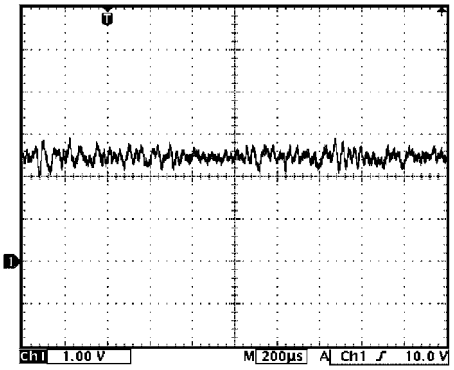


I4RS0B110072-

Reference waveform No.24

Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: “C37-56” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV TIME: 200 μs/DIV
Measurement condition	• After warmed up to normal operating temperature • Run engine at 4000 r/min.

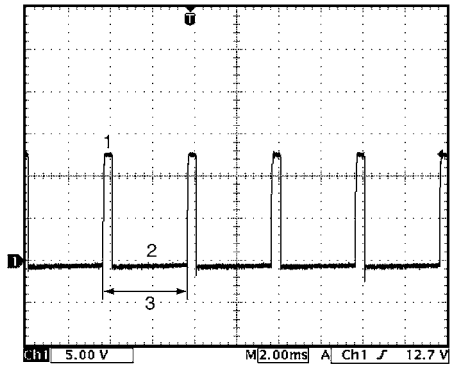


I4RS0B110073-

Reference waveform No.25

Oil control valve signal with engine idling (for M15 engine model)

Measurement terminal	CH1: “C37-60” to “C37-59”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	At the moment of the ignition switch turned on



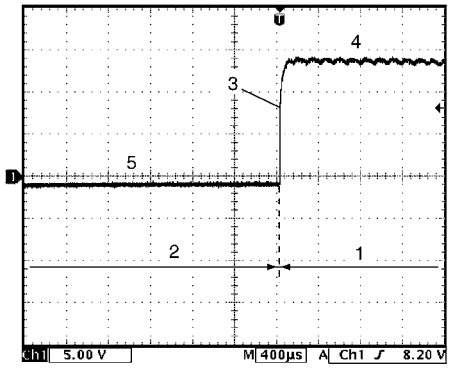
I4RS0B110074-

1. ON signal
2. OFF signal
3. Only duty cycle

Reference waveform No.26

Oil control valve signal with engine racing (for M15 engine model)

Measurement terminal	CH1: “C37-60” to “C37-59”
Oscilloscope setting	CH1: 5 V/DIV TIME: 400 μs/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 20 km/h (12 mph) and depress accelerator pedal fully



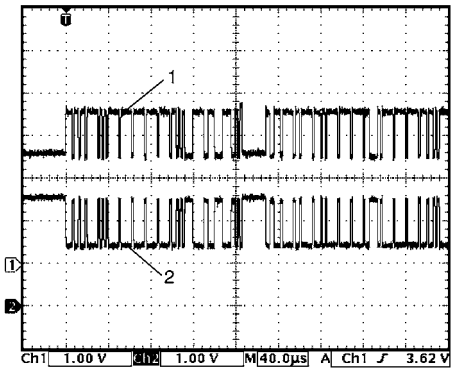
I4RS0B110075-

1.	Accelerator pedal depressed fully
2.	Accelerator pedal depressed partially
3.	Oil control valve signal
4.	ON signal
5.	OFF signal

Reference waveform No.27

CAN communication line signal from BCM with ignition switch turned ON

Measurement terminal	CH1: “E23-3” to “C37-58” CH2: “E23-18” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μs/DIV
Measurement condition	Ignition switch turned ON (Signal pattern is depending on engine condition)



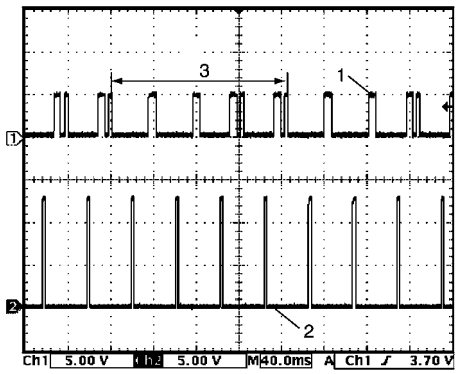
I4RS0B110076-

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

Reference waveform No.28

Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “E23-4” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



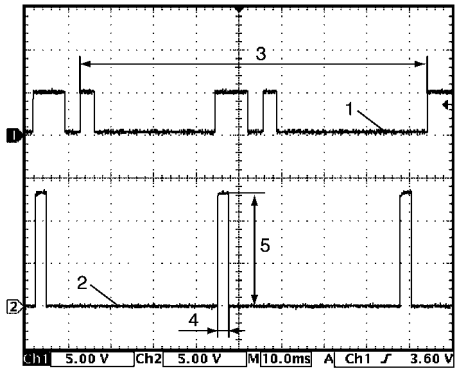
I4RS0A110096-

1.	Cylinder reference signal (CMP reference signal)
3.	720° crank angle

Reference waveform No.29

Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “E23-4” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



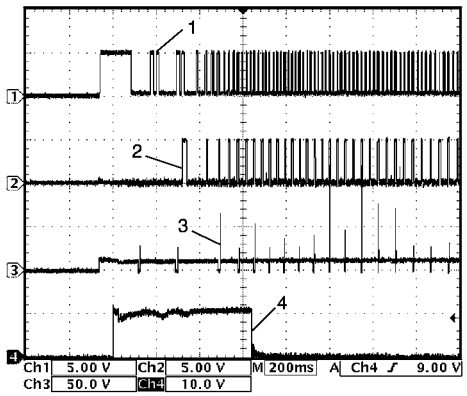
I4RS0A110097-

1.	Cylinder reference signal (CMP reference signal)
3.	360° crank angle
4.	2 to 4 msec.
5.	10 – 14 V

Reference waveform No.30

Ignition coil signal and fuel injector signal with engine cranking

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58” CH3: “C37-1” to “C37-58” CH4: “C37-48” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV CH3: 50 V/DIV, CH4: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at cranking



I4RS0A110098-

1. Cylinder reference signal (CMP reference signal)
2. Ignition coil No.1 and No.4 signal
3. No.1 fuel injector signal
4. Engine start signal

Resistance Check

1) Remove ECM from its bracket referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.

CAUTION:

Never touch terminals of ECM itself or connect voltmeter or ohmmeter (2).

2) Connect special tool to ECM connectors securely.

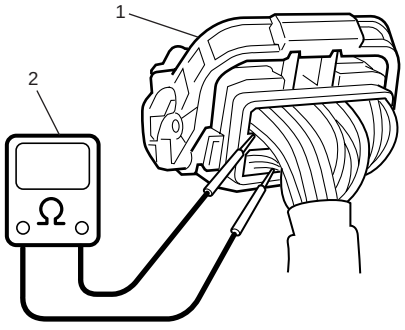
NOTE:

Do not connect the other connector of special tool to ECM.

3) Check resistance between each pair of terminals of disconnected connectors (1) as listed in the following table.

CAUTION:

- **Be sure to connect ohmmeter probe from wire harness side of coupler.**
- **Be sure to turn OFF ignition switch for this check.**
- **Resistance in the following table represents that measured when parts temperature is 20 °C (68 °F).**



I4RS0A110086-

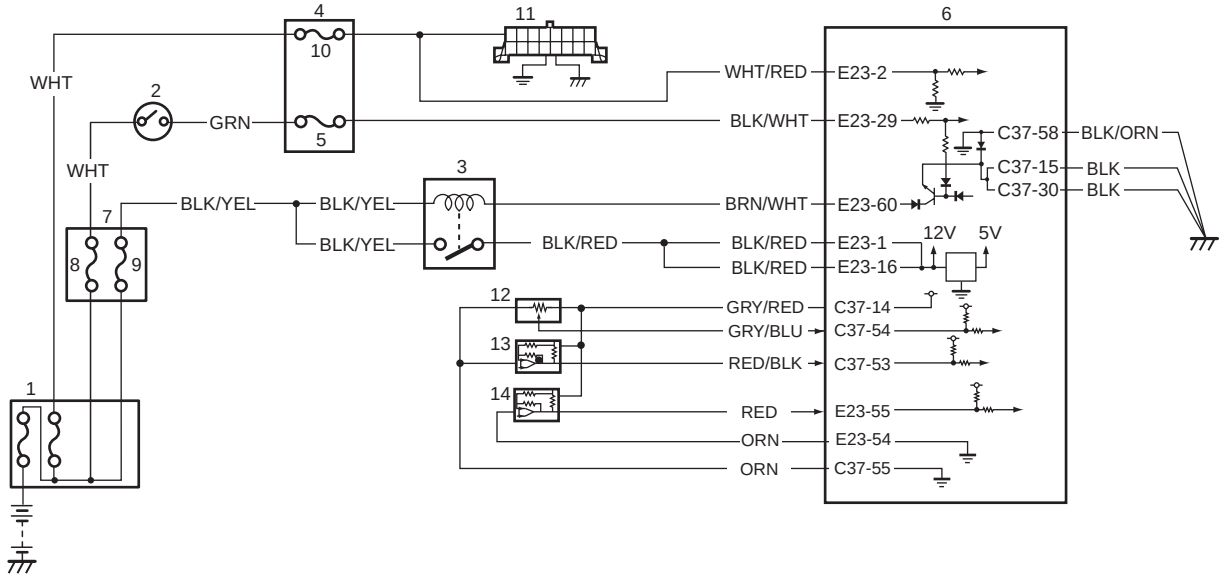
Terminals	Circuit	Standard resistance	Condition
C37-47 to E23-29	Heater of HO2S-2	4 – 15 Ω	—
E23-46 to E23-1/16	Radiator cooling fan relay No.1	160 – 240 Ω	—
E23-60 to E23-29	Main relay	160 – 240 Ω	Battery disconnected and ignition switch turned ON
E23-15 to E23-29	Fuel pump relay	160 – 240 Ω	—
C37-16 to E23-1/16	No.3 fuel injector	10.8 – 18.2 Ω	—
C37-17 to E23-1/16	No.4 fuel injector		

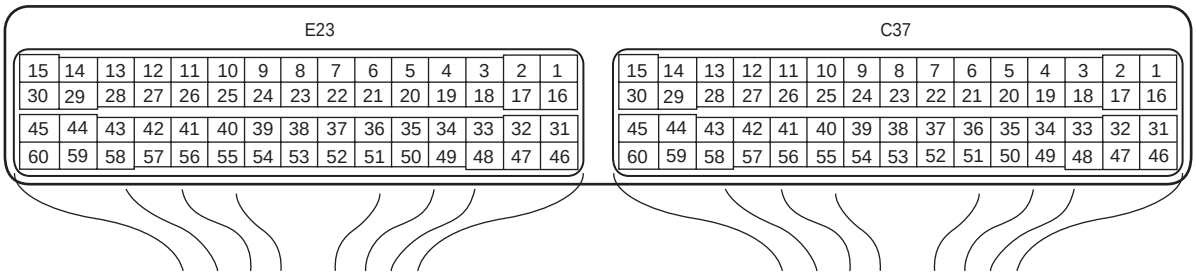
Terminals	Circuit	Standard resistance	Condition
C37-4 to E23-1/16	EGR valve (stepping motor No.1 coil)	20 – 31 Ω	—
C37-29 to E23-1/16	EVAP canister purge valve	28 – 35 Ω	—
C37-2 to E23-1/16	No.2 fuel injector	10.8 – 18.2 Ω	—
C37-3 to E23-1/16	EGR valve (stepping motor No.2 coil)	20 – 31 Ω	—
C37-18 to E23-1/16	EGR valve (stepping motor No.4 coil)		
C37-19 to E23-1/16	EGR valve (stepping motor No.3 coil)		
C37-46 to E23-29	Heater of HO2S-1	2 – 11 Ω	—
C37-1 to E23-1/16	No.1 fuel injector	10.8 – 18.2 Ω	—
E23-47 to E23-1/16	A/C compressor relay	160 – 240 Ω	—
C37-60 to C37-59	Oil control valve (for M15 engine model)	6 – 15 Ω	—
E23-45 to E23-1/16	Throttle actuator control relay (for AMT model)	160 – 240 Ω	—

ECM Power and Ground Circuit Check

S4RS0A1104066

Wiring Diagram





I4RS0A110099-

1. Main fuse box	5. "IG COIL" fuse	9. "FI" fuse	13. MAP sensor
2. Ignition switch	6. ECM	10. "RADIO" fuse	14. A/C refrigerant pressure sensor
3. Main relay	7. Relay box	11. DLC	
4. BCM (included in junction block assembly)	8. "IG ACC" fuse	12. TP sensor	

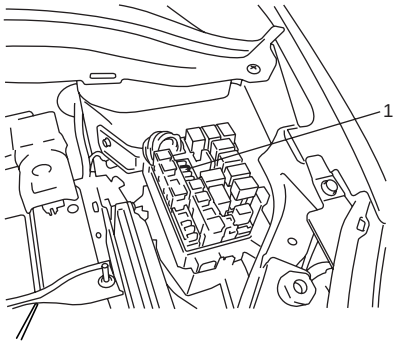
Circuit Description

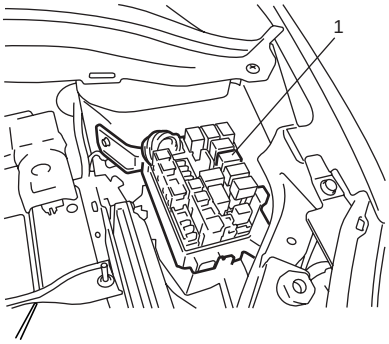
When the ignition switch is turned ON, the main relay turns ON (the contact point closes) and the main power is supplied to ECM.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**

Step	Action	Yes	No
1	**Circuit fuse check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection to ECM connector at “E23-2”, “E23-29”, “E23-60”, “E23-1”, “E23-16”, “C37-58”, “C37-15” and “C37-30” terminals. 3) If OK, check “RADIO” fuse and “IG COIL” fuse for blowing. *Are “RADIO” fuse and “IG COIL” fuse in good condition?*	Go to Step 2.	Replace fuse(s) and check for short in circuits connected to fuse(s).
2	**Power supply circuit check** 1) Measure voltage between “E23-2” terminal of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 3.	“WHT/RED” or “WHT” wire is open circuit.
3	**Ignition signal check** 1) Turn ignition switch to ON position. 2) Measure voltage between “E23-29” terminal of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 4.	“BLK/WHT” or “GRN” wire is open circuit.
4	**Main relay circuit check** 1) Turn ignition switch to OFF position. 2) Check “FI” fuse (1) (15 A) in relay box for blowing.  I4RS0A110016- 3) If OK, measure voltage between “E23-60” terminal of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 5.	Go to Step 9.
5	**Main relay circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Measure voltage between “E23-60” terminal of ECM connector and body ground. *Is voltage 0 – 1 V?*	Go to Step 7.	Go to Step 6.

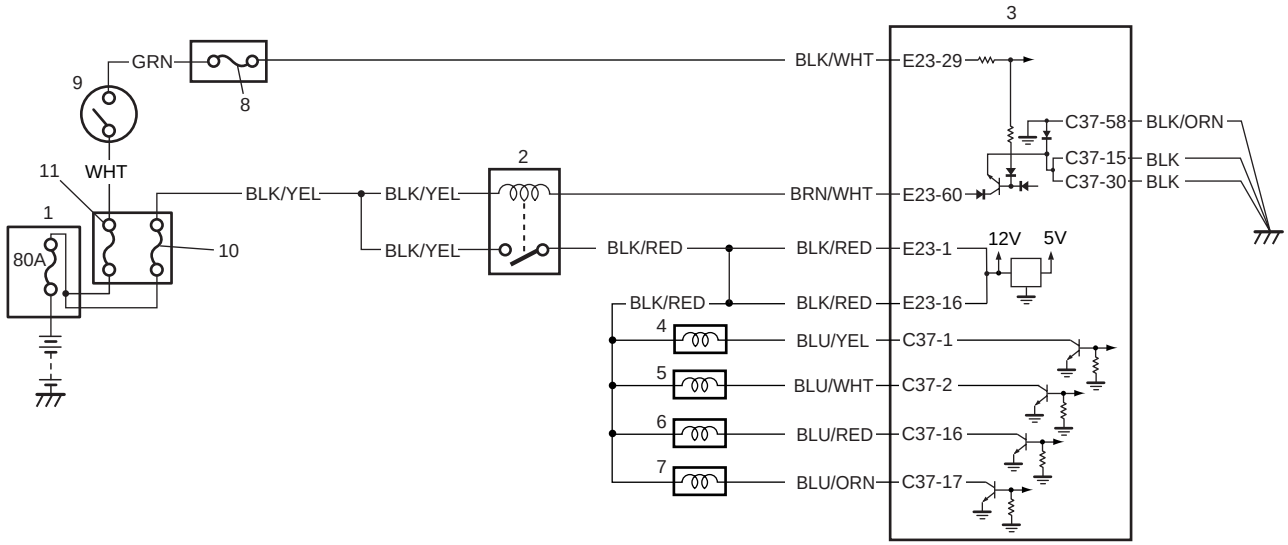
Step	Action	Yes	No
6	**ECM ground circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Measure resistance between each “C37-58”, “C37-15” and “C37-30” terminals of ECM connector and body ground. *Is resistance 1 Ω or less?*	Substitute a known-good ECM and recheck.	“BLK/ORN” or “BLK” wire is open or high resistance circuit.
7	**Main relay circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Using service wire, ground “E23-60” terminal of ECM connector and measure voltage between each “E23-1” and “E23-16” terminals of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 11.	Go to Step 8.
8	**Main relay circuit check** 1) Remove main relay (1) from relay box.  I4RS0A110017- 2) Check for proper connection to main relay connector at “BLK/YEL” and “BLK/RED” wire terminals. 3) If OK, measure resistance between each “E23-1” and “E23-16” wire terminals of ECM connector and “BLK/RED” wire terminal of main relay connector. *Is resistance 1 Ω or less?*	Go to Step 9.	“BLK/RED” wire is open circuit or high resistance circuit.
9	**Main relay circuit check** 1) Remove main relay from relay box with ignition switch turned OFF. 2) Measure voltage between “BLK/YEL” wire terminal of main relay connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 10.	“BLK/YEL” wire is open circuit.
10	**Main relay check** 1) Check main relay referring to “Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: in Section 1C”. *Is main relay in good condition?*	“BRN/WHT” wire is open or high resistance circuit.	Replace main relay.

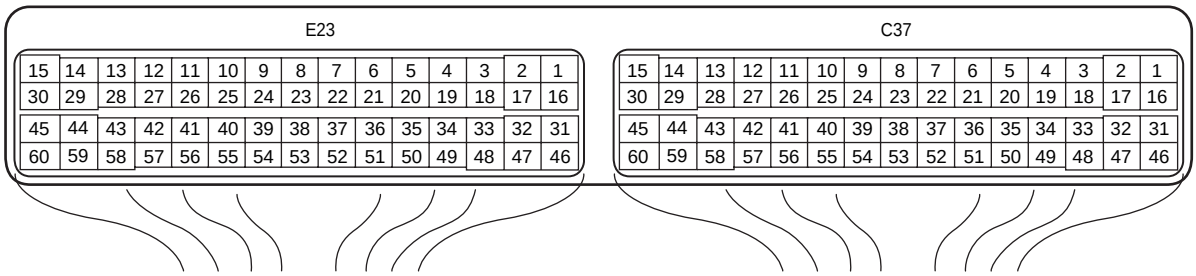
Step	Action	Yes	No
11	**Sensor power source circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure each voltage between “C37-14” terminal of ECM connector and vehicle body ground. *Is each voltage 4 – 6 V?*	ECM power and ground circuit is in good condition.	Go to Step 12.
12	**Sensor power source circuit check** 1) Disconnect connectors from ECM, TP sensor, MAP sensor, A/C refrigerant pressure sensor and accelerator pedal position (APP) sensor with ignition switch turned OFF. 2) Measure each resistance between “C37-14” terminal of ECM connector and vehicle body ground. *Is each resistance infinity?*	Check internal short circuit of TP sensor, MAP sensor and/or A/C refrigerant pressure sensor.	“GRY/RED” wire is shorted to ground circuit.

Fuel Injector Circuit Check

S4RS0A1104056

Wiring Diagram





I4RS0A110077-

1. Main fuse box	4. No.1 injector	7. No.4 injector	10. “FI” fuse
2. Main relay	5. No.2 injector	8. “IG COIL” fuse	11. “IG ACC” fuse
3. ECM	6. No.3 injector	9. Ignition switch	

Troubleshooting

NOTE:

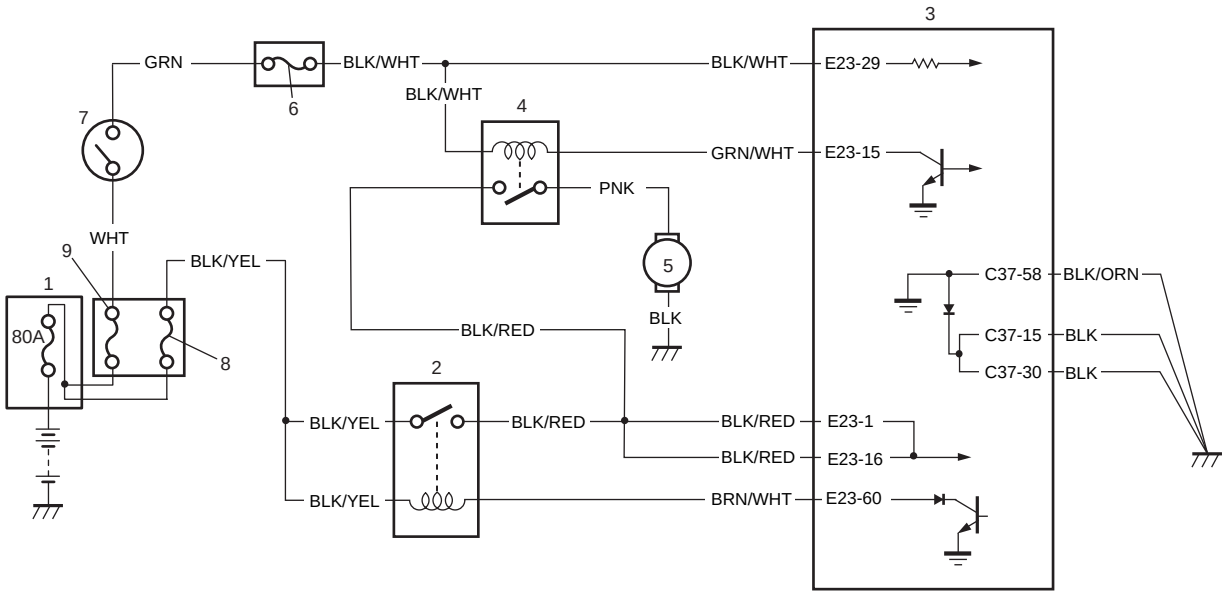
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

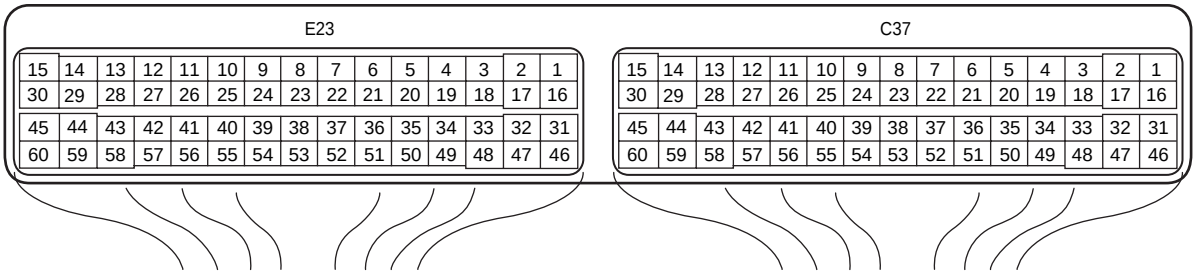
Step	Action	Yes	No
1	**Fuel injector check for operating sound** 1) Using sound scope, check each injector for operating sound at engine cranking. *Do all 4 injector make operating sound?*	Fuel injectors circuit is in good condition.	Go to Step 2.
2	**Fuel injector resistance check** 1) Disconnect connectors from fuel injectors with ignition switch turned OFF. 2) Check for proper connection to fuel injector at each terminals. 3) If OK, check all 4 fuel injectors for resistance referring to "Fuel Injector Inspection: in Section 1G". *Are all injectors in good condition?*	Go to Step 3.	Faulty fuel injector.
3	**Fuel injector insulation resistance check** 1) Check that there is insulation between each fuel injector terminal and engine ground. *Is there insulation?*	Go to Step 4.	Faulty fuel injector.
4	**Fuel injector power supply check** 1) Measure voltage between each "BLK/RED" wire terminal of fuel injector connector and engine ground with ignition switch turned ON. *Is voltage 10 – 14 V?*	Go to Step 5.	"BLK/RED" wire is open or shorted to ground circuit. If it is in good condition, go to "ECM Power and Ground Circuit Check: ".
5	**Wire circuit check** 1) Turn OFF ignition switch. 2) Disconnect connectors from ECM. 3) Measure resistance between each "BLU/YEL", "BLU/WHT", "BLU/RED", "BLU/ORN" wire terminal of fuel injector connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"BLU/YEL", "BLU/WHT", "BLU/RED" and/or "BLU/ORN" wire(s) are shorted to ground.
6	**Wire circuit check** 1) Measure voltage between each "BLU/YEL", "BLU/WHT", "BLU/RED", "BLU/ORN" wire terminal of fuel injector connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 7.	"BLU/YEL", "BLU/WHT", "BLU/RED" and/or "BLU/ORN" wire(s) are shorted to power supply circuit.
7	**Fuel injector drive signal check** 1) Connect connectors to each fuel injector and ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between each "C37-1", "C37-2", "C37-16", "C37-17" terminal of ECM connector and vehicle body ground. *Is voltage 10 – 14 V?*	Check fuel injector referring to "Fuel Injector Inspection: in Section 1G". If check result is satisfactory, substitute a known-good ECM and recheck.	"BLU/YEL", "BLU/WHT", "BLU/RED" and/or "BLU/ORN" wire(s) are open circuit.

Fuel Pump and Its Circuit Check

S4RS0A1104057

Wiring Diagram





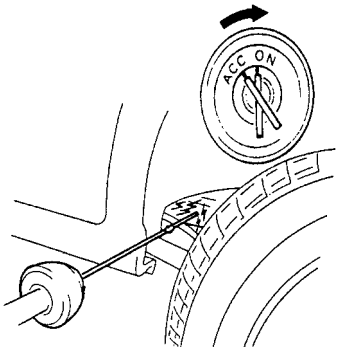
I4RS0A110078-

1. Main fuse box	4. Fuel pump relay	7. Ignition switch
2. Main relay	5. Fuel pump	8. “FI” fuse
3. ECM	6. “IG COIL” fuse	9. “IG ACC” fuse

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**

Step	Action	Yes	No
1	**Fuel pump control system check for operation** *Is fuel pump heard to operate 3 sec. after ignition switch is turned ON?*  I2RH01110132-	Fuel pump circuit is in good condition.	Go to Step 2.
2	**Fuel pump relay power supply check** 1) Disconnect fuel pump relay from relay box with ignition switch turned OFF. 2) Check for proper connection to fuel pump relay at each terminal. 3) If OK, turn ON ignition switch, measure voltage between “BLK/WHT” wire terminal of fuel pump relay connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 3.	“BLK/WHT” wire is open or shorted to ground circuit.
3	**Fuel pump relay power supply check** 1) Turn ON ignition switch, measure voltage between “BLK/RED” wire terminal of fuel pump relay connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 4.	“BLK/RED” wire is open circuit.
4	**Fuel pump relay check** 1) Check fuel pump relay referring to “Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: in Section 1C”. *Is relay in good condition?*	Go to Step 5.	Faulty relay.
5	**Fuel pump relay drive signal check** 1) Connect fuel pump relay to relay box. 2) Connect voltmeter between “E23-15” terminal of ECM connector and vehicle body ground. 3) Measure voltage 3 second after ignition switch is turned ON. *Is voltage 10 – 14 V?*	Go to Step 6.	“GRN/WHT” wire is open circuit or shorted to ground circuit.
6	**Fuel pump relay drive signal check** 1) Measure voltage within 3 second after ignition switch is turned ON. *Is voltage 0 – 1 V?*	Go to Step 7.	Substitute a known-good ECM and recheck.

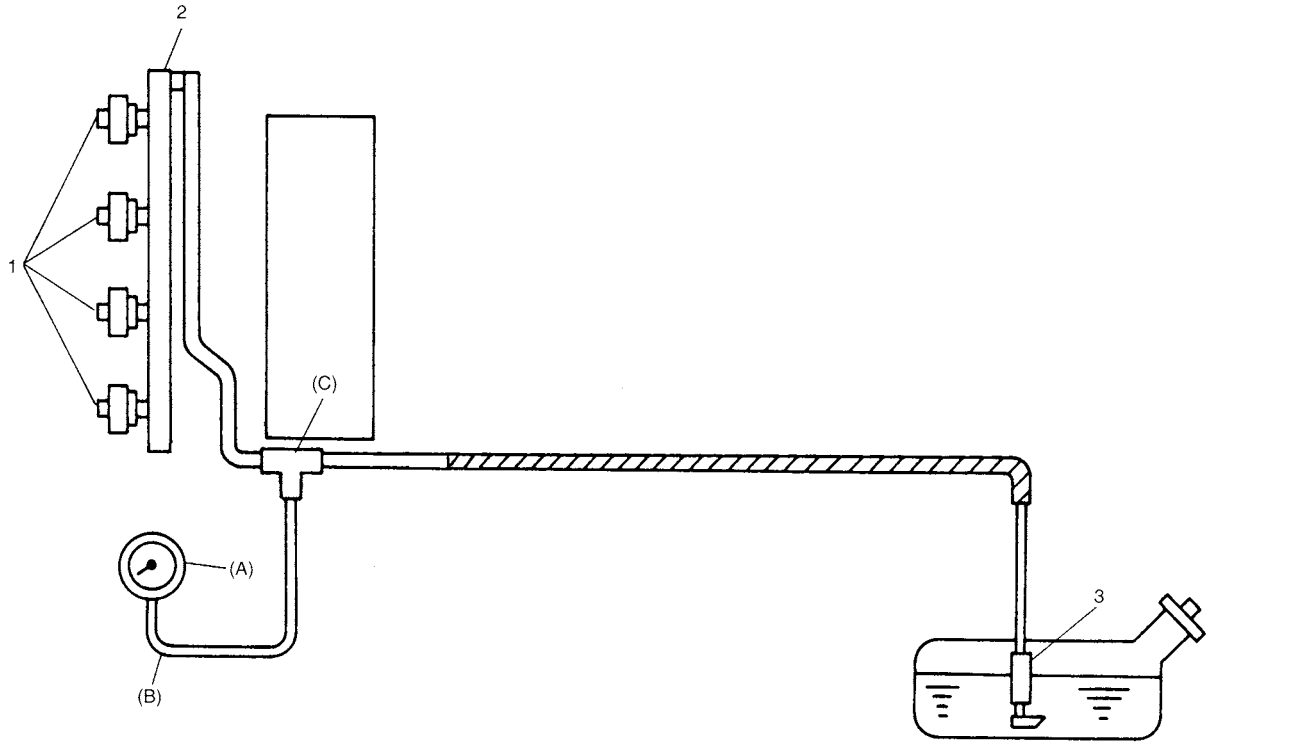
Step	Action	Yes	No
7	**Wire circuit check** 1) Turn OFF ignition switch. 2) Detach fuel tank referring to “Fuel Tank Removal and Installation: in Section 1G”. 3) Disconnect connector from fuel pump. 4) Measure resistance between “PNK” wire terminal of fuel pump connector and vehicle body ground. *Is resistance infinity?*	Go to Step 8.	“PNK” wire is shorted to ground.
8	**Fuel pump circuit check** 1) Turn OFF ignition switch. 2) Connect service wire between “E23-15” terminal of ECM connector and vehicle body ground. 3) Turn ON ignition switch, measure voltage between “PNK” terminal at fuel pump connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 9.	“PNK” wire is open circuit.
9	**Fuel pump circuit check** 1) Turn OFF ignition switch. 2) Measure resistance between “BLK” wire terminal at fuel pump connector and vehicle body ground. *Is resistance less than 5 Ω?*	Faulty fuel pump.	“BLK” wire is open circuit.

Fuel Pressure Check

S4RS0A1104058

System Diagram

Special tool
(A): 09912–58442
(B): 09912–58432
(C): 09912–58490



I3RM0A110081-

1.	Injector
2.	Delivery pipe
3.	Fuel filter and fuel pump

Troubleshooting

NOTE:

Before using the following flow, check to make sure that battery voltage is higher than 11 V. If battery voltage is low, pressure becomes lower than specification even if fuel pump and line are in good condition.

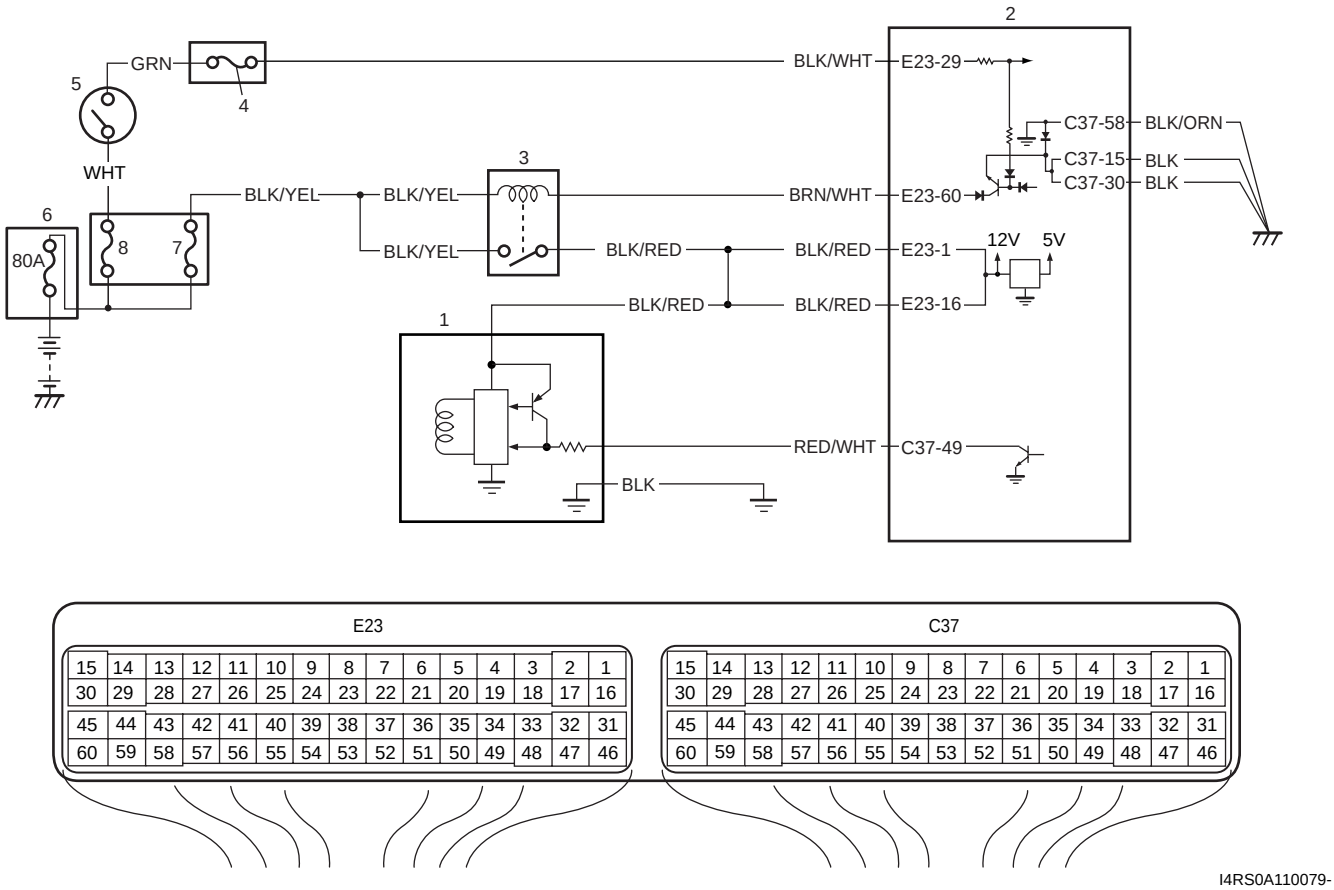
Step	Action	Yes	No
1	**Fuel pressure check** 1) Check fuel pressure referring to “Fuel Pressure Inspection: in Section 1G”. *Is check result satisfactory?*	Go to Step 2.	Go to Step 5.
2	**Fuel pressure check** 1) Start engine and warm it up to normal operating temperature. 2) Keep engine speed at 4000 rpm. *Does fuel pressure show about the same value as Step 1?*	Go to Step 3.	Go to Step 8.
3	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for fuel leakage. *Are they in good condition?*	Go to Step 4.	Repair or replace defective part.

Step	Action	Yes	No
4	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for damage or deform. *Are they in good condition?*	Faulty fuel pressure regulator.	Repair or replace damaged or deformed part.
5	*Was fuel pressure higher than specification in Step 1?*	Go to Step 6.	Go to Step 7.
6	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for damage or deform. *Are they in good condition?*	Faulty fuel pressure regulator.	Repair or replace damaged or deformed part.
7	**Fuel pump operating sound check** 1) Remove fuel filler cap and then turn ON ignition switch. *Can you hear operating sound?*	Go to Step 8.	Faulty fuel pump.
8	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for damage or deform. *Are they in good condition?*	Clogged fuel filter, faulty fuel pump, faulty fuel pressure regulator or fuel leakage from hose connection in fuel tank.	Repair or replace defective part.

Idle Air Control System Check

S4RS0A1104059

Wiring Diagram



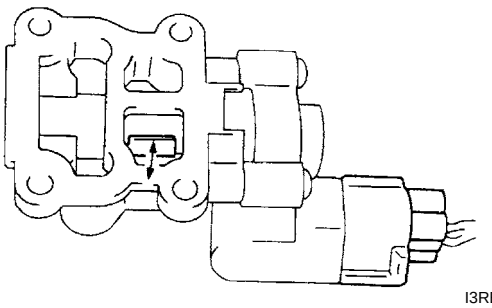
I4RS0A110079-

1. IAC valve	4. "IG COIL" fuse	7. "FI" fuse
2. ECM	5. Ignition switch	8. "IG ACC" fuse
3. Main relay	6. Main fuse box	

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

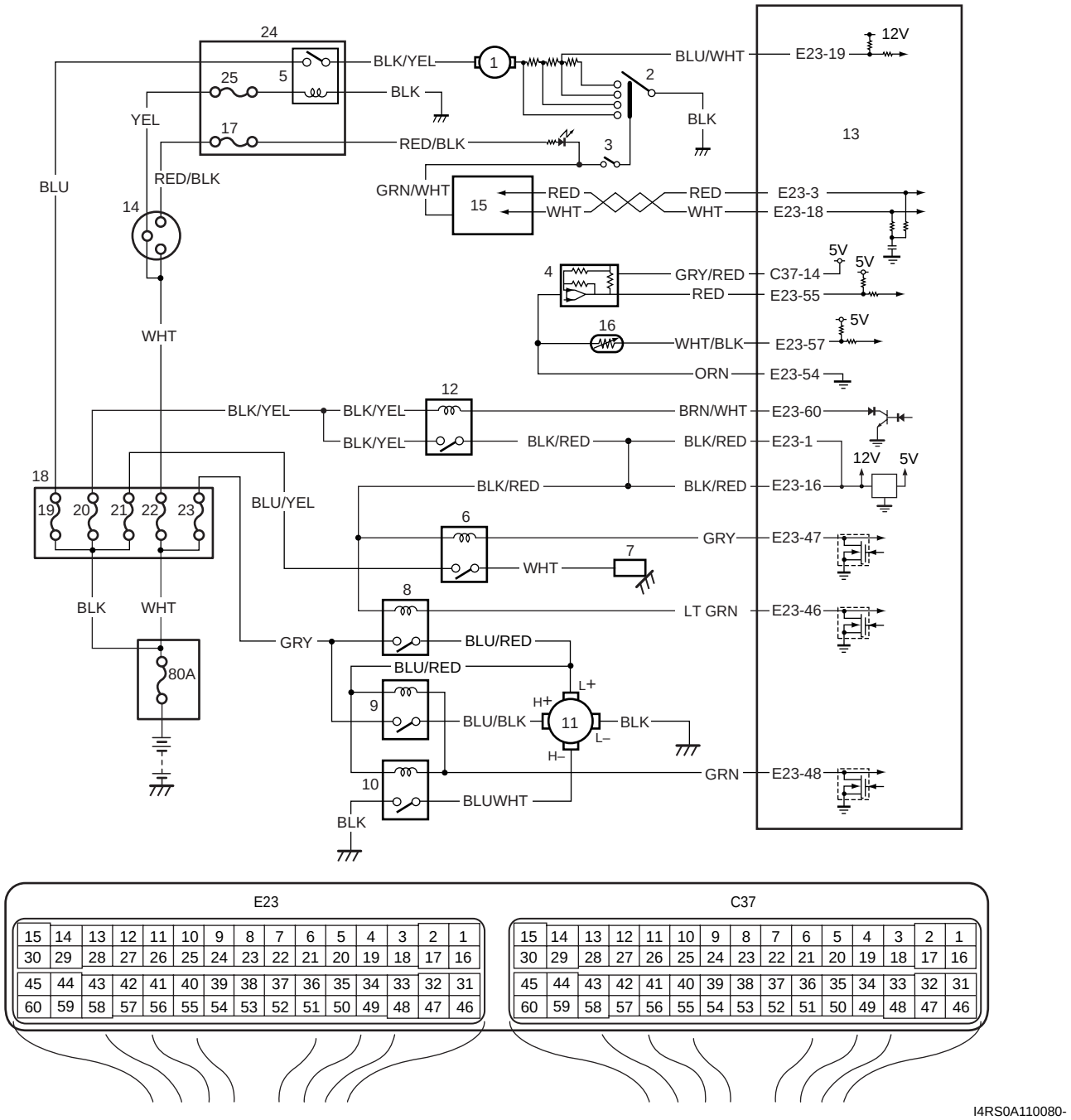
Step	Action	Yes	No
1	1) Check engine idle speed and IAC duty referring to "Idle Speed / Idle Air Control (IAC) Duty Inspection: ". *Is idle speed within specification?*	Go to Step 2.	Go to Step 4.
2	*Is IAC duty within specification in Step 1?*	Go to Step 3.	Check for Vacuum leak, EVAP canister purge control system, Clog of IAC air passage, Accessory engine load, "Electric Load Signal Circuit Check: ", Closed throttle position (TP sensor), Stuck of PCV valve.
3	*Is engine idle speed kept at specified speed even with headlight turned ON?*	System is in good condition.	Go to Step 7.
4	*Was idle speed higher than specification in Step 1?*	Go to Step 5.	Go to Step 7.
5	**A/C system circuit check** 1) Check A/C System circuit referring to Step 1 of "A/C System Circuits Check: ". *Is it in good condition?*	Go to Step 6.	Repair or replace A/C system circuit or A/C system.
6	**ECT sensor check** 1) Check ECT sensor performance referring to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". *Is it in good condition?*	Go to Step 7.	Replace ECT sensor and recheck.
7	**Idle air control system check** 1) Remove IAC valve from throttle body referring to "Idle Air Control (IAC) Valve Removal and Installation: in Section 1C". 2) Check IAC valve for operation referring to "Idle Air Control (IAC) Valve On-Vehicle Inspection: in Section 1C".  I3RB0A110051- *Is check result satisfactory?*	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 8.

Step	Action	Yes	No
8	**Idle air control valve circuit check** 1) Check idle air control valve circuit referring to Step 4 to 10 of “DTC P0505: Idle Air Control System: ”. *Is circuit in good condition?*	Replace IAC valve.	Repair IAC valve circuit.

A/C System Circuits Check

S4RS0A1104060

Wiring Diagram



I4RS0A110080-

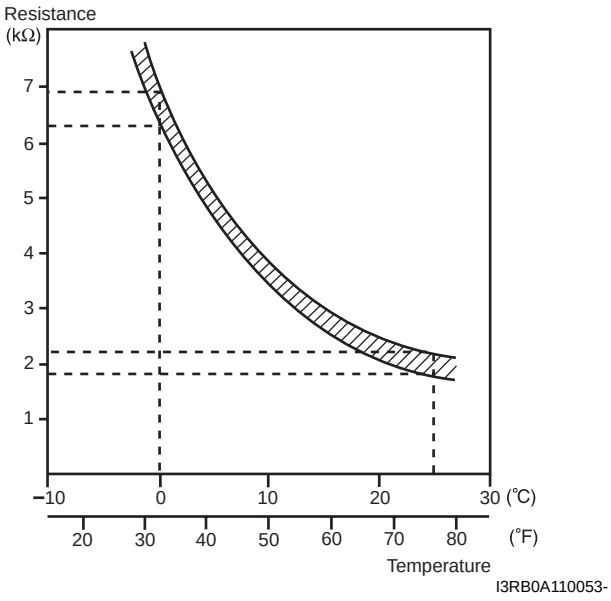
1. Blower fan motor	8. Radiator cooling fan motor relay No.1	15. BCM	22. "IG ACC" fuse
2. Blower fan switch	9. Radiator cooling fan motor relay No.2	16. Evaporator outlet air temp. sensor	23. "RDTR FAN" fuse
3. A/C switch	10. Radiator cooling fan motor relay No.3	17. "IG1 SIG" fuse	24. Junction block assembly
4. A/C refrigerant pressure sensor	11. Radiator cooling fan motor	18. Relay box	25. "IG2 SIG" fuse
5. Blower motor relay	12. Main relay	19. "HTR FAN" fuse	
6. Compressor relay	13. ECM	20. "FI" fuse	
7. A/C compressor	14. Ignition switch	21. "A/C COMP" fuse	

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	**Reception data check from BCM** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check DTC for reception data from BCM. *Is there DTC P1678?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**A/C switch signal circuit check** 1) Start engine and select "DATA LIST" mode on scan tool. 2) Check A/C switch signal under following conditions respectively. **A/C switch signal** **Engine running, A/C switch OFF: OFF** **Engine running, A/C switch ON and blower speed selector turned 1st position or more: ON** *Is check result satisfactory?*	Go to Step 3.	Check A/C switch circuit.
3	**DTC check of ECT sensor circuit** 1) Check ECM for DTC of ECT sensor circuit. *Is there DTC P0116, DTC P0117 or DTC P0118?*	Go to applicable DTC diag. flow.	Go to Step 4.
4	**Radiator cooling fan control system check** *Is radiator cooling fan started when A/C and blower speed selector switch are turned ON with engine running?*	Go to Step 10.	Go to Step 5.
5	**Radiator cooling fan control circuit check** 1) Check DTC with scan tool. *Is DTC P0480 displayed?*	Go to "DTC P0480: Fan 1 (Radiator Cooling Fan) Control Circuit: ".	Go to Step 6.

Step	Action	Yes	No
6	**A/C evaporator outlet air temp. sensor check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection to “E23-57” and “E23-54” wire terminals of ECM connector. 3) If OK, measure resistance between “E23-57” and “E23-54” wire terminals of ECM connector. **Evaporator temp. sensor resistance** **At 0 °C: 6.3 – 6.9 kΩ** **At 25 °C: 1.8 – 2.2 kΩ**  *Is resistance within specification?*	Go to Step 7.	Faulty A/C evaporator outlet air temp. sensor or its circuit.
7	**DTC check of A/C refrigerant pressure sensor circuit** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check ECM for DTC of A/C refrigerant pressure sensor circuit. *Is there DTC P0532 or DTC P0533?*	Go to applicable DTC diag. flow.	Go to Step 8.
8	**A/C refrigerant pressure sensor voltage check** 1) Check A/C refrigerant pressure sensor voltage referring to “Inspection of ECM and Its Circuits: ”. *Is voltage within specified value?*	Go to Step 9.	Check amount of refrigerant. If OK, replace A/C refrigerant pressure sensor.
9	**Radiator cooling fan check** 1) Check radiator cooling fan referring to “Radiator Cooling Fan Motor On-Vehicle Inspection: in Section 1F”. *Is check result satisfactory?*	Radiator cooling fan drive circuit malfunction. If circuit is OK, go to Step 6.	Replace radiator cooling fan motor.
10	**A/C compressor control system check** *Is A/C compressor started when A/C and blower speed selector switch are turned ON with engine running?*	A/C system is in good condition.	Go to Step 11.

Step	Action	Yes	No
11	**A/C compressor relay circuit check** 1) Measure voltage between “E23-47” wire terminal of ECM connector and vehicle body ground under following conditions respectively. **Voltage between “E23-47” terminal of ECM connector and ground** **While engine running and A/C switch turned OFF: 10 – 14 V** **While engine running, A/C and blower speed selector switch turned ON: 0 – 1 V** *Is check result satisfactory?*	Go to Step 12.	Go to Step 13.
12	**A/C compressor relay check** 1) Check A/C compressor relay referring to “Compressor Relay Inspection: in Section 7B”. *Is it in good condition?*	A/C compressor drive circuit malfunction.	Replace A/C compressor relay.
13	**A/C compressor relay circuit check** 1) Remove A/C compressor relay with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between “BLK/RED” wire terminal of A/C compressor relay connector and vehicle body ground. *Is voltage 10 –14 V?*	Go to Step 14.	“BLK/RED” wire open circuit.
14	**A/C compressor relay check** 1) Check A/C compressor relay referring to “Compressor Relay Inspection: in Section 7B”. *Is it in good condition?*	“GRY” wire open circuit. If OK, substitute a known-good ECM and recheck.	Replace A/C compressor relay.

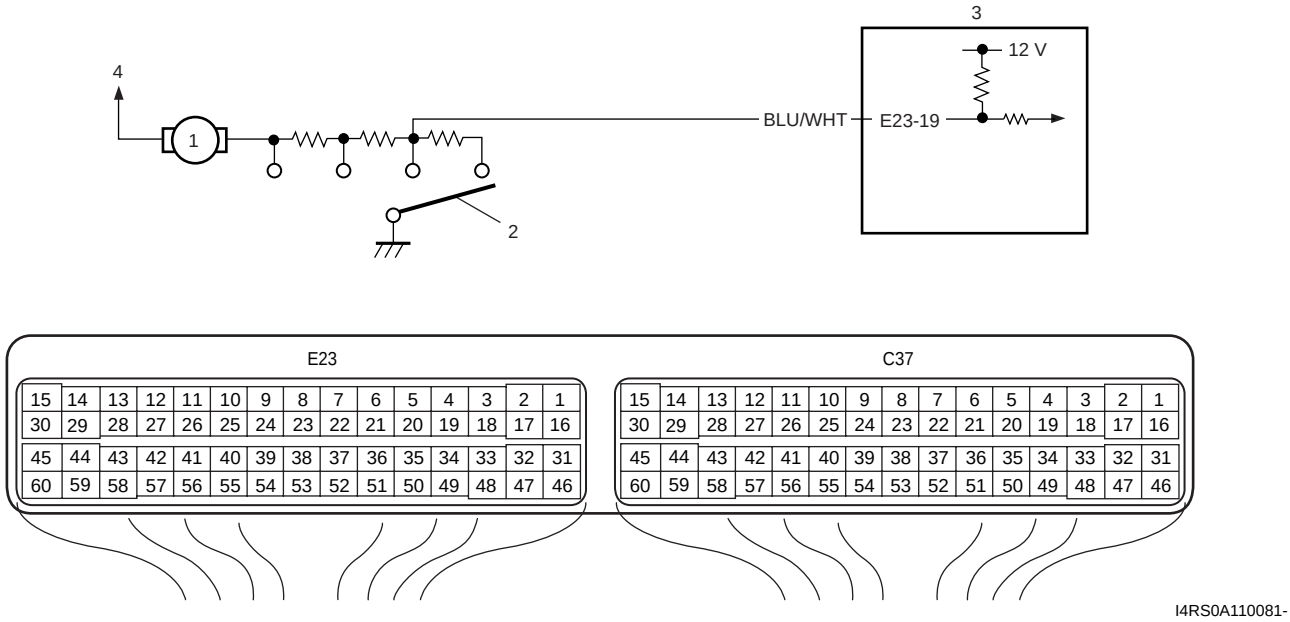
NOTE:

When A/C evaporator outlet air temp. is below 2.5 °C (36.5 °F), A/C remains OFF (“E23-47” terminal voltage becomes 10 – 14 V). This condition is not abnormal.

Electric Load Signal Circuit Check

S4RS0A1104061

Wiring Diagram



1. Blower fan motor	3. ECM
2. Blower fan switch	4. To blower motor relay

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**

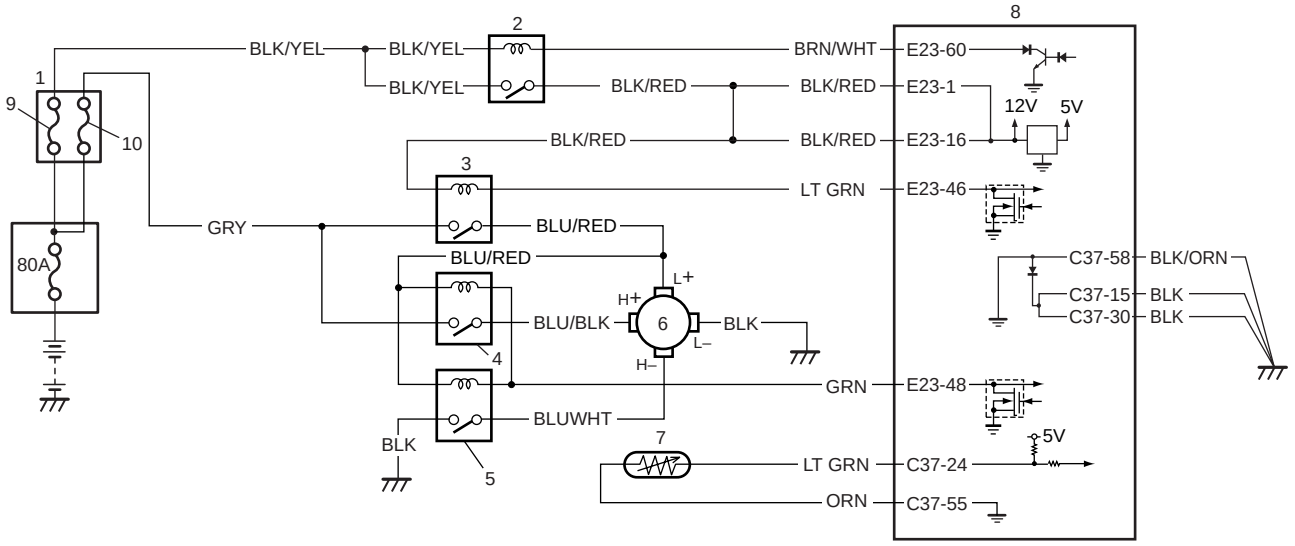
Step	Action	Yes	No
1	*Do you have SUZUKI scan tool?*	Go to Step 2.	Go to Step 3.
2	**Electric load signal circuit check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Check electric load signal under following conditions respectively. **Electric load signal** **Ignition switch turned ON, blower speed selector turned OFF or 1st position: OFF** **Ignition switch turned ON, blower speed selector turned to 2nd position or more: ON** *Is check result satisfactory?*	Electric load signal circuit is in good condition.	“BLU/WHT” wire is open circuit or short circuit, or blower circuit malfunction.

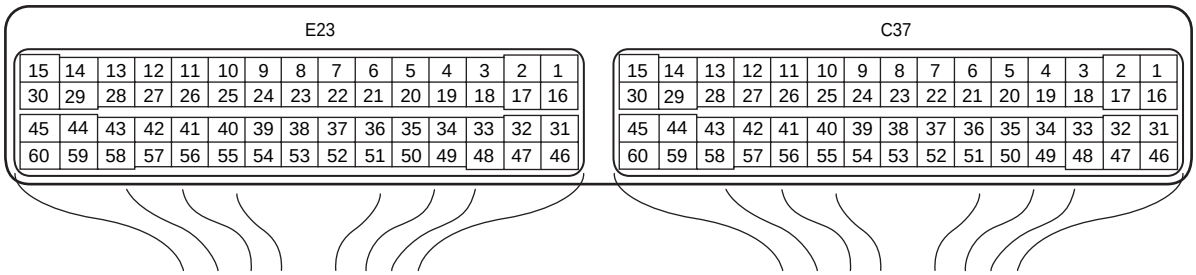
Step	Action	Yes	No
3	**Electric load signal circuit check** 1) Turn ON ignition switch. 2) Check voltage at terminal “E23-19” of ECM connector connected, under following conditions respectively. **Voltage at “E23-19”** **Ignition switch turned ON, blower speed selector turned OFF or 1st position: 10 – 14 V** **Ignition switch turned ON, blower speed selector turned to 2nd position or more: 0 V** *Is each voltage as specified?*	Electric load signal circuit is in good condition.	“BLU/WHT” wire is open circuit or short circuit, or electric load circuit malfunction.

Radiator cooling fan Low Speed Control System Check

S4RS0A1104062

Wiring Diagram





I4RS0A110082-

1. Relay box	5. Radiator cooling fan relay No. 3	9. “FI” fuse
2. Main relay	6. Radiator cooling fan motor	10. “RDTR FAN” fuse
3. Radiator cooling fan relay No. 1	7. ECT sensor	
4. Radiator cooling fan relay No. 2	8. ECM	

Troubleshooting

WARNING:

Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch at the "ON" position.

NOTE:

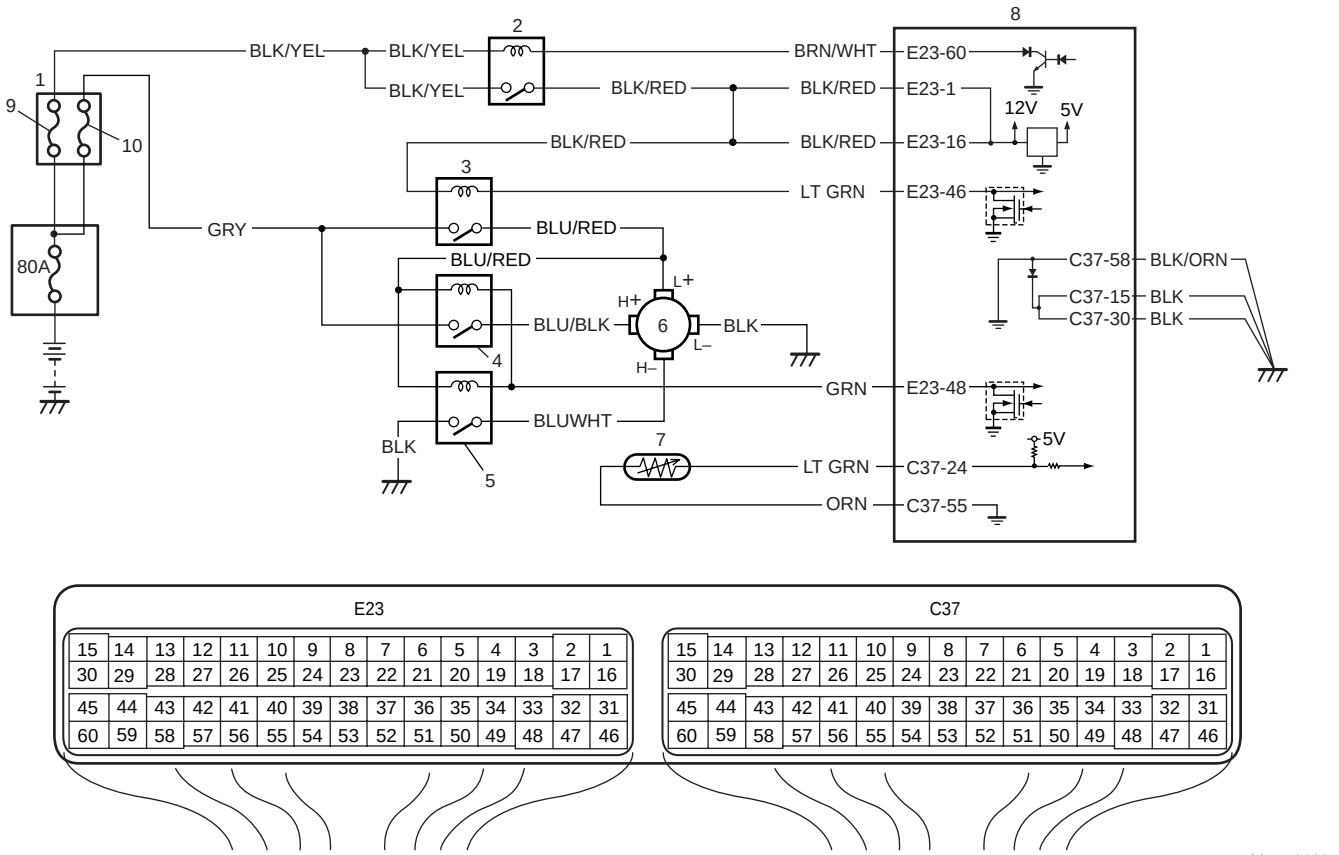
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	*Is there DTC(s) of ECT sensor circuit (DTC P0116 / P0117 / P0118) and/or radiator cooling fan circuit (DTC P0480)?*	Go to corresponding DTC flow.	Go to Step 2.
2	**Low speed radiator cooling fan control circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select "DATA LIST" mode on scan tool. 3) Warm up engine until coolant temp. is 97.5 °C, 207.5 °F or higher and A/C switch turns OFF. (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) *Is radiator cooling fan started at low speed when engine coolant temp. reached above temp.?*	Radiator cooling fan low speed control system is in good condition.	Perform from Step 2 to Step 8 in DTC P0480 diag. flow. If OK, Go to Step 3.
3	**Radiator cooling fan control check** 1) Disconnect radiator cooling fan control relays No. 2, and No. 3 from relays box with ignition switch turned OFF. 2) Run engine when ECT is over 97.5 °C, 207.5 °F. 3) Measure voltage between vehicle body ground and "BLU/RED" wire terminal of disconnected radiator cooling fan motor connector. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLU/RED" wire is open or high resistance circuit.
4	**Check radiator cooling fan wire circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "BLK" wire terminal of disconnected radiator cooling fan motor connector and vehicle body ground. *Is resistance below 1 Ω?*	Go to Step 5.	"BLK" wire is open or high resistance circuit.
5	**Radiator cooling fan check** 1) Check radiator cooling fan referring to "Radiator Cooling Fan Motor On-Vehicle Inspection: in Section 1F". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty radiator cooling fan.

Radiator cooling fan High Speed Control System Check

S4RS0A1104084

Wiring Diagram



I4RS0A110082-

1. Relay box	5. Radiator cooling fan relay No. 3	9. "FI" fuse
2. Main relay	6. Radiator cooling fan motor	10. "RDTR FAN" fuse
3. Radiator cooling fan relay No. 1	7. ECT sensor	
4. Radiator cooling fan relay No. 2	8. ECM	

Troubleshooting

WARNING:

Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch at the "ON" position.

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance d/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	*Is there DTC(s) of ECT sensor circuit (DTC P0116 / P0117 / P0118) and/or radiator cooling fan circuit (DTC P0480)?*	Go to corresponding DTC flow.	Go to Step 2.
2	**Low speed radiator cooling fan control circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Warm up engine until coolant temp. is 97.5 °C, 207.5 °F or higher and A/C switch turns OFF. (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) *Is radiator cooling fan started at low speed when engine coolant temp. reached above temp.?*	Go to Step 3.	Perform from Step 2 to Step 5 in “Radiator cooling fan Low Speed Control System Check: ”.
3	**High speed radiator cooling fan control circuit check** 1) Start engine and select “DATA LIST” mode on scan tool. 2) Warm up engine until coolant temp. is 102.5 °C, 216.5 °F or higher and A/C switch turns OFF. (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) *Is radiator cooling fan started at high speed when engine coolant temp. reached above temp?*	Radiator cooling fan control system is in good condition.	Perform from Step 9 to Step 14 in DTC P0480 diag. flow. If OK, Go to Step 4.
4	**Radiator cooling fan control No. 2 and No. 3 check** 1) Run engine when ECT is over 102.5 °C, 216.5 °F. 2) Measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage lower than 1.5 V?*	Go to Step 5.	Faulty ECM.
5	**Radiator cooling fan No. 2 wire circuit check** 1) Remove radiator cooling fan control relay No.2 with ignition switch turned OFF. 2) Measure voltage between “GRY” wire terminal of disconnected radiator cooling fan control relay No. 2 connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 6.	“GRY” wire is open or high resistance circuit.
6	**Radiator cooling fan No. 2 wire circuit check** 1) Disconnect connector from radiator cooling fan motor with ignition switch turned OFF. 2) Measure resistance between “BLU/BLK” wire terminal of disconnected radiator cooling fan control relay No. 2 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	“BLU/BLK” wire is shorted to ground circuit.
7	**Radiator cooling fan No. 2 wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “BLU/BLK” wire terminal of disconnected radiator cooling fan control relay No. 2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	“BLU/BLK” wire is shorted to power supply circuit.

Step	Action	Yes	No
8	**Radiator cooling fan control No. 2 check** 1) Connect radiator cooling fan control relay No. 2 to relay box with ignition switch turned OFF. 2) Run engine when ECT is over 102.5 °C, 216.5 °F. 3) Measure voltage between vehicle body ground and "BLU/BLK" wire terminal of disconnected radiator cooling fan motor connector. *Is voltage 10 – 14 V?*	Go to Step 10.	Go to Step 9.
9	**Radiator cooling fan control relay No.2 check** 1) Remove radiator cooling fan control relay No.2 with ignition switch turned OFF. 2) Check radiator cooling fan control relay No.2 referring to "Radiator Cooling Fan Relay Inspection: in Section 1F" *Is it in good condition?*	"BLU/BLK" wire is open or high resistance circuit.	Faulty radiator cooling fan control relay No.2.
10	**Radiator cooling fan No. 3 wire circuit check** 1) Remove radiator cooling fan control relay No.3 with ignition switch turned OFF. 2) Measure resistance between vehicle body ground and "BLK" wire terminal of disconnected radiator cooling fan control relay No. 3 connector in relay box. *Is resistance below 1 Ω?*	Go to Step 11.	"BLK" wire is open or high resistance circuit.
11	**Radiator cooling fan control No. 3 check** 1) Connect radiator cooling fan control relay No. 3 to relay box with ignition switch turned OFF. 2) Run engine when ECT is over 102.5 °C, 216.5 °F. 3) Measure resistance between vehicle body ground and "BLU/WHT" wire terminal of disconnected radiator cooling fan motor connector. *Is resistance below 2 Ω?*	Go to Step 13.	Go to Step 12.
12	**Radiator cooling fan control relay No. 3 check** 1) Remove radiator cooling fan control relay No.3 with ignition switch turned OFF. 2) Check radiator cooling fan control relay No.3 referring to "Radiator Cooling Fan Relay Inspection: in Section 1F" *Is it in good condition?*	"BLU/WHT" wire is open or high resistance circuit.	Faulty radiator cooling fan control relay No.3.
13	**Radiator cooling fan check** 1) Check radiator cooling fan referring to "Radiator Cooling Fan Motor On-Vehicle Inspection: in Section 1F". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty radiator cooling fan.

Repair Instructions

Idle Speed / Idle Air Control (IAC) Duty Inspection

S4RS0A1106001

Before idle speed / IAC duty check, make sure of the following.

- Lead wires and hoses of electronic fuel injection and engine and emission control systems are connected securely.
- Accelerator cable has some play, that is, it is not tight.
- Valve lash is checked according to maintenance schedule.
- Ignition timing is within specification.
- All accessories (wipers, heater, lights, A/C, etc.) are out of service.
- Air cleaner has been properly installed and is in good condition.
- No abnormal air drawn in from air intake system.

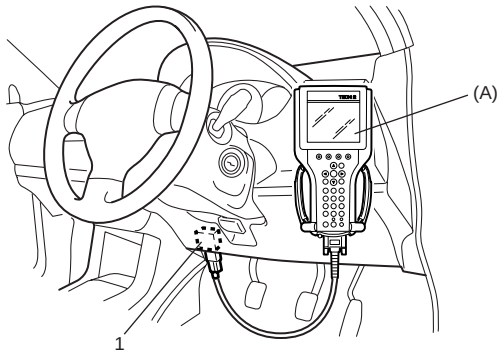
After all items are confirmed, check idle speed and IAC duty as follows.

NOTE:

Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), and set parking brake and block drive wheels.

1) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

Special tool
(A): SUZUKI scan tool



I4RS0A110013-

2) Warm up engine to normal operating temperature.
3) Check engine idle speed and "IAC duty" by using "Data List" mode on scan tool to check "IAC duty".
4) If duty and/or idle speed is out of specification, inspect idle air control system referring to "Idle Air Control System Check: ".

Engine idle speed and IAC duty

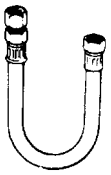
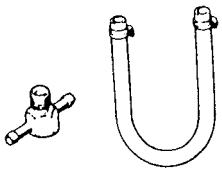
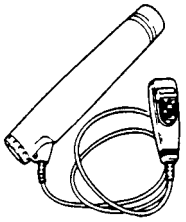
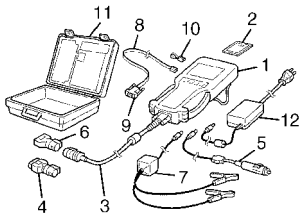
	A/C OFF	A/C ON
M/T vehicle	**700 ± 50 rpm 10 – 55%**	**850 ± 50 rpm**
A/T vehicle at P/N range	**750 ± 50 rpm 10 – 55%**	**850 ± 50 rpm**

5) Check that specified engine idle speed is obtained with A/C turned ON if vehicle is equipped with A/C. If not, check A/C system circuit and idle air control system.

Special Tools and Equipment

Special Tool

S4RS0A1108001

09912–58432 Fuel pressure gauge hose This tool is included in fuel pressure gauge set (09912-58413). ☞ 	09912–58442 Fuel pressure gauge This tool is included in fuel pressure gauge set (09912-58413). ☞
09912–58490 3-way joint & hose ☞ 	09930–76420 Timing-light (dry cell type) ☞ 
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞ 	

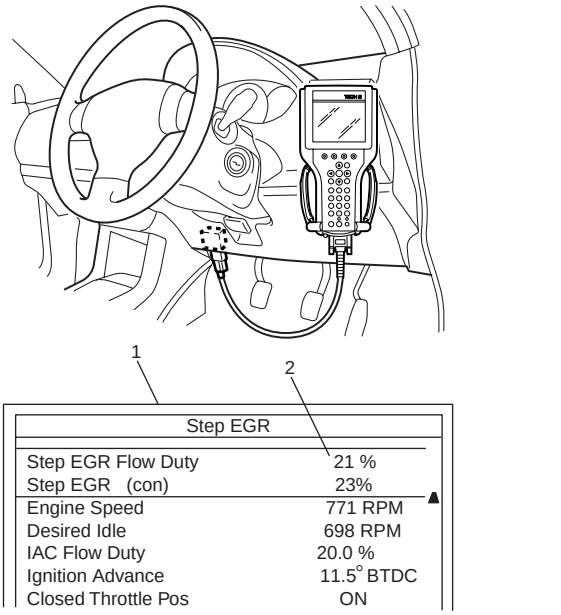
Aux. Emission Control Devices

Diagnostic Information and Procedures

EGR System Inspection

S4RS0A1204001

1) Connect SUZUKI scan tool to data link connector (DLC) with ignition switch turned OFF.
2) Turn ON ignition switch and erase DTC using “CLEAR DTC” in “TROUBLE CODES” menu.
3) Start engine and warm it up to normal operating temperature then select “DATA LIST” mode on scan tool.
4) Make sure that vehicle condition is as follows.
   - Vehicle speed = 0 km/h (0 KPH)
   - Engine speed ≤ 900 rpm
   - Engine coolant temp. ≥ 90 °C, 164 °F
5) With engine idling (without depressing accelerator pedal), open EGR valve by using “STEP EGR” mode in “MISC TEST” menu. In this state, as EGR valve opening increases engine idle speed drops. If not, possible cause is clogged EGR gas passage, stuck or faulty EGR valve.



I4RS0A120001-

1. SUZUKI scan tool display
2. EGR valve opening (0: Close, 100: Full open)

Repair Instructions

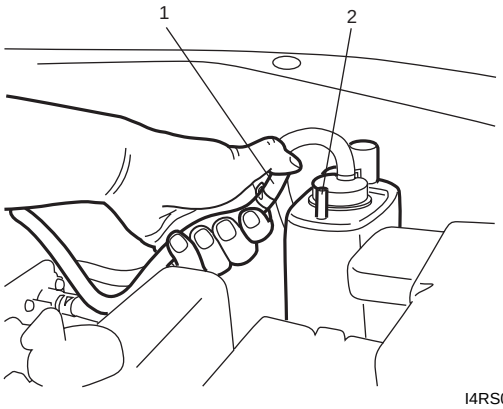
EVAP Canister Purge Inspection

S4RS0A1206001

NOTE:

Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in “P” range) and that parking brake lever is pulled all the way up.

1) Disconnect purge hose (1) from EVAP canister (2).
2) Place finger against the end of disconnected hose and check that vacuum is not felt there when engine is cool and running at idle speed. If check result is not satisfactory, check EVAP canister purge valve, wire harness and ECM.



I4RS0A120002-

EVAP Canister Purge Valve and Its Circuit Inspection

S4RS0A1206002

WARNING:

Do not apply vacuum by mouth; otherwise harmful fuel vapor can be breathed in.

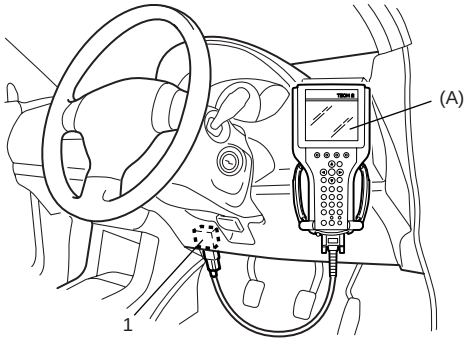
CAUTION:

Do not apply vacuum more than –86 kPa (–12.47 psi); otherwise EVAP canister purge valve could be damaged.

1) Prepare to operate EVAP canister purge valve as follows.
   a) When using SUZUKI scan tool:
      i) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF and disconnect purge valve vacuum hoses from intake manifold and EVAP canister.

ii) Turn ON ignition switch, clear DTC and select “MISC TEST” mode on SUZUKI scan tool.

Special tool
(A): SUZUKI scan tool



I4RS0A120003-

b) When not using SUZUKI scan tool:

NOTE:

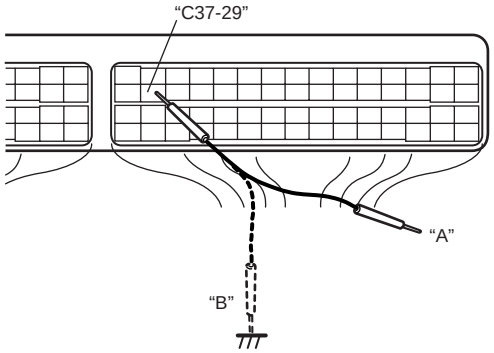
Before performed this check, be sure to read the “Precautions of ECM Circuit Inspection: in Section 1A”.

i) Disconnect purge valve vacuum hoses from intake manifold and EVAP canister.

ii) Remove ECM from its bracket with ECM connectors connected referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.

iii) Connect special tool between ECM and ECM connector referring to “Inspection of ECM and Its Circuits: in Section 1A”.

iv) Turn ON ignition switch.
Using service wire, ground “C37-29” terminal circuit of special tool (valve ON: “B”) and unground it (valve OFF: “A”).

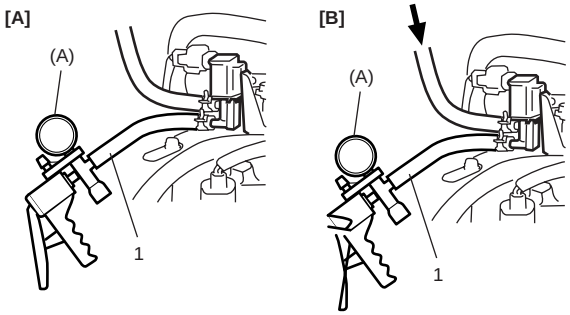


I4RS0A120004-

2) Check purge valve for operation and vacuum passage for clog when valve is switched ON and OFF by using SUZUKI scan tool or service wire.
If check result is not satisfactory, check vacuum hoses, EVAP canister purge valve, wire harness and connections.

EVAP canister purge valve specification
[A] Valve OFF: When vacuum (–60 kPa (–8.7 psi)) is applied to hose (1), vacuum can be applied.
[B] Valve ON: When vacuum is applied to hose (1), vacuum can not be applied.

Special tool
(A): 09917–47011

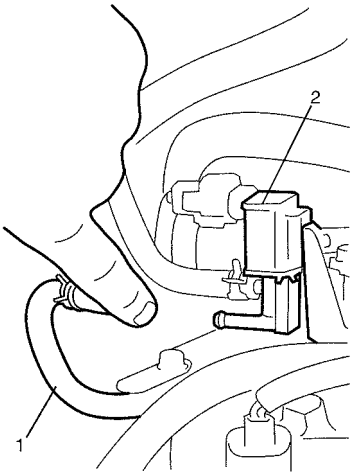


I3RB0A120005-

Vacuum Passage Inspection

S4RS0A1206003

Start engine and run it at idle speed. Disconnect vacuum hose (1) from EVAP canister purge valve (2). With finger placed against disconnected hose, check that vacuum is applied.
If it is not applied, clean vacuum passage by blowing compressed air.

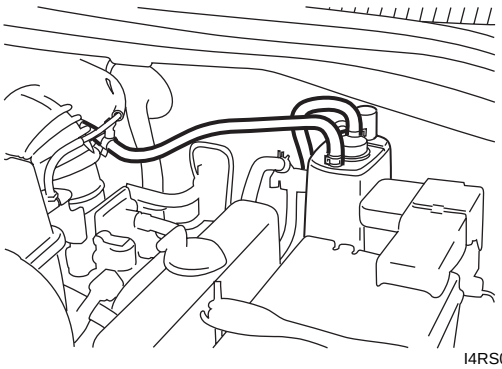


I3RM0A120006-

Vacuum Hose Inspection

S4RS0A1206004

Check hoses for connection, leakage, clog and deterioration.
Replace as necessary.



I4RS0A120005-

EVAP Canister Purge Valve Inspection

S4RS0A1206005

WARNING:

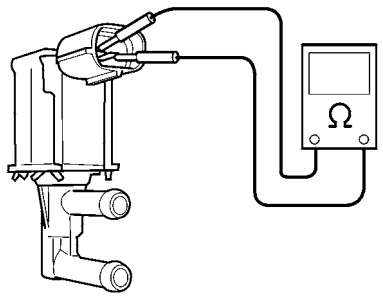
Do not apply vacuum by mouth; otherwise harmful fuel vapor can be breathed in.

CAUTION:

Do not apply vacuum more than –86 kPa (–12.47 psi); otherwise EVAP canister purge valve could be damaged.

1) With ignition switch turned OFF, disconnect coupler and vacuum hoses from canister purge valve.
2) Remove EVAP canister purge valve from air cleaner assembly.
3) Check resistance between two terminals of EVAP canister purge valve.
   If resistance is not as specified, replace EVAP canister purge valve.

   EVAP canister resistance
   30 – 34 Ω at 20 °C (68 °F)



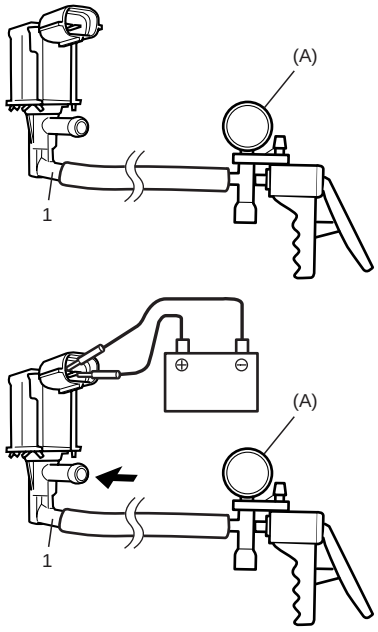
I3RM0A120008-

4) With coupler disconnected, apply vacuum (–60 kPa (–8.7 psi)) to pipe (1). If vacuum can be applied, go to next step. If vacuum can not be applied, replace EVAP canister purge valve.
5) In this state, connect 12 V-battery to EVAP canister purge valve terminals. If vacuum can not be applied, EVAP canister purge valve is in good condition.
   If applied, replace EVAP canister purge valve.

WARNING:

Do not suck the air through valve. Fuel vapor inside valve is harmful.

Special tool
(A): 09917–47011



I3RB0A120007-

6) Install EVAP canister purge valve to air cleaner assembly.

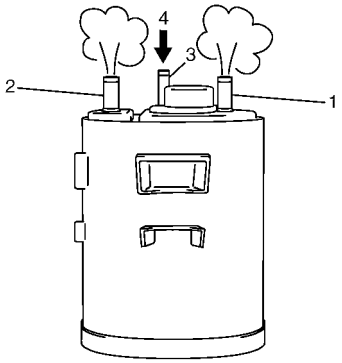
EVAP Canister Inspection

S4RS0A1206006

WARNING:

DO NOT SUCK nozzles on EVAP canister. Fuel vapor inside EVAP canister is harmful.

1) Check outside of EVAP canister visually.
2) Disconnect vacuum hoses from EVAP canister.
3) Check that there is no restriction of flow through purge pipe (1) and air pipe (2) when air is blown (4) into tank pipe (3).
   If any faulty condition is found in this inspection, replace EVAP canister.



I4RS0A120006-

EGR Valve Removal and Installation

S4RS0A1206007

Removal

1) Disconnect negative cable at battery.
2) Remove air intake pipe.
3) Remove EGR pipe.
4) Disconnect EGR valve connector.
5) Remove EGR valve and gasket from cylinder head.

Installation

Reverse removal procedure noting the following.

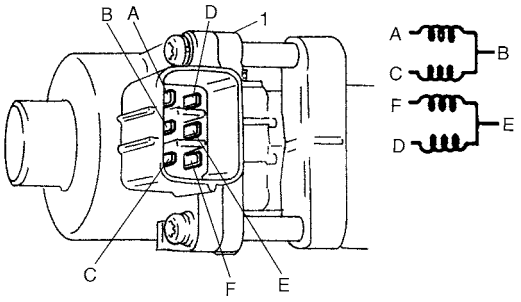
- Clean mating surface of valve and cylinder head.
- Use new gaskets.

EGR Valve Inspection

S4RS0A1206008

1) Check resistance between following terminals of EGR valve (1) in each pair.
   If found faulty, replace EGR valve assembly.

   EGR valve resistance (A – B, C – B, F – E, D – E terminal)
   20 – 24 Ω



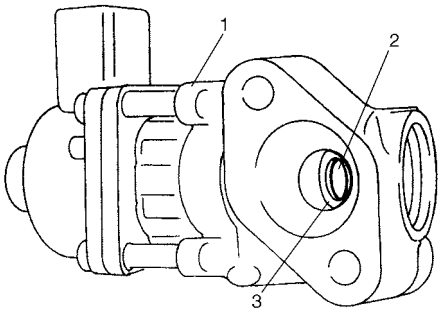
I2RH0B120005-

2) Remove carbon from EGR valve gas passage.

CAUTION:

Do not use any sharp-edged tool to remove carbon.
Be careful not to damage or bend EGR valve (1), valve seat (3) and rod.

3) Inspect valve (2), valve seat and rod for fault, cracks, bend or other damage.
   If found faulty, replace EGR valve assembly.



I2RH0B120006-

PCV Hose Inspection

S4RS0A1206009

NOTE:

Be sure to check that there is no obstruction in PCV valve or its hoses before checking IAC duty, for obstructed PCV valve or hose hampers its accurate adjustment.

Check hoses for connection, leakage, clog and deterioration.
Replace as necessary.

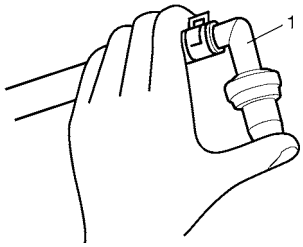
PCV Valve Inspection

S4RS0A1206010

NOTE:

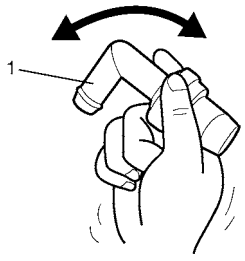
Be sure to check that there is no obstruction in PCV valve or its hoses before checking IAC duty, for obstructed PCV valve or hose hampers its accurate adjustment.

1) Detach air cleaner assembly.
2) Disconnect PCV valve from cylinder head cover and install plug to head cover hole.
3) Install air cleaner assembly temporarily.
4) Run engine at idle.
5) Place your finger over end of PCV valve (1) to check for vacuum.
   If there is no vacuum, check for clogged valve.
   Replace as necessary.



I2RH0B120007-

6) After checking vacuum, stop engine and remove PCV valve (1).
   Shake valve and listen for rattle of check needle inside the valve. If valve does not rattle, replace it.



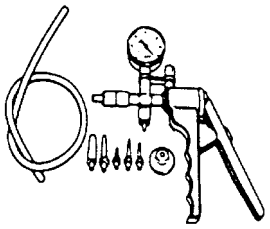
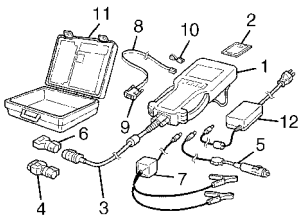
I2RH0B120008-

7) After checking, remove plug and install PCV valve.
8) Install air cleaner assembly securely.

Special Tools and Equipment

Special Tool

S4RS0A1208001

09917–47011 Vacuum pump gauge ☞ / ☞		SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞	

Engine Electrical Devices

Repair Instructions

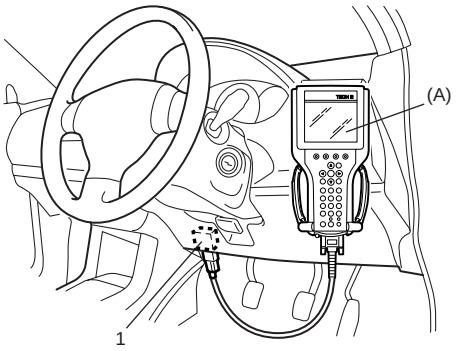
Idle Air Control (IAC) Valve Operation Inspection

S4RS0A1306001

Using SUZUKI scan tool

1) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

   Special tool
   (A): SUZUKI scan tool



I4RS0A130001-

2) Warm up engine to normal operating temperature.
3) Clear DTC and select “MISC TEST” mode on SUZUKI scan tool.
4) Check that idle speed increases and/or reduces when IAC valve is opened and/or when closed by SUZUKI scan tool.
   If idle speed does not change, check IAC valve and wire harness.

Not Using SUZUKI Scan Tool

1) Warm up engine to normal operating temperature.
2) Stop engine.
3) Turn ignition switch to ON position.
4) Disconnect IAC valve connector.
5) Start engine.
6) Connect IAC valve connector.
7) Check that idle speed increases and/or reduces when connector is connected to IAC valve.
   If idle speed does not change, check IAC valve and wire harness.

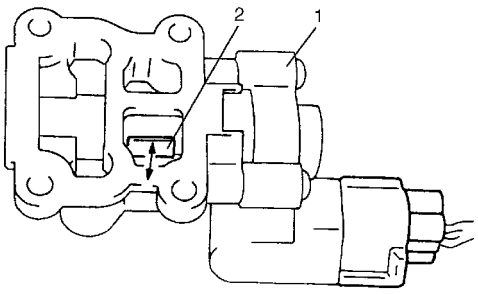
Idle Air Control (IAC) Valve On-Vehicle Inspection

S4RS0A1306002

1) Remove IAC valve referring to “Idle Air Control (IAC) Valve Removal and Installation: ”.
2) Connect each connector to IAC valve (1) and TP sensor.
3) Check that rotary valve (2) of IAC valve opens and closes once and then stops in about 60 ms as soon as ignition switch is turned ON.

NOTE:

- **This check should be performed by two people, one person turns on ignition switch while the other checks valve operation.**
- **As valve operation is momentary, it may be overlooked. To prevent this, perform this operation check 3 times or more continuously.**
  If rotary valve of IAC valve does not operate at all, check wire harness for open and short. If wire harness is in good condition, replace IAC valve and recheck.



I2RH0B130002-

4) Install IAC valve referring to “Idle Air Control (IAC) Valve Removal and Installation: ”.

Idle Air Control (IAC) Valve Removal and Installation

S4RS0A1306003

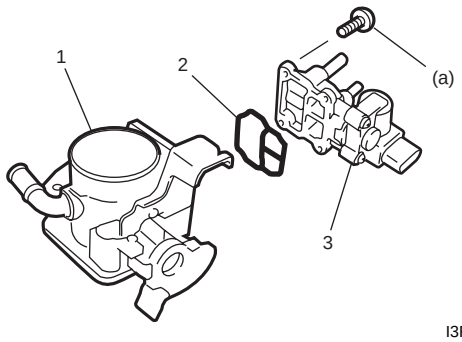
Removal

1) Remove throttle body referring to “Throttle Body Removal and Installation: in Section 1D”.
2) Remove IAC valve from throttle body.

Installation

1) Install new gasket (2) to throttle body (1).
2) Install IAC valve (3) to throttle body.
Tighten IAC valve screws to specified torque.

Tightening torque
IAC valve screw (a): 3.5 N·m (0.35 kg-m, 2.5 lb-ft)



I3RB0A130001-

3) Install throttle body referring to “Throttle Body Removal and Installation: in Section 1D”.

Engine Control Module (ECM) Removal and Installation

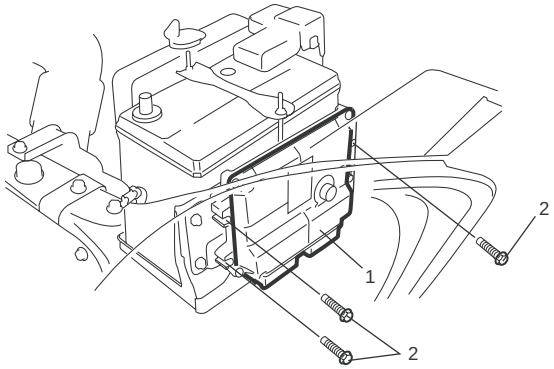
S4RS0A1306004

CAUTION:

As ECM consists of precision parts, be careful not to expose it to excessive shock.

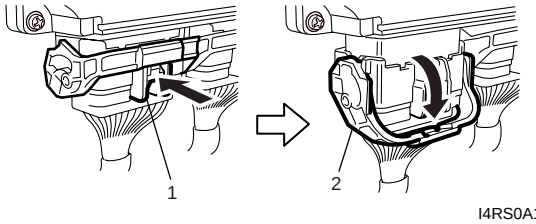
Removal

1) Disconnect negative cable at battery.
2) Remove ECM (1) from its bracket by removing its mounting bolts (2).



I4RS0A130002-

3) Disconnect connectors from ECM as follows.
   a) Push lock (1) to release locking of lock lever (2).
   b) Turn lock lever to arrow direction until it stops.

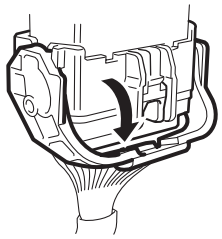


I4RS0A130003-

Installation

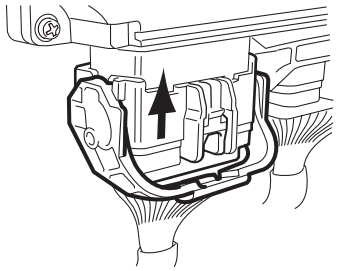
Reverse removal procedure noting the following:

- Connect connectors to ECM as follows.
  a. Make sure that lock lever of ECM connector is unlock position.



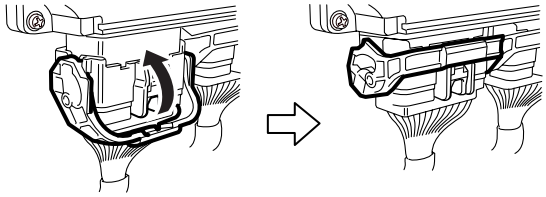
I4RS0B130021-

  b. Insert ECM connectors to ECM until it stops with unlocked lock lever.



I4RS0B130022-

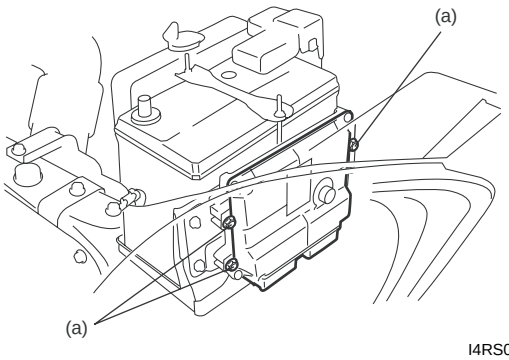
  c. Lock ECM connectors securely by pulling its lock lever up.



I4RS0A130004-

- Tighten ECM mounting bolts to specified torque.

Tightening torque
ECM mounting bolt (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)



I4RS0A130005-

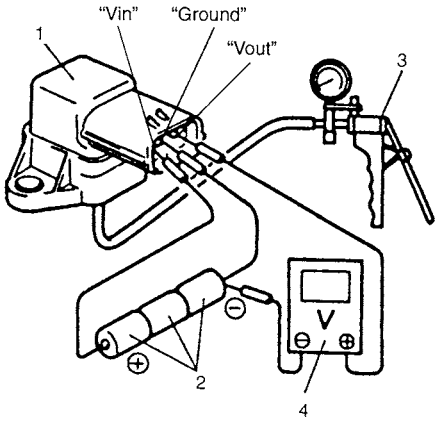
Manifold Absolute Pressure (MAP) Sensor Inspection

S4RS0A1306005

1) Remove air cleaner assembly.
2) Disconnect connector from MAP sensor.
3) Remove MAP sensor.
4) Arrange 3 new 1.5 V batteries (2) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin” terminal of sensor and negative terminal to “Ground” terminal. Then check voltage between “Vout” and “Ground”. Also, check if voltage reduces when vacuum is applied up to 400 mmHg by using vacuum pump (3).
   If check result is not satisfactory, replace MAP sensor (1).

Output voltage (When input voltage is 4.5 – 5.5 V, ambient temp. 20 – 30 °C, 68 – 86 °F)

Altitude (Reference)		Barometric pressure		Output voltage
(ft)	(m)	(mmHg)	(kPa)	(V)
0 – 2000	0 – 610	760 – 707	100 – 94	3.3 – 4.3
2001 – 5000	611 – 1524	Under 707 over 634	94 – 85	3.0 – 4.1
5001 – 8000	1525 – 2438	Under 634 over 567	85 – 76	2.7 – 3.7
8001 – 10000	2439 – 3048	Under 567 over 526	76 – 70	2.5 – 3.3



I3RM0A130005-

5) Install MAP sensor securely.
6) Connect MAP sensor connector securely.
7) Install air cleaner assembly.

Throttle Position (TP) Sensor On-Vehicle Inspection

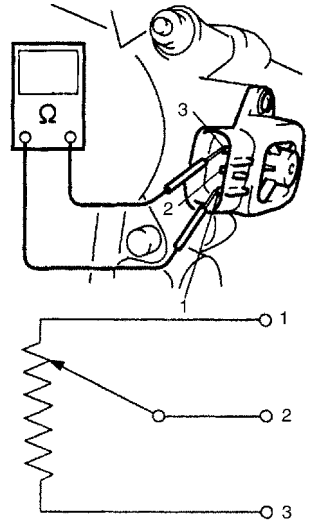
S4RS0A1306006

1) Disconnect negative cable at battery.
2) Disconnect TP sensor connector.
3) Using ohmmeter, check resistance between terminals under each condition.
   If check result is not satisfactory, replace TP sensor.

TP sensor resistance
Between terminals “1” and “3”: 4.0 – 6.0 kΩ
Between terminals “2” and “3”: 20 Ω – 6.0 kΩ, varying according to throttle valve opening

NOTE:

There should be more than 2 kΩ resistance difference between when throttle valve is at idle position and when it is fully open.



I3RB0A130003-

1. Reference voltage terminal
2. Output voltage terminal
3. Ground terminal

4) Connect TP sensor connector securely.
5) Connect negative cable to battery.

Throttle Position (TP) Sensor Removal and Installation

S4RS0A1306007

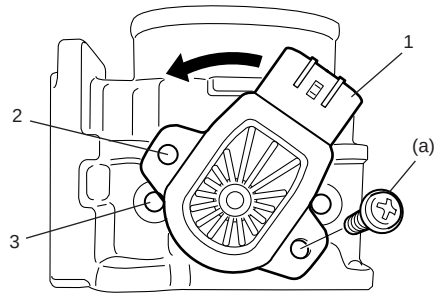
Removal

1) Disconnect negative cable at battery.
2) Disconnect TP sensor connector and remove TP sensor from throttle body.

Installation

1) Install TP sensor (1) to throttle body.
   Fit TP sensor to throttle body in such way that its holes (3) are a little away from TP sensor screw holes (2) as shown in the figure and turn TP sensor counterclockwise so that those holes align.

   Tightening torque
   TP sensor screw (a): 2.5 N·m (0.25 kg-m, 1.8 lb-ft)



I3RB0A130004-

2) Connect connector to TP sensor securely.
3) Connect negative cable to battery.

Engine Coolant Temperature (ECT) Sensor Removal and Installation

S4RS0A1306008

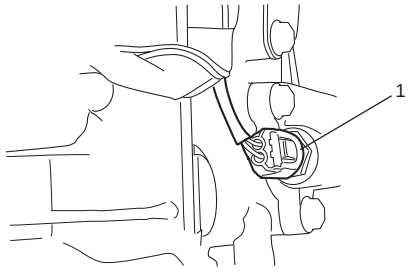
Removal

1) Disconnect negative cable at battery.
2) Drain coolant referring to “Cooling System Draining: in Section 1F”.

   WARNING:

   To avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot.
   Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

3) Remove air intake pipe.
4) Disconnect connector from ECT sensor (1).



I2RH0B130008-

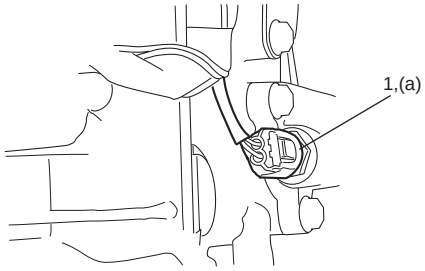
5) Remove ECT sensor from thermostat case.

Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of ECT sensor and thermostat case.
- Check O-ring for damage and replace, if necessary.
- Tighten ECT sensor (1) to specified torque.

  Tightening torque
  ECT sensor (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)



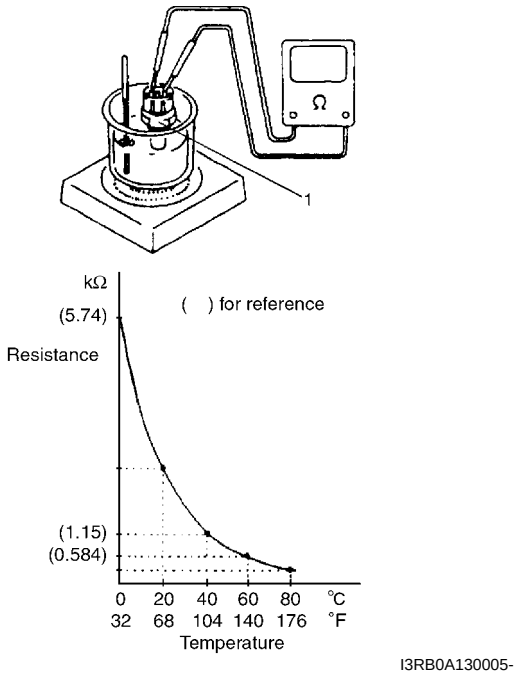
I2RH0B130009-

- Connect connector to ECT sensor securely.
- Refill coolant referring to “Cooling System Flush and Refill: in Section 1F”.

Engine Coolant Temperature (ECT) Sensor Inspection

S4RS0A1306009

Immerse temperature sensing part of ECT sensor (1) in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown, replace ECT sensor.



I3RB0A130005-

Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection

S4RS0A1306010

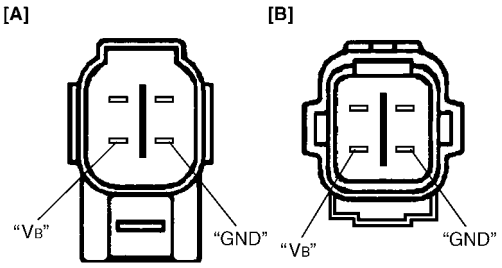
1) Disconnect sensor connector.
2) Using ohmmeter, measure resistance between terminals "V_B" and "GND" of sensor connector.
   If found faulty, replace oxygen sensor.

NOTE:

Temperature of sensor affects resistance value largely. Make sure that sensor heater is at correct temperature.

Resistance of oxygen sensor heater
HO2S-1: 5.0 – 6.4 Ω at 20 °C (68 °F)
HO2S-2: 11.7 – 14.5 Ω at 20 °C (68 °F)

Viewed from terminal side



I4RS0A130006-

[A]:	HO2S-1
[B]:	HO2S-2

3) Connect sensor connector securely.

Heated Oxygen Sensor (HO2S-1 and HO2S-2) Removal and Installation

S4RS0A1306011

Removal

WARNING:

To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.

1) Disconnect negative cable at battery.
2) Disconnect connector of heated oxygen sensor and release its wire harness from clamps.
3) Perform following items before removing heated oxygen sensor.
   a) For HO2S-1, remove exhaust manifold referring to "Exhaust Manifold Removal and Installation: in Section 1K", if necessary.
   b) For HO2S-2, hoist vehicle.
4) Remove heated oxygen sensor (1) from exhaust pipe or exhaust manifold.

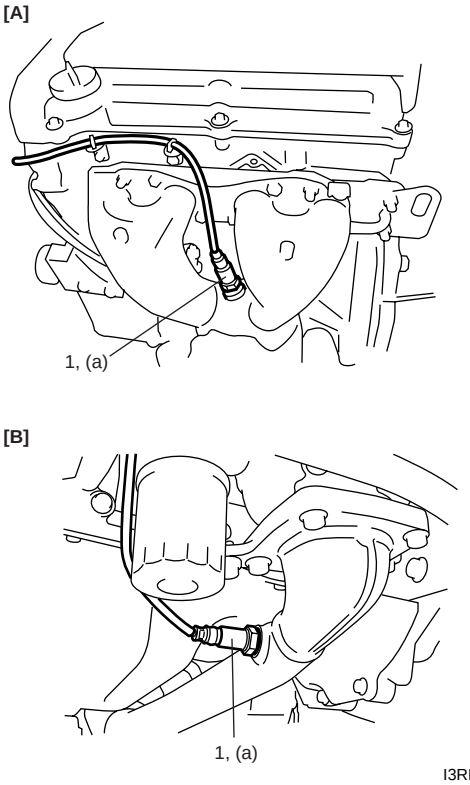
Installation

Reverse removal procedure noting the following.

- Tighten heated oxygen sensor (1) to specified torque.

  Tightening torque
  Heated oxygen sensor (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

- Install exhaust manifold referring to “Exhaust Manifold Removal and Installation: in Section 1K”, if removed.
- Connect connector of heated oxygen sensor (1) and clamp wire harness securely.
- After installing heated oxygen sensor, start engine and check that no exhaust gas leakage exists.



I3RM0A130007-

[A]: HO2S-1
[B]: HO2S-2

Camshaft Position (CMP) Sensor Removal and Installation

S4RS0A1306013

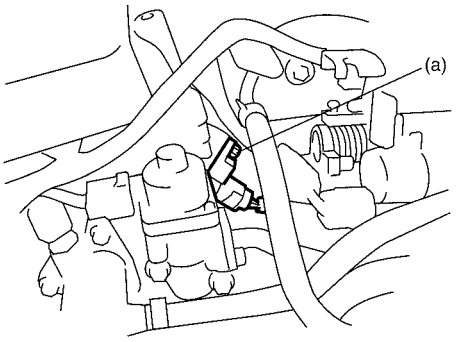
Removal

1) Disconnect negative cable at battery.
2) Disconnect connector from CMP sensor.
3) Remove camshaft position sensor from cylinder head.

Installation

1) Install camshaft position sensor to cylinder head.

   Tightening torque
   CMP sensor bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A130013-

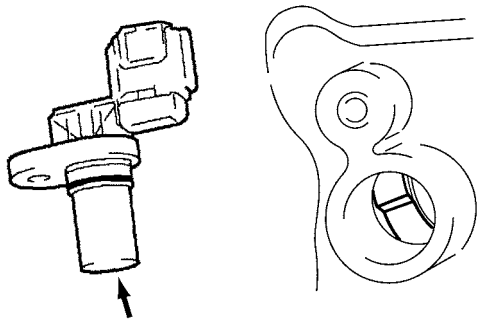
2) Connect connector to CMP sensor securely.
3) Connect negative cable to battery.

Camshaft Position (CMP) Sensor Inspection

S4RS0A1306014

Visual check

- Check that O-ring is free from damage.
- Check that end face of sensor and signal rotor tooth are free from any metal particles and damage.

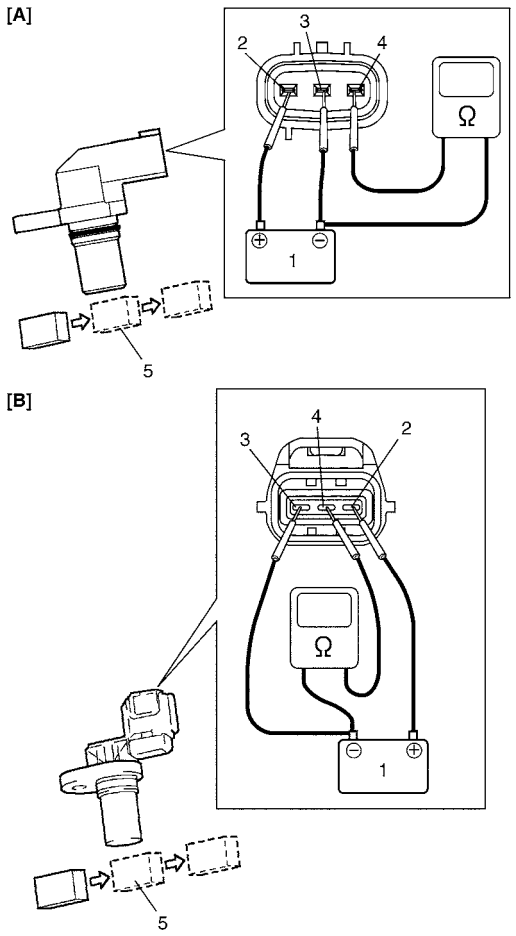


I4RS0B130015-

Performance check

1) Remove metal particles on end face of CMP sensor, if any.
2) Arrange 12 V battery (1) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using ohmmeter, measure resistance between “Vout” terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of CMP sensor.
   If resistance does not vary as specified below, replace CMP sensor.

CMP sensor resistance
Resistance varies from less than 220 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 220 Ω (ON)



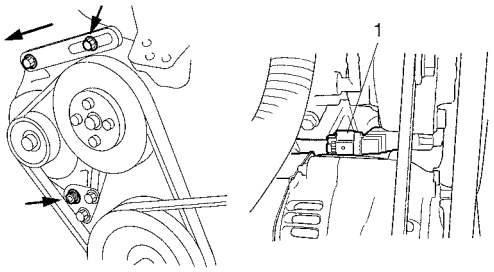
I4RS0B130016-

Crankshaft Position (CKP) Sensor Removal and Installation

S4RS0A1306015

Removal

1) Disconnect negative cable at battery.
2) Remove generator drive belt, loosen pivot bolt and move generator rearward.
3) Disconnect connector from crankshaft position sensor.
4) Remove crankshaft position sensor (1) from cylinder block.

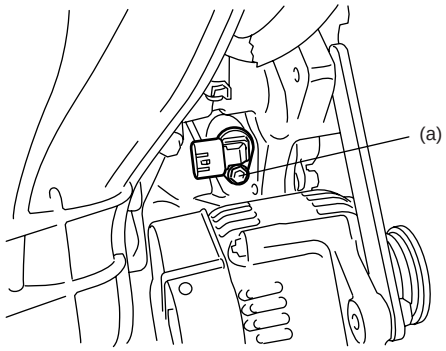


I2RH0B130012-

Installation

1) Install crankshaft position sensor to cylinder block. Tighten CKP sensor bolt to specified torque.

Tightening torque
CKP sensor bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A130007-

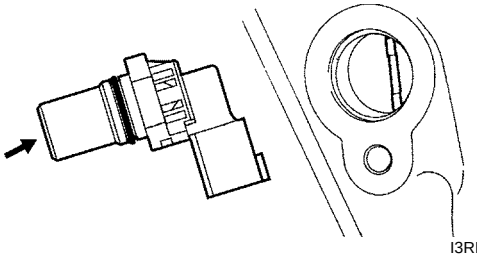
2) Connect connector to CKP sensor securely.
3) Adjust generator drive belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: in Section 1F”.
4) Connect negative cable to battery.

Crankshaft Position (CKP) Sensor Inspection

S4RS0A1306023

Visual check

- Check that O-ring is free from damage.
- Check that end face of sensor and signal pulley tooth are free from any metal particles and damage.



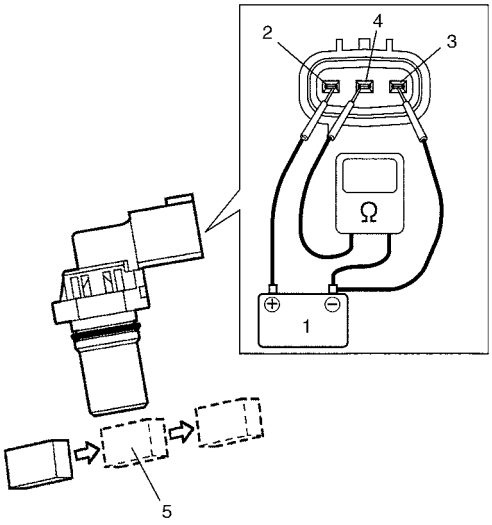
I3RB0A130006-

Performance check

1) Remove metal particles on end face of CKP sensor, if any.
2) Arrange 12 V battery (1) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using ohmmeter, measure resistance between “Vout” terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of CKP sensor.
   If resistance does not vary as specified below, replace CKP sensor.

CKP sensor resistance

Resistance varies from less than 220 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 220 Ω (ON)



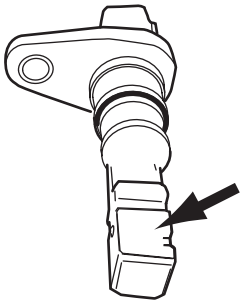
I4RS0B130017-

Vehicle Speed Sensor (VSS) Inspection (M/T model)

S4RS0A1306016

Visual check

- Check that O-ring is free from damage
- Check that end face of sensor and signal rotor tooth are free from any metal particles and damage.



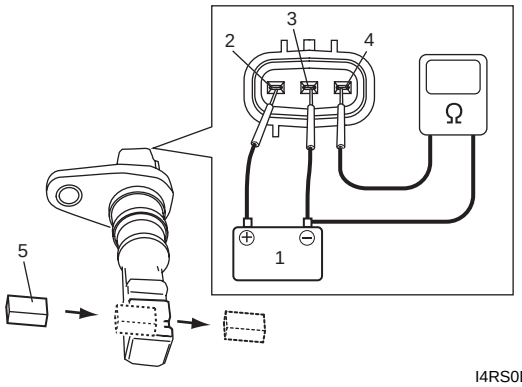
I4RS0B130018-

Performance check

1) Remove metal particles on end face of VSS, if any.
2) Arrange 12 V battery (1) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using ohmmeter, measure resistance between “Vout” terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of VSS.
   If resistance does not vary as specified below, replace VSS.

VSS resistance

Resistance varies from less than 100 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 100 Ω (ON)



I4RS0B130019-

Knock Sensor Removal and Installation

S4RS0A1306018

Removal

1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Remove right side drive shaft referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”.
4) Disconnect knock sensor connector (1).
5) Remove knock sensor (2) from cylinder block.

Installation

Reverse removal procedure for installation.

Tightening torque

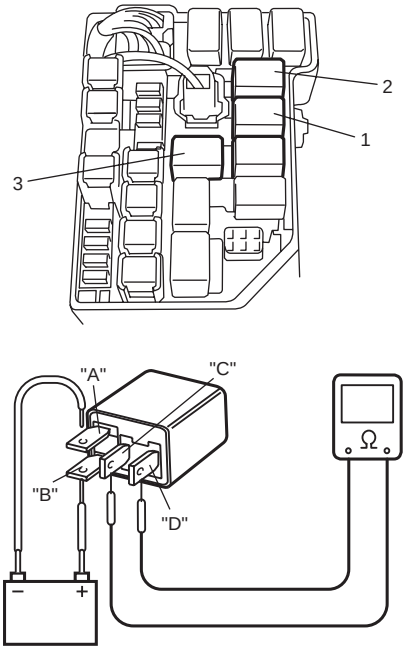
Knock sensor (a): 22 N·m (2.2 kg-m, 16.0 lb-ft)

I3RB0A130007-

Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection

S4RS0A1306019

1) Disconnect negative cable at battery.
2) Remove main relay (1), fuel pump relay (3) and starting motor control relay (2) from relay box.
3) Check that there is no continuity between terminal “C” and “D”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “B” of relay. Connect battery negative (–) terminal to terminal “A” of relay. Check for continuity between terminal “C” and “D”. If there is no continuity when relay is connected to the battery, replace relay.



I4RS0A130014-

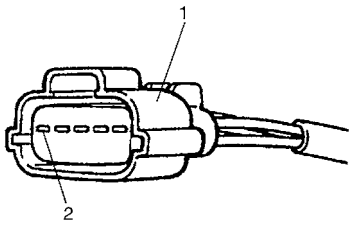
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection

S4RS0A1306020

NOTE:

Before performed this inspection, be sure to read the “Precautions of ECM Circuit Inspection: in Section 1A”.

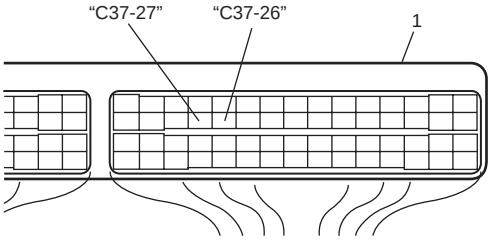
1) Disconnect negative cable at battery.
2) Disconnect MAF and IAT sensor connector.
3) Connect voltmeter to “BLK/RED” wire terminal (2) of MAF and IAT sensor connector (1) disconnected and ground.



I3RB0A130009-

4) Turn ON ignition switch position and check that voltage is battery voltage.
   If not, check if wire harness is open or connection is poor.
5) Turn OFF ignition switch position and connect connector to MAF and IAT sensor.
6) Remove ECM from its bracket referring to “Engine Control Module (ECM) Removal and Installation: ”
7) Connect special tool between ECM and ECM connector referring to “Inspection of ECM and Its Circuits: in Section 1A”.
8) Turn ON ignition switch position and check MAF signal voltage between “C37-26” terminal circuit and “C37-27” terminal circuit of special tool.

   MAF signal voltage between “C37-26” terminal circuit and “C37-27” terminal circuit of special tool
   MAF signal voltage of MAF and IAT sensor with ignition switch turned ON: 0.5 – 1.0 V



I4RS0A130009-

1. ECM

9) Start engine and check that voltage is lower than 5 V and it rises as engine speed increases.

   MAF signal voltage between “C37-26” terminal circuit and “C37-27” terminal circuit of special tool
   MAF signal reference voltage of MAF and IAT sensor at specified Idle speed: 1.3 – 1.8 V

10) If check result is not as specified above, cause may lie in wire harness, connector connection, MAF and IAT sensor or ECM.

Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Removal and Installation

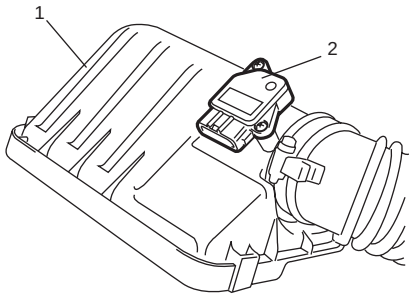
S4RS0A1306021

CAUTION:

- **Do not disassemble MAF and IAT sensor.**
- **Do not expose MAF and IAT sensor to any shock.**
- **Do not clean MAF and IAT sensor.**
- **If MAF and IAT sensor has been dropped, it should be replaced.**
- **Do not blow compressed air by using air gun or the like.**
- **Do not put finger or any other object into MAF and IAT sensor. Malfunction may occur.**

Removal

1) Disconnect negative cable at battery.
2) Disconnect MAF and IAT sensor connector.
3) Remove air cleaner case (1).
4) Remove MAF and IAT sensor (2) from air cleaner case.



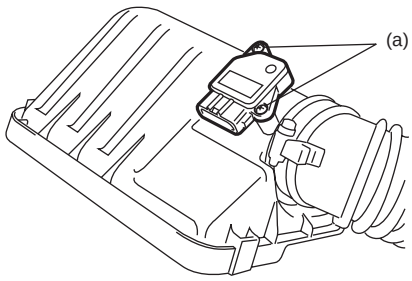
I4RS0A130010-

Installation

Reverse removal procedure noting the followings.

- Tighten MAF and IAT sensor screws to specified torque.

  Tightening torque
  MAF and IAT sensor screw (a): 1.5 N·m (0.15 kg-m, 1.1 lb-ft)



I4RS0A130011-

- Connect MAF and IAT sensor connector securely.

Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection

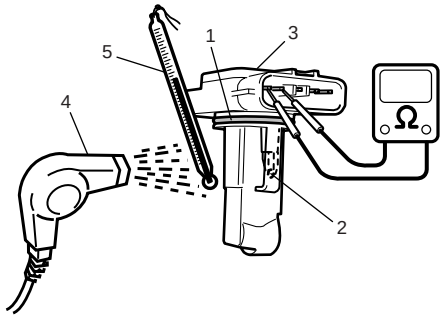
S4RS0A1306022

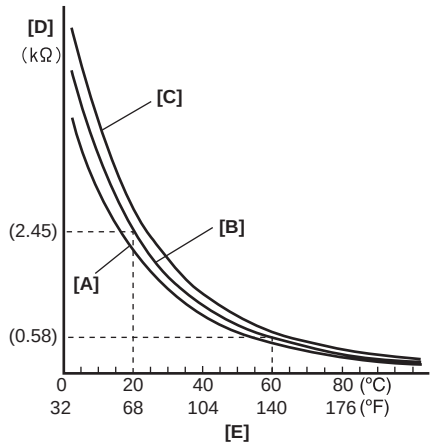
CAUTION:

Do not heat up MAF and IAT sensor more than 100 °C (212 °F). Otherwise, MAF and IAT sensor will be damaged.

- Check sensor O-ring (1) for damage and deterioration. Replace as necessary.
- Blow hot air to temperature sensing part (2) of MAF and IAT sensor (3) using hot air drier (4) and measure resistance between sensor terminals while heating air gradually.
  If measured resistance does not show such characteristic as shown, replace MAF and IAT sensor.

Intake air temperature sensor resistance
–20 °C (–4 °F): 13.6 – 18.4 kΩ
20 °C (68 °F): 2.21 – 2.69 kΩ
60 °C (140 °F): 0.493 – 0.667 kΩ





I4RS0A130012-

[A]:	Lower limit
[B]:	Nominal
[C]:	Upper limit
[D]:	Resistance
[E]:	Temperature
5.	Temperature gauge

Specifications

Tightening Torque Specifications

S4RS0A1307001

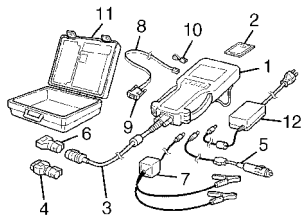
Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
IAC valve screw	3.5	0.35	2.5	☞
ECM mounting bolt	8	0.8	6.0	☞
TP sensor screw	2.5	0.25	1.8	☞
ECT sensor	15	1.5	11.0	☞
Heated oxygen sensor	45	4.5	32.5	☞
CMP sensor bolt	10	1.0	7.5	☞
CKP sensor bolt	10	1.0	7.5	☞
Knock sensor	22	2.2	16.0	☞
MAF and IAT sensor screw	1.5	0.15	1.1	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A1308001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞		

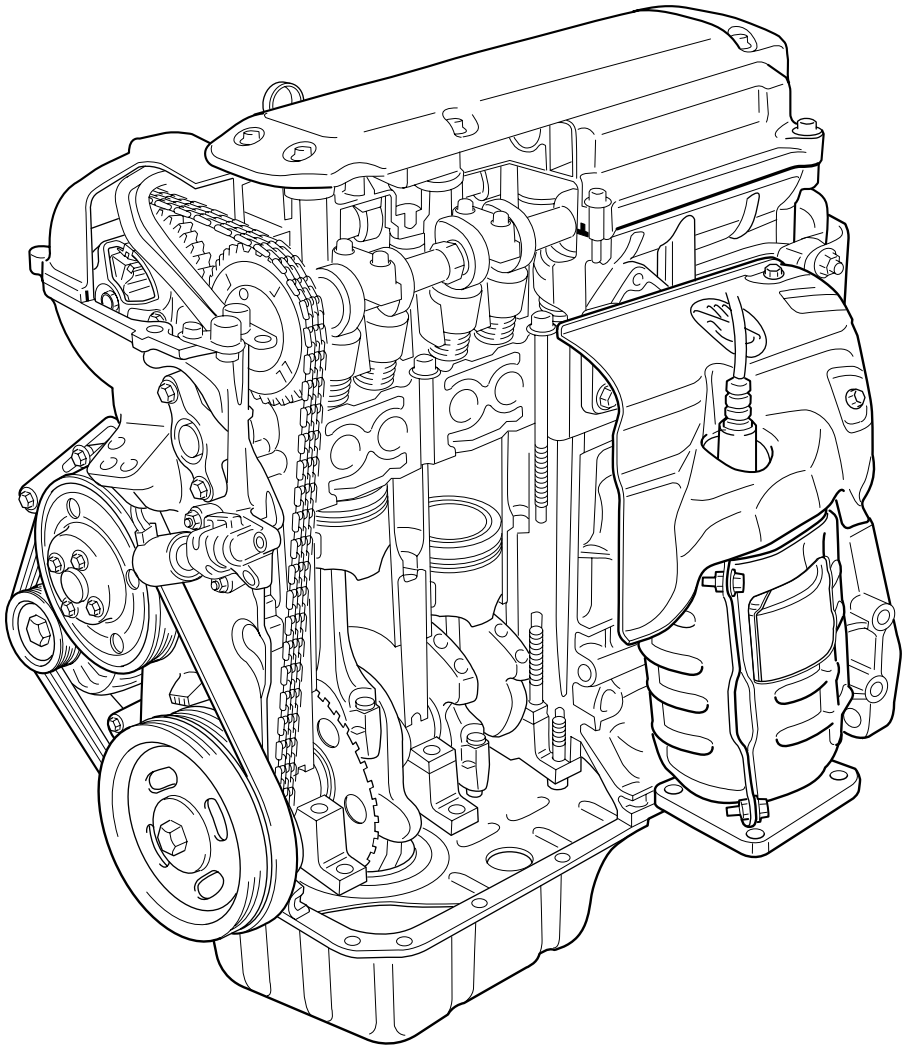
Engine Mechanical

General Description

Engine Construction Description

S4RS0A1401001

The engine is water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit with its DOHC (Double overhead camshaft) valve mechanism arranged for “V” type valve configuration and 16 valves (4 valves/one cylinder). The double overhead camshaft is mounted over the cylinder head; it is driven from crankshaft through timing chain, and no push rods are provided in the valve train system.



I3RM0A140001-

Camshaft Position Control (VVT Variable Valve Timing) System Description

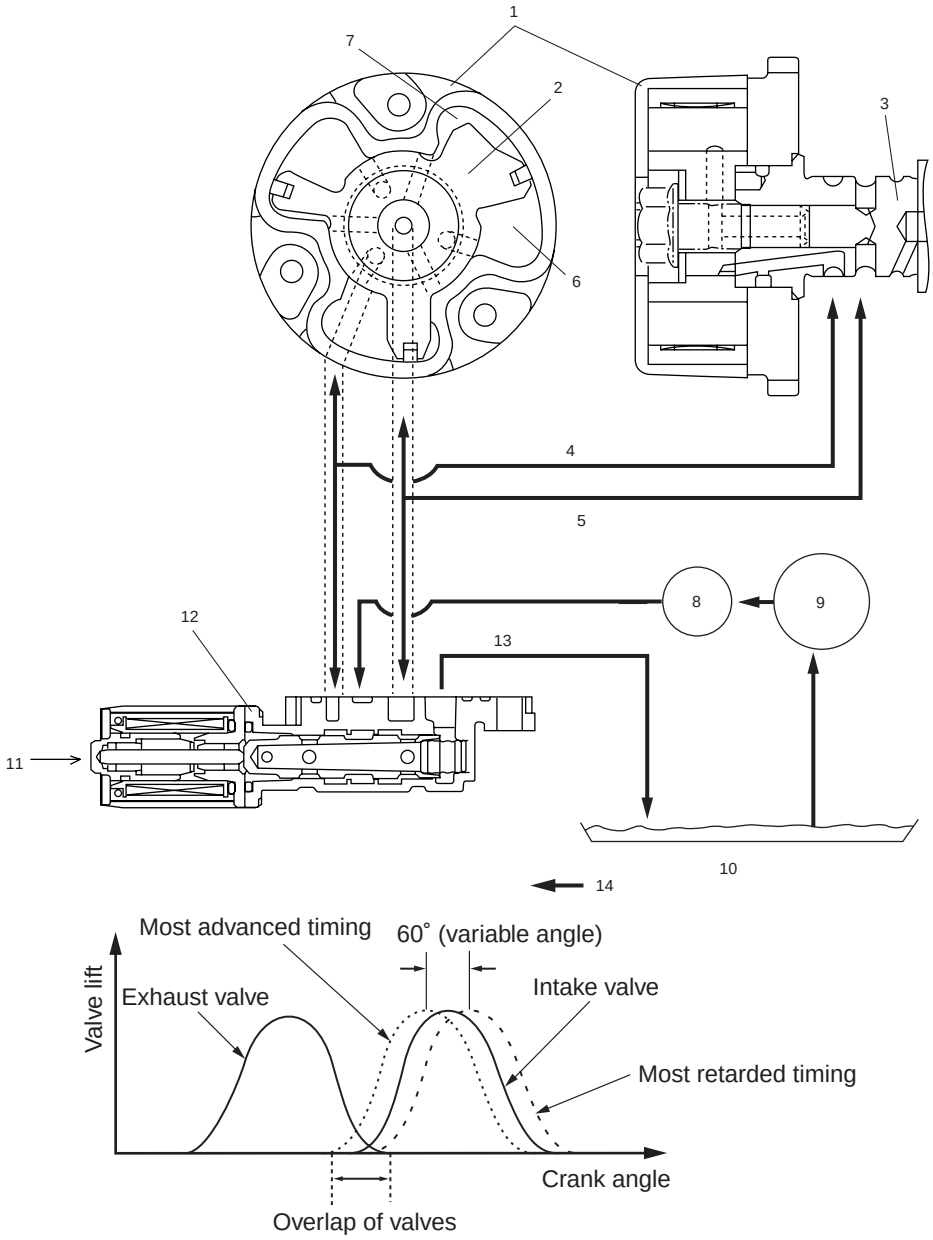
S4RS0A1401002

System Description

The VVT system is an electronic control system which continuously vary and optimize the intake valve timing in response to the engine operating condition.

The optimized intake valve timing produce such an air intake with high efficiency that both the higher power generation and lower fuel consumption can be attained in the whole engine speed range from low to high. In the area of the average engine load, low emission of nitrogen oxides (NOx) and high fuel efficiency can also be attained by making the valve opening overlap between the intake and exhaust valves longer.

For the brief of the system operation, the intake valve timing is varied by the cam timing sprocket (1) which varies the rotational phase between the intake camshaft (3) and sprocket. The rotor (2) in the cam timing sprocket is actuated by switching or adjusting the hydraulic pressure applied to the chambers for the timing advancing (7) and/or retarding (6). To switch or adjust the hydraulic pressure appropriately, ECM operates the oil control valve (12) with detecting the engine speed, intake air value, throttle opening, engine coolant temperature and camshaft position (angle).

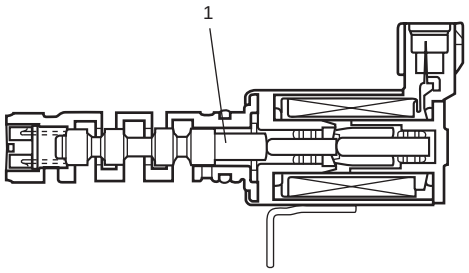


I3RH0B140002-

4. Oil passage to chamber for timing retarding	8. Oil filter	10. Oil pan	12. Oil flow
5. Oil passage to chamber for timing advancing	9. Oil pump	11. Control signal from ECM	

Oil Control Valve

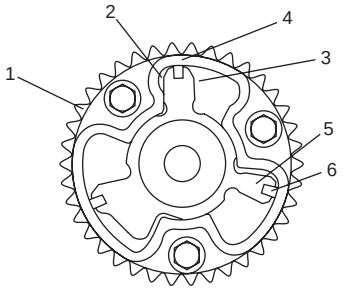
The oil control valve switches and adjusts the hydraulic pressure applied to the cam timing sprocket by moving the spool valve (1) according to the duty pulse signals output from the ECM. By this operation, the intake valve timing is varied continuously. Signals output from the ECM are the duty pulse of about 240 Hz.



I3RH0B140003-

Cam Timing Sprocket

The cam timing sprocket is equipped with the chambers for timing advancing (2) and retarding (3) which are separated by the rotor (5). The rotor rotates receiving the hydraulic pressure applied to both the chambers. The sprocket (1) is installed on the housing (4) and the rotor is secured on the intake camshaft by fastening the bolts. Therefore, the actuation of the rotor makes the phase difference between the sprocket and intake camshaft.

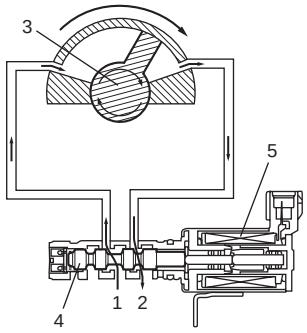


I3RH0B140004-

6. Seal

Timing Advancing

When the duty ratio of the signal output from the ECM is heavy, the spool valve (4) of the oil control valve moves to the left (opposite direction against the coil (5)). By this spool valve movement, the pressurized oil (1) is led into the chambers for timing advancing and the oil in the chambers for timing retarding is drained. This operations actuate the rotor (3) and result in the advanced timing of the intake valve.

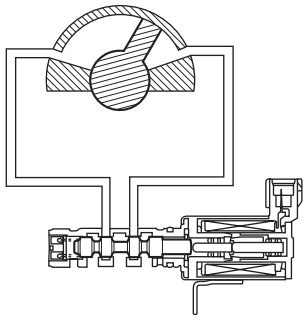


I3RH0B140005-

2. Drain

Timing Holding

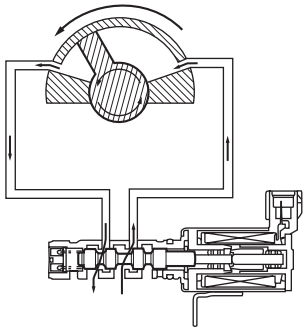
When the duty ratio of the signal output from the ECM shows that of holding, the spool valve of the oil control valve is located at hold position. Because this condition generates no oil pressure changes in both chambers, the rotor is fixed at a target position.



I3RH0B140006-

Timing Retarding

When the duty ratio of the signal output from the ECM is light, the spool valve of the oil control valve moves to the right (head for the coil). By this spool valve movement, the pressurized oil is led into the chambers for timing retarding and the oil in the chambers for timing advancing is drained. This operations actuate the rotor and result in the retarded timing of the intake valve.



I3RH0B140007-

Targeted Timing Varying Operation

Driving condition	Valve timing	Target of control	Effect
Engine running at idle speed	Most retarded	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold.	Stabilization of the engine rotation at idle speed.
Average engine load range	To the advanced side	To lengthen the valve opening overlap in order to enhance the internal exhaust gas recirculation and reduce the pumping loss.	Improvement of the fuel efficiency. Lowering of the exhaust emission.
Light engine load range	To the retarded side	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold.	Keeping of the engine stability.

Driving condition	Valve timing	Target of control	Effect
Low or average engine speed range with heavy engine load	To the advanced side	To advance the closing timing of the intake valve in order to improve the volumetric efficiency.	Improvement of generating the engine torque at low and average engine speed.
High engine speed range with heavy engine load	To the retarded side	To retard the closing timing of the intake valve in order to improve the volumetric efficiency.	Improvement of generating the engine power.
Low engine coolant temperature	Most retarded	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold and reduce the fuel increasing. To slow the fast idle speed of the engine as a result of stabilizing the engine idling.	Stabilization of the fast idling of the engine. Improvement of the fuel efficiency.
At engine starting and stopping	Most retarded	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold.	Improvement of start ability.

Diagnostic Information and Procedures

Compression Check

S4RS0A1404001

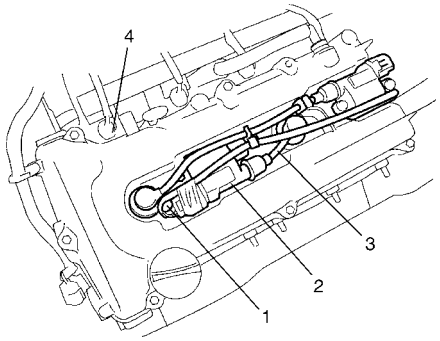
Check compression pressure on all 4 cylinders as follows:

1) Warm up engine to normal operating temperature.
2) Stop engine after warming up.

NOTE:

After warming up engine, place transaxle gear shift lever in “Neutral”, and set parking brake and block drive wheels.

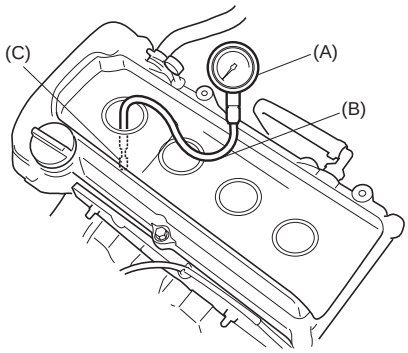
3) Disconnect ignition coil couplers (1).
4) Remove ignition coil assemblies (2) with high-tension cord (3).
5) Remove all spark plugs.
6) Disconnect fuel injector wires (4) at the coupler.



I2RH0B140003-

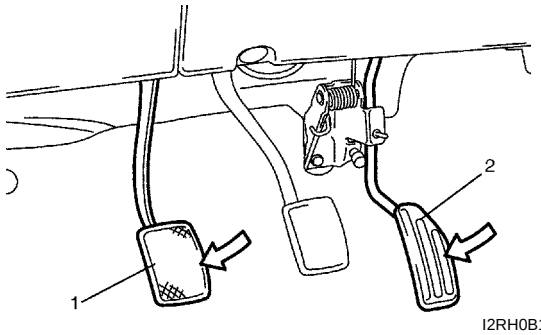
7) Install special tools (Compression gauge) into spark plug hole.

Special tool
(A): 09915–64512
(B): 09915–64530
(C): 09915–67010



I3RH0B140009-

8) Disengage clutch (1) (to lighten starting load on engine) for M/T vehicle, and depress accelerator pedal (2) all the way to make throttle fully open.



I2RH0B140005-

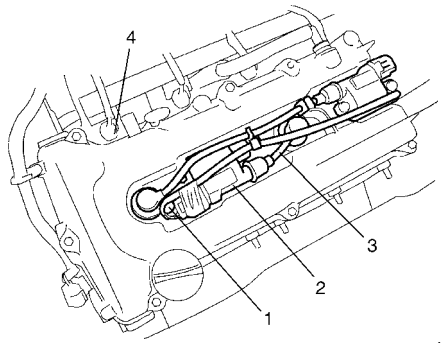
9) Crank engine with fully charged battery, and read the highest pressure on compression gauge.

NOTE:

- **For measuring compression pressure, crank engine at least 250 r/min. by using fully charged battery.**
- **If measured compression pressure is lower than limit value, check installation condition of special tool. If it is properly installed, possibility is compression pressure leakage from where piston ring and valve contact.**

Compression pressure
Standard: 1400 kPa (14.0 kg/cm^2, 199.0 psi)
Limit: 1100 kPa (11.0 kg/cm^2, 156.0 psi)
Max. difference between any two cylinders: 100 kPa (1.0 kg/cm^2, 14.2 psi)

10) Carry out Steps 7) through 9) on each cylinder to obtain 4 readings.
11) After checking, install spark plugs and ignition coil assemblies (2) with high-tension cord (3).
12) Connect ignition coil couplers (1).
13) Connect fuel injector wires (4) at the coupler.



I2RH0B140003-

Engine Vacuum Check

S4RS0A1404002

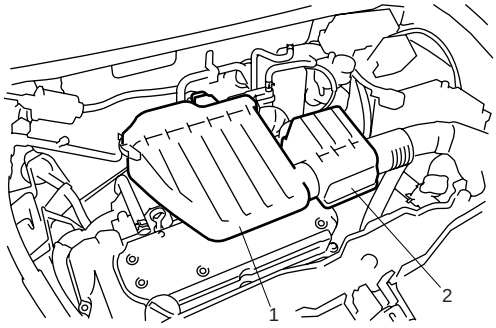
The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

1) Warm up engine to normal operating temperature.

NOTE:

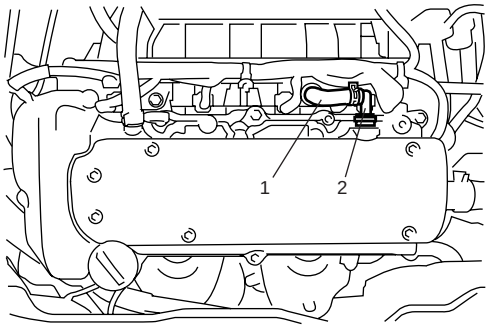
After warming up engine, be sure to place transaxle gear shift lever in "Neutral", and set parking brake and block drive wheels.

2) Stop engine and turn off the all electric switches.
3) Remove air cleaner case (1) and resonator (2).



I3RM0A140002-

4) Remove PCV hose (1) from PCV valve (2).

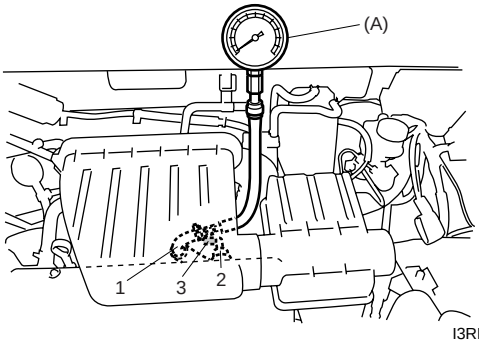


I3RH0B140011-

5) Connect special tool (Vacuum gauge) to PCV hose (1).

Special tool
(A): 09915–67311

6) Blind PCV valve (2) using tape (3) or the like.



I3RM0A140003-

7) Install air cleaner case and resonator.
8) Run engine at specified idle speed and read vacuum gauge. Vacuum should be within specification.

Vacuum specification (at sea level)
59 – 73 kPa (45 – 55 cmHg, 17.7 – 21.6 in.Hg) at specified idle speed

9) After checking, disconnect special tool (Vacuum gauge) from PCV valve.
10) Detach blind cap from PCV valve.
11) Install air cleaner case and resonator.

Valve Lash (Clearance) Inspection

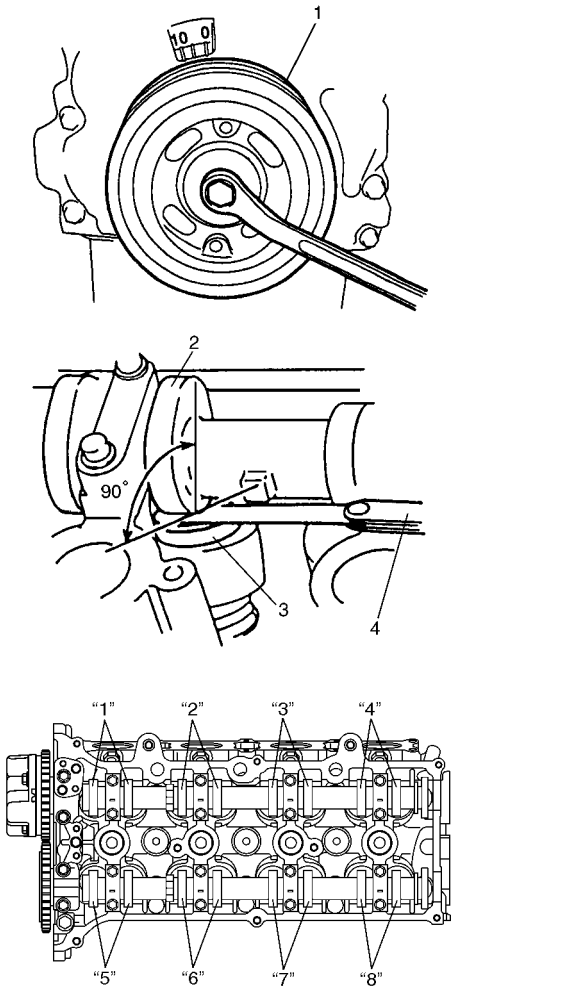
S4RS0A1404003

1) Remove negative cable at battery.
2) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
3) Remove right side engine under cover, if necessary.
4) Using 17 mm wrench, turn crankshaft pulley (1) clockwise until cam lobes (2) become perpendicular to shim faces (3) at valves “1” and “7” as shown in the figure.
5) Check valve lashes with thickness gauge (4) according to the following procedure.
   a) Check valve lashes at valves “1” and “7”.
   b) Turn camshafts by 90° (by turning crankshaft with wrench).
   c) Make sure that cam lobes are perpendicular to shim faces at valves to be checked (in this case, “3” and “8”), if not, adjust it by turning crankshaft. Check valve lashes.
   d) In the same manner as b) – c), check valve lashes at valves “4” and “6”.
   e) In the same manner as b) – c) again, check valve lashes at valves “2” and “5”.

If valve lash is out of specification, record valve lash and adjust it to specification by replacing shim.

Valve clearance specification

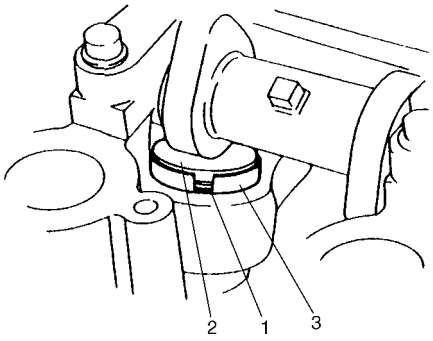
	When cold (Coolant temperature is 15 – 25 °C (59 – 77 °F))	When hot (Coolant temperature is 60 – 68 °C (140 – 154 °F))
Intake	**0.18 – 0.22 mm (0.007 – 0.009 in.)**	**0.21 – 0.27 mm (0.008 – 0.011 in.)**
Exhaust	**0.28 – 0.32 mm (0.011 – 0.013 in.)**	**0.30 – 0.36 mm (0.012 – 0.014 in.)**



I3RM0A140004-

Replacement of Shim

1) Close the valve whose shim (2) is to be replaced by turning crankshaft, then turn tappet (3) till its cut section (1) faces inside as shown in the figure.

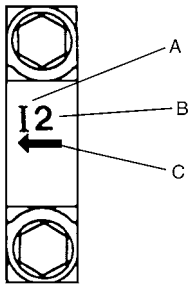


I2RH0B140006-

2) Lift down the valve by turning crankshaft to 360°.
3) Hold tappet at that position using special tool as follows.
   a) Remove its housing bolts.
   b) Check housing No. and select special tool corresponding to housing No., referring to "Special tool selection table".

Special tool selection table

No. on camshaft housing	Embossed mark on special tool
I2	IN2
I3, I4, I5	IN345
E2	EX2
E3, E4, E5	EX345



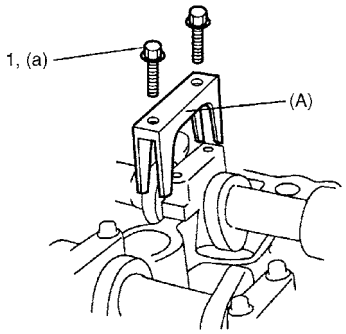
I2RH0B140011-

A: I: Intake side or E: Exhaust side
B: Position from timing chain side
C: Pointing to timing chain side

   c) Hold down the tappet so as not to contact the shim by installing special tool on camshaft housing with housing bolt (1) tighten housing bolts to specified torque.

Special tool
(A): 09916–67020
(A): 09916–67021

Tightening torque
Camshaft housing bolts (a): 8 N·m (0.8 kg-m, 6.0 lb-ft) (for tightening of special tool)

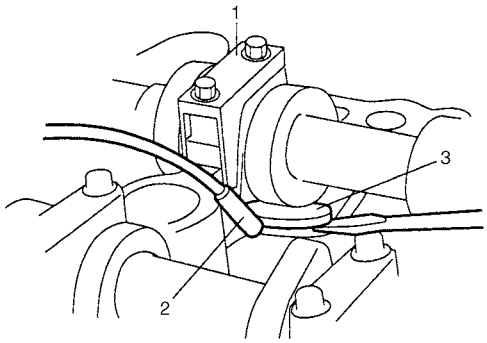


I3RM0A140005-

4) Turn camshaft by approximately 90° clockwise and remove shim (3).

WARNING:

Never put in the hand between camshaft and tappet.

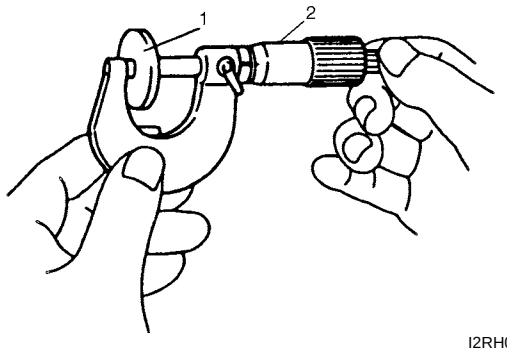


I2RH0B140013-

1. Special tool
2. Magnet

5) Using a micrometer (2), measure the thickness of the removed shim (1), and determine replacement shim by calculating the thickness of new shim with the following formula and table.

Shim thickness specification
Intake side:
A = B + C – 0.20 mm (0.008 in.)
Exhaust side:
A = B + C – 0.30 mm (0.012 in.)
A: Thickness of new shim
B: Thickness of removed shim
C: Measured valve clearance



I2RH0B140014-

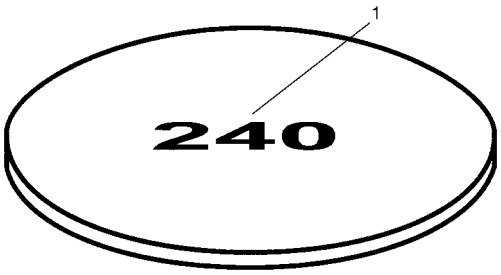
For example of intake side:
When thickness of removed shim is 2.40 mm (0.094 in.), and measured valve clearance is 0.45 mm (0.018 in.).
A = 2.40 mm (0.094 in.) + 0.45 mm (0.018 in.) – 0.20 mm (0.008 in.) = 2.65 mm (0.104 in.)
Calculated thickness of new shim = 2.65 mm (0.104 in.)

6) Select new shim No. (1) with a thickness as close as possible to calculated value.

Available new shims No.

Thickness mm (in.)	Shim No.	Thickness mm (in.)	Shim No.
2.175 (0.0856)	218	2.600 (0.1024)	260
2.200 (0.0866)	220	2.625 (0.1033)	263
2.225 (0.0876)	223	2.650 (0.1043)	265
2.250 (0.0886)	225	2.675 (0.1053)	268
2.275 (0.0896)	228	2.700 (0.1063)	270
2.300 (0.0906)	230	2.725 (0.1073)	273
2.325 (0.0915)	233	2.750 (0.1083)	275
2.350 (0.0925)	235	2.775 (0.1093)	278
2.375 (0.0935)	238	2.800 (0.1102)	280
2.400 (0.0945)	240	2.825 (0.1112)	283
2.425 (0.0955)	243	2.850 (0.1122)	285
2.450 (0.0965)	245	2.875 (0.1132)	288
2.475 (0.0974)	248	2.900 (0.1142)	290
2.500 (0.0984)	250	2.925 (0.1152)	293
2.525 (0.0994)	253	2.950 (0.1161)	295
2.550 (0.1004)	255	2.975 (0.1171)	298
2.575 (0.1014)	258	3.000 (0.1181)	300

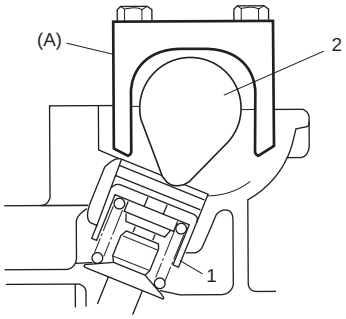
7) Install new shim facing shim No. side with tappet.



I2RH0B140015-

8) Lift valve by turning crankshaft counterclockwise (in opposite direction against above Step 4)) and remove special tool.

Special tool
(A): 09916–67020
(A): 09916–67021

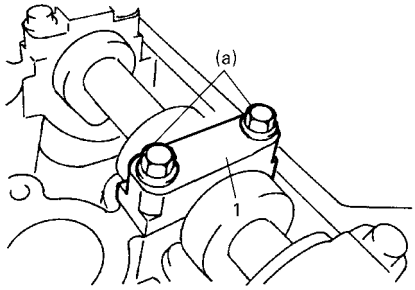


I3RM0A140006-

1.	Tappet
2.	Camshaft

9) Install camshaft housing (1) and tighten bolts to specified torque.

Tightening torque
Camshaft housing bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B140149-

10) Check valve clearance again after adjusting it.
11) After checking and adjusting all valves.
12) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.

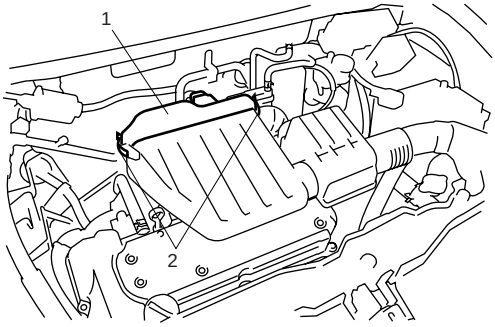
Repair Instructions

Air Cleaner Element Removal and Installation

S4RS0A1406001

Removal

1) Open air cleaner case (1) by unhooking its clamps (2).
2) Remove air cleaner element from case.



I3RM0A140007-

Installation

Reverse removal procedure for installation.

Air Cleaner Element Inspection and Cleaning

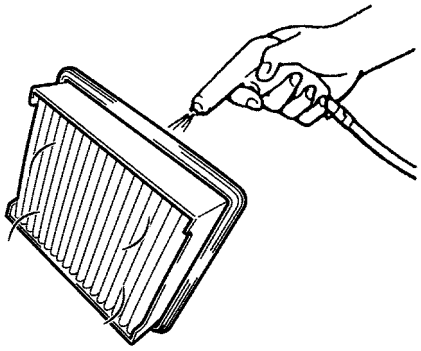
S4RS0A1406002

Inspection

Check air cleaner element for dirt. Replace excessive dirty element.

Cleaning

Blow off dust by compressed air from air outlet side of element.



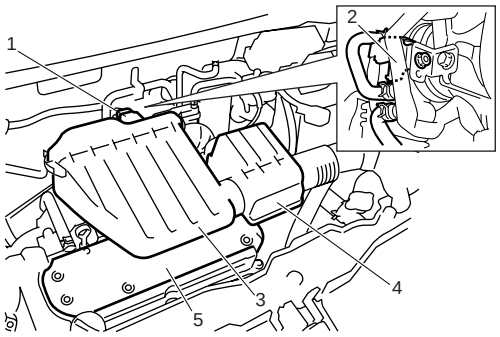
I2RH0B140150-

Cylinder Head Cover Removal and Installation

S4RS0A1406011

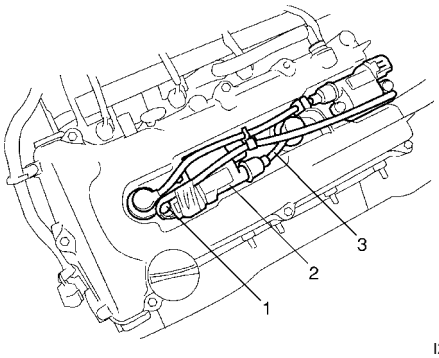
Removal

1) Disconnect negative cable at battery.
2) Disconnect MAF sensor coupler (1).
3) Remove EVAP canister purge valve (2).
4) Remove air cleaner case (3) and resonator (4).
5) Remove cylinder head upper cover (5).



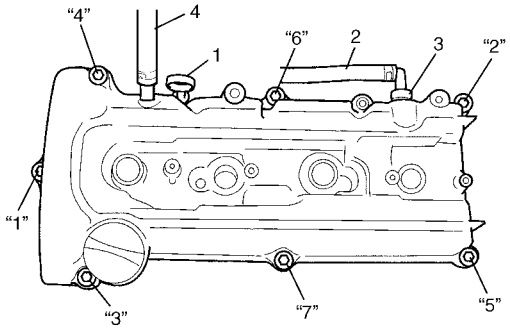
I3RM0A140008-

6) Disconnect ignition coil couplers (1).
7) Remove ignition coil assemblies (2) with high-tension cord (3).
8) Remove wire harness clamp (4) from cylinder head cover.



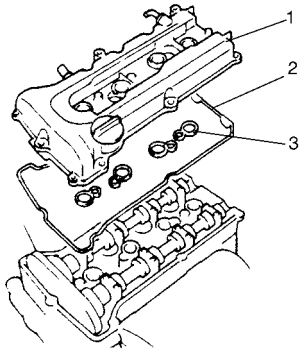
I2RH0B140032-

9) Remove oil level gauge (1).
10) Disconnect PCV hose (2) from PCV valve (3) and disconnect breather hose (4) from cylinder head cover.
11) Remove cylinder head cover mounting bolts in such order as indicated in the figure.



I2RH0B140033-

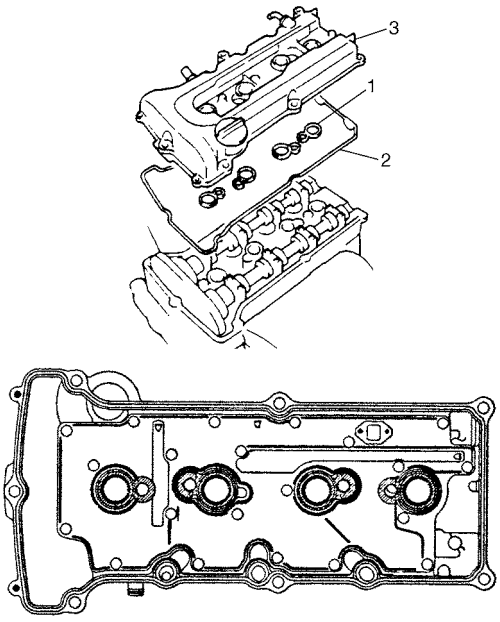
12) Remove cylinder head cover (1) with cylinder head cover gasket (2) and spark plug hole gasket (3).



I2RH0B140034-

Installation

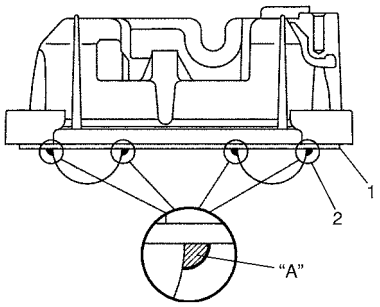
1) Install new spark plug hole gaskets (1) and new cylinder head cover gasket (2) to cylinder head cover (3) as shown in the figure.



I2RH0B140035-

2) Remove oil, old sealant, and dust from sealing surfaces on cylinder head and cover. After cleaning, apply sealant “A” to the following point.
   - Cylinder head cover gasket (1) sealing surface area (2) as shown.

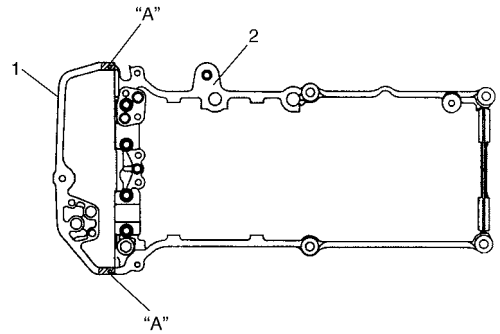
     “A”: Water tight sealant 99000–31250



I2RH0B140036-

   - Timing chain cover (1) and cylinder head (2) mating surface as shown.

     “A”: Water tight sealant 99000–31250



I2RH0B140037-

3) Install cylinder head cover to cylinder head.

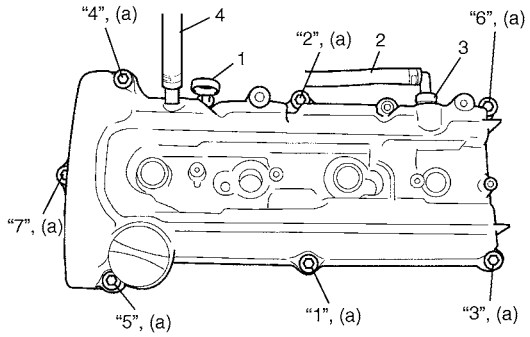
   NOTE:

   When installing cylinder head cover, use care so that cylinder head cover gasket or spark plug hole gaskets will not get out of place or fall off.

4) Tightening bolts in such order as indicated in the figure a little at a time till they are tightened to specified torque.

   Tightening torque
   Cylinder head cover bolt (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)

5) Connect PCV hose (2) to PCV valve (1).
6) Connect breather hose (4).
7) Install oil level gauge.



I3RH0B140016-

8) Install wire harness clamp to cylinder head cover.
9) Install ignition coil assemblies with high-tension cord.
10) Connect ignition coil couplers and clamp harness securely.
11) Install cylinder head upper cover.
12) Install air cleaner case and resonator.
13) Connect negative cable at battery.

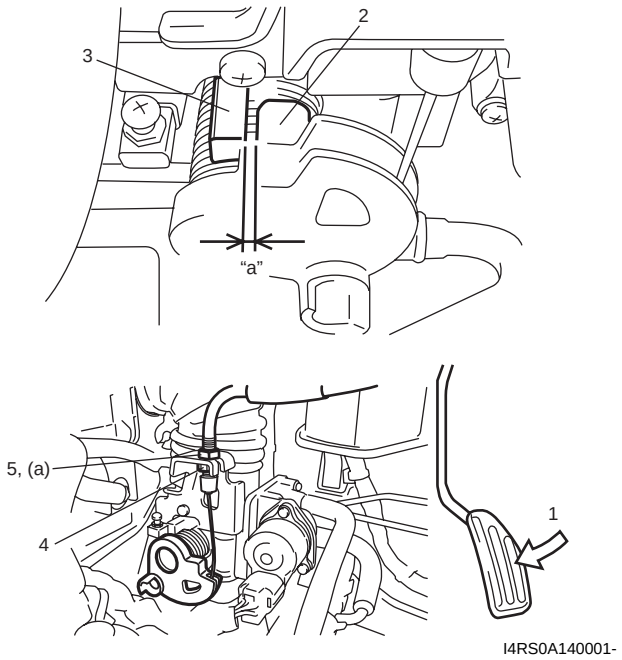
Accelerator Cable Adjustment

S4RS0A1406003

With accelerator pedal depressed fully (1), check clearance between throttle lever (2) and lever stopper (3) of throttle body.
If measured value is out of specification, adjust it to specification with cable adjusting nut (4), and then tighten accelerator cable locking nut to specified torque.

Tightening torque
Accelerator cable locking nut (a): 12 N·m (1.2 kg-m, 9.0 lb-ft)

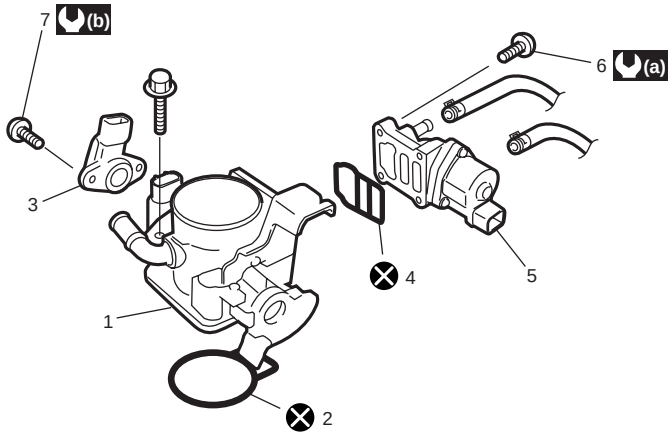
Accelerator cable adjustment clearance (with pedal depressed fully)
"a": 0.5 – 2.0 mm (0.02 – 0.07 in.)



I4RS0A140001-

Throttle Body Components

S4RS0A1406004



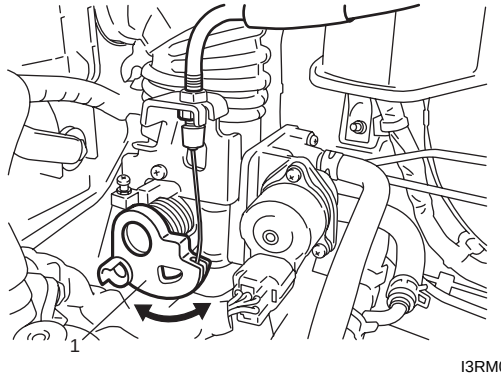
I4RS0A140002-

1. Throttle body	5. Idle air control valve	(b) : 2.5 N·m (0.25 kg-m, 2.0 lb-ft)
2. Throttle body gasket	6. IAC valve screws	⊗ : Do not reuse.
3. TP sensor	7. TP sensor screws	
4. Gasket	(a) : 3.5 N·m (0.35 kg-m, 2.5 lb-ft)	

Throttle Body On-Vehicle Inspection

S4RS0A1406005

Check that throttle lever (1) moves smoothly.



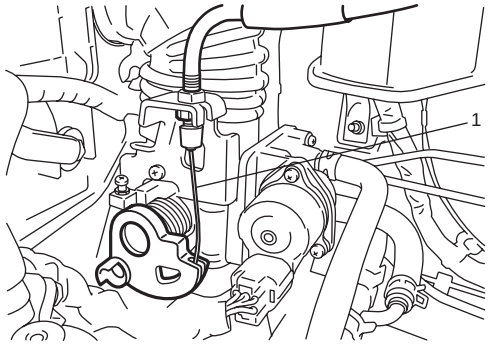
I3RM0A140011-

Throttle Body Removal and Installation

S4RS0A1406006

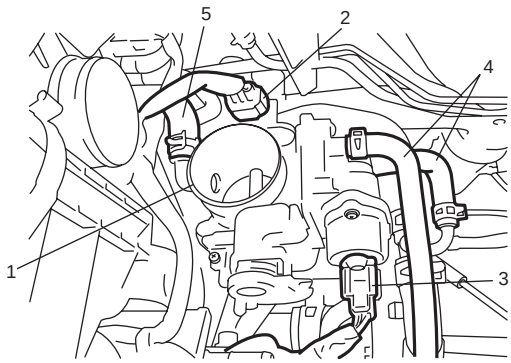
Removal

1) Disconnect negative cable at battery.
2) Drain coolant referring to “Cooling System Draining: in Section 1F”.
3) Disconnect accelerator cable (1) from throttle body.



I3RM0A140012-

4) Detach EVAP canister and purge valve chamber, and remove air cleaner outlet hose.
5) Disconnect connectors from TP sensor (2) and IAC valve (3).
6) Disconnect engine coolant hoses (4) and breather hose (5) from throttle body (1).



I3RM0A140013-

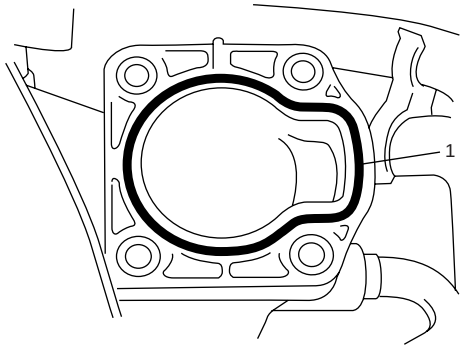
7) Remove throttle body from intake manifold.
8) Remove TP sensor and IAC valve from throttle body.

NOTE:

While disassembling and assembling throttle body, use special care not to deform levers on throttle valve shaft or cause damage to any other parts.

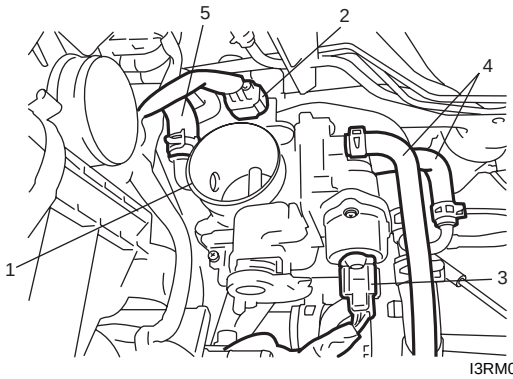
Installation

1) Install IAC valve to throttle body referring to “Idle Air Control (IAC) Valve Removal and Installation: in Section 1C”.
2) Install TP sensor to throttle body referring to “Throttle Position (TP) Sensor Removal and Installation: in Section 1C”.
3) Clean mating surfaces and install new throttle body gasket (1) to intake manifold.



I3RM0A140014-

4) Install throttle body (1) to intake manifold.
5) Connect connectors to TP sensor (2) and IAC valve (3) securely.
6) Connect engine coolant hoses (4) and breather hose (5).



I3RM0A140013-

7) Connect accelerator cable and adjust cable play to specification referring to “Accelerator Cable Adjustment: ”.
8) Install air cleaner outlet hose, purge valve chamber and EVAP canister.
9) Refill coolant referring to “Cooling System Flush and Refill: in Section 1F”.
10) Connect negative cable at battery.

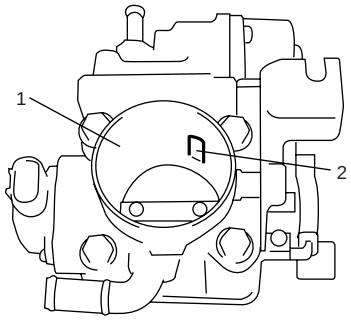
Throttle Body Cleaning

S4RS0A1406008

Clean throttle body bore (1) and idle air passage (2) by blowing compressed air.

NOTE:

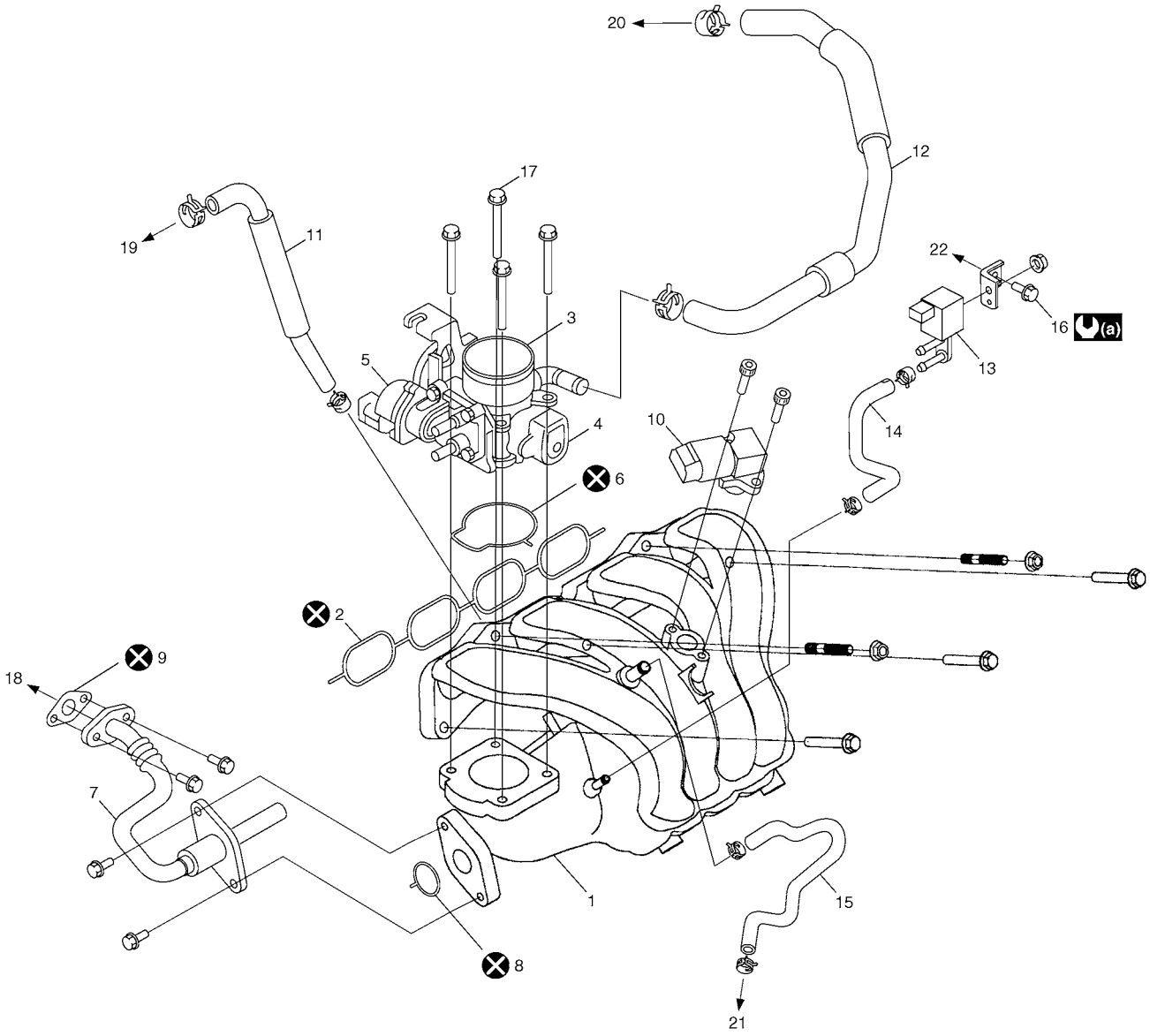
TP sensor, idle air control valve or other components containing rubber must not be placed in a solvent or cleaner both. A chemical reaction will cause these parts to swell, harden or get distorted.



I3RM0A140015-

Throttle Body and Intake Manifold Components

S4RS0A1406009



I4RS0A140003-

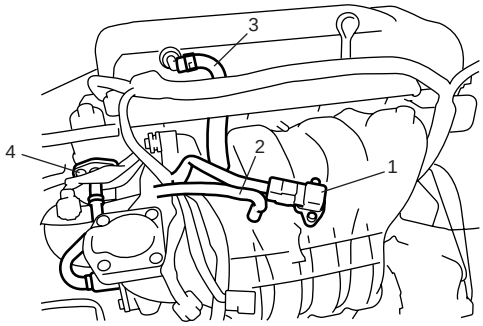
1. Intake manifold	7. EGR pipe	13. EVAP canister purge valve	19. To PCV valve
2. Intake manifold O-ring	8. O-ring	14. EVAP canister purge valve hose	20. To cylinder head cover
3. Throttle body	9. Gasket	15. Brake booster hose	21. To brake booster
4. TP sensor	10. MAP sensor	16. EVAP canister purge valve bracket bolt	22. To air cleaner case
5. IAC valve	11. PCV valve hose	17. Throttle body mounting bolt	(a) : 5 N·m (0.5 kg-m, 4.0 lb-ft)
6. O-ring	12. Breather hose	18. To EGR valve	: Do not reuse.

Intake Manifold Removal and Installation

S4RS0A1406010

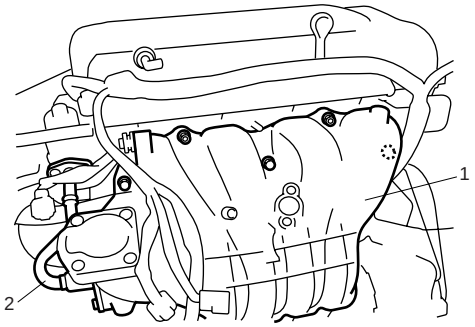
Removal

1) Remove throttle body referring to “Throttle Body Removal and Installation: ”.
2) Disconnect MAP sensor coupler (1).
3) Disconnect the following hoses:
   - Brake booster hose (2) from cylinder head cover
   - PCV hose (3) from PCV valve
4) Remove EGR pipe bolt (4) from EGR valve.



I4RS0A140004-

5) Remove intake manifold (1) and EGR pipe (2) from cylinder head, and then remove its gasket and O-ring.



I3RM0A140018-

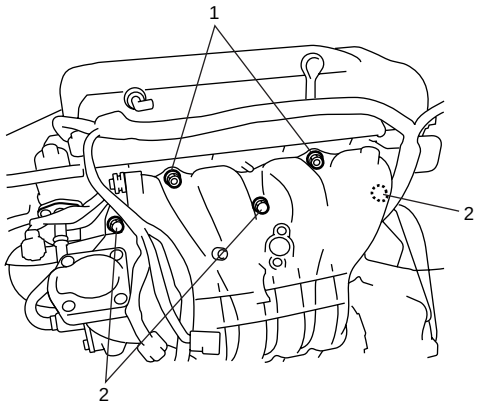
Installation

Reverse removal procedure for installation noting the followings.

- Use new intake manifold O-ring.
- Use new EGR pipe gasket and O-ring.
- Tighten EVAP canister purge valve bracket bolt to specified torque.

  Tightening torque
  EVAP canister purge valve bracket bolt: 5 N·m (0.5 kg-m, 4.0 lb-ft)

- Install intake manifold bolt (2) and nut (1) as shown in figure.

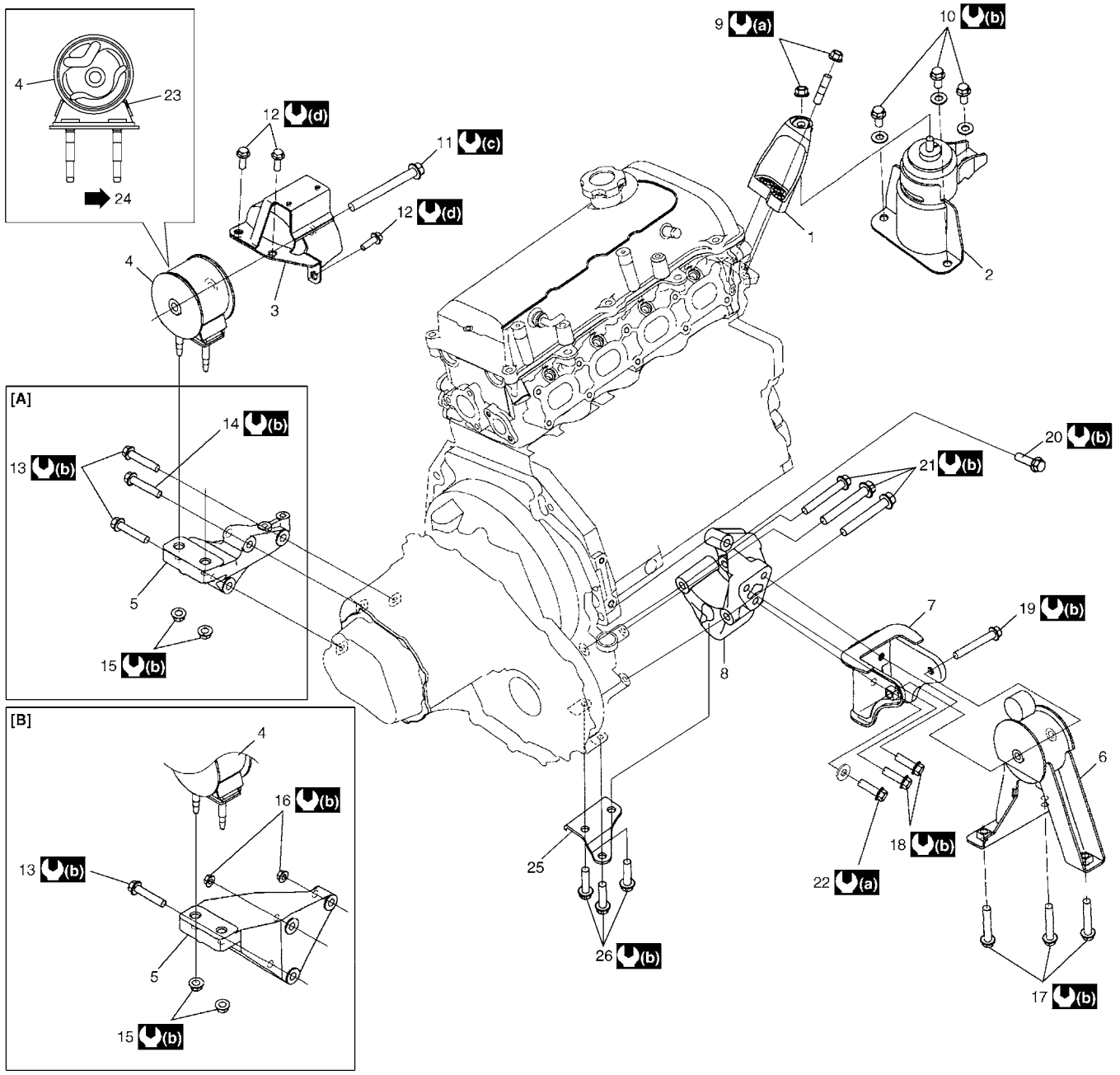


I4RS0A140005-

- Check to ensure that all removed parts are back in place.
  Reinstall any necessary parts which have not been reinstalled.
- Adjust accelerator cable play, referring to “Accelerator Cable Adjustment: ”.
- Refill cooling system referring to “Cooling System Flush and Refill: in Section 1F”.
- Upon completion of installation, turn ignition switch ON but engine OFF and check for fuel leaks.
- Finally, start engine and check for engine coolant leaks.

Engine Mountings Components

S4RS0A1406012



I4RS0A140006-

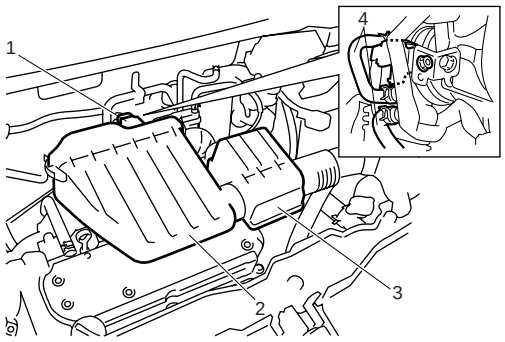
[A]: A/T model	10. Engine right mounting bolt	21. Engine rear mounting body bracket bolt
[B]: M/T model	11. Engine left mounting bush bolt	22. Engine rear mounting No.3 bracket bolt
1. Engine right mounting bracket	12. Engine left mounting No.1 bracket bolt	23. Yellow mark
2. Engine right mounting	13. Engine left mounting No.2 bracket bolt (short)	24. Vehicle forward
3. Engine left mounting No.1 bracket	14. Engine left mounting No.2 bracket bolt (long)	25. Engine rear mounting stiffener
4. Engine left mounting	15. Engine left mounting bracket nut	26. Engine rear mounting stiffener bolt
5. Engine left mounting No.2 bracket	16. Engine left mounting nut	(a) : 65 N·m (6.5 kg-m, 47.0 lb-ft)
6. Engine rear mounting	17. Engine rear mounting bolt	(b) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
7. Engine rear mounting No.1 bracket	18. Engine rear mounting No.1 bracket bolt	(c) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
8. Engine rear mounting No.2 bracket	19. Engine rear mounting bush bolt	(d) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
9. Engine right mounting nut	20. Engine rear mounting No.2 bracket bolt	

Engine Assembly Removal and Installation

S4RS0A1406013

Removal

1) Relieve fuel pressure according to “Fuel Pressure Relief Procedure: in Section 1G”.
2) Disconnect negative and positive cable at battery.
3) Remove battery and tray.
4) Remove engine hood after disconnecting windshield washer hose.
5) Remove right and left side engine under covers.
6) Remove A/C compressor belt by referring to “Compressor Drive Belt Removal and Installation: in Section 7B”.
7) Drain engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
8) Drain transaxle oil.
9) Drain coolant.
10) Remove cowl top plate referring to “Cowl Top Components: in Section 9K”.
11) Disconnect MAF sensor coupler (1).
12) Remove air cleaner case (2) and resonator (3).
13) Remove canister purge hose (4) from EVAP canister purge valve.



I3RM0A140022-

14) With hose connected, detach A/C compressor from its bracket (if equipped) referring to “Compressor Assembly Removal and Installation: in Section 7B”.

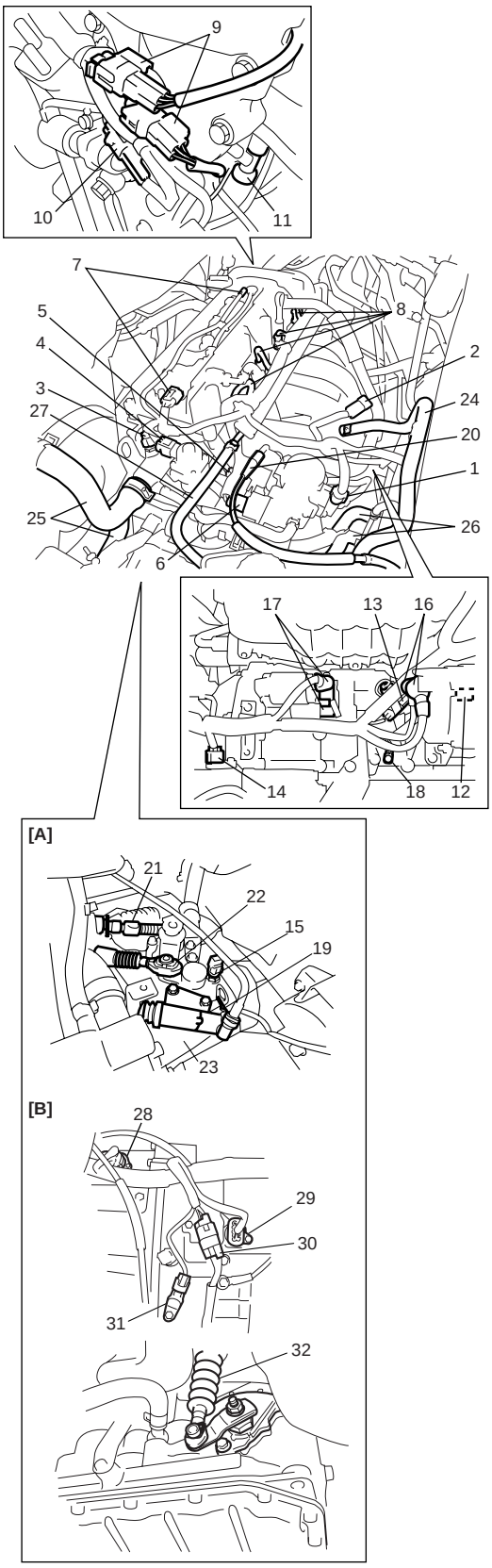
CAUTION:

Suspend removed A/C compressor at a place where no damage will be caused during removal and installation of engine assembly.

15) Disconnect the following electric wires:
    - TP sensor (1)
    - MAP sensor (2)
    - ECT sensor (3)
    - EGR valve (4)
    - CMP sensor (5)
    - IAC valve (6)
    - Ignition coil assembly (7)
    - Injectors (8)
    - Heated oxygen sensor (9)
    - Oil control valve (10)
    - Engine oil pressure switch (11)
    - CKP sensor (12)
    - Knock sensor (13)
    - VSS (14)
    - Back up light switch (15) (For M/T vehicle)
    - Generator (16)
    - Starting motor (17)
    - Ground terminal (18) from cylinder block
    - Battery ground cable (19) from transaxle
    - Output shaft speed sensor (VSS) (28) (For A/T vehicle)
    - Solenoid valve (29) (For A/T vehicle)
    - Transmission range sensor (30) (For A/T vehicle)
    - Input shaft speed sensor (31) (For A/T vehicle)
    - Magnet clutch switch of A/C compressor (if equipped)
    - Each wire harness clamps
16) Remove fuse box from its bracket.
17) Disconnect the following cables:
    - Accelerator cable (20)
    - Gear select control cable (21) (For M/T vehicle)
    - Gear shift control cable (22) (For M/T vehicle)
    - A/T select cable (32) (For A/T vehicle)
18) Disconnect the following hoses:
    - A/T fluid cooler hoses
    - Brake booster hose (24) from intake manifold
    - Radiator inlet and outlet hoses (25) from each pipe
    - Heater inlet and outlet hoses (26) from each pipe
    - Fuel feed hoses (27) from fuel feed pipe
19) With hose connected, detach clutch operating cylinder (23). (For M/T vehicle)

CAUTION:

Suspend removed clutch operating cylinder at a place where no damage will be caused during removal and installation of engine assembly.



I4RS0A140007-

[A]:	M/T vehicle
[B]:	A/T vehicle

20) Disconnect right and left drive shaft joints from differential gear referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”.

NOTE:

For engine and transaxle removal, it is not necessary to remove drive shafts from steering knuckle.

21) Remove exhaust No.1, No.2 and center pipes referring to “Exhaust Manifold Removal and Installation: in Section 1K”.

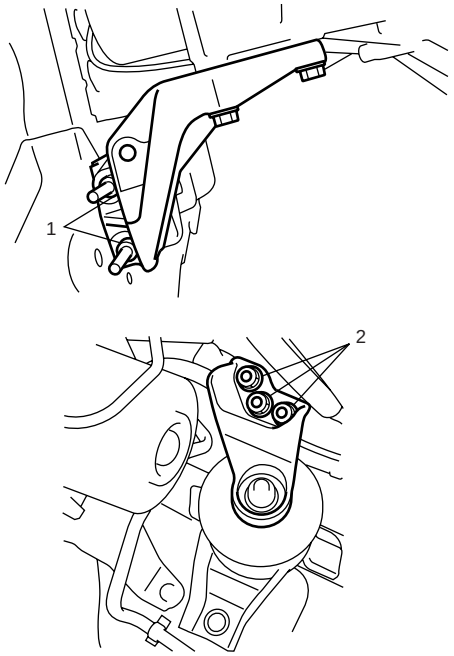
22) Support engine assemble by using supporting device referring to “Engine Supporting Points: in Section 0A”.

23) Remove suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B”.

24) Remove engine rear mounting from engine rear mounting No.1 bracket.

25) Support engine and transaxle with jack, and then remove supporting device.

26) Remove engine left mounting bracket nuts (1) and engine right mounting nuts (2).



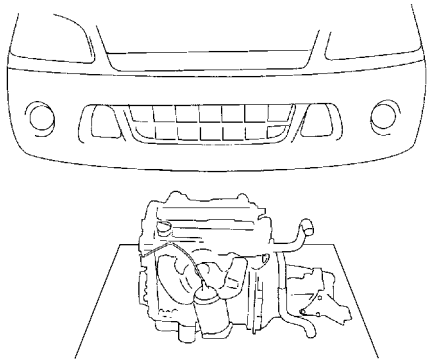
I4RS0A140008-

27) Before removing engine with transaxle from engine compartment, recheck to make sure all hoses, electric wires and cables are disconnected from engine and transaxle.

28) Lower engine with transaxle from engine compartment.

CAUTION:

Before lowering engine, to avoid damage to A/C compressor and clutch operating cylinder, make clearance by rising them. Be sure not to damage suspended A/C compressor and clutch operating cylinder.



I4RS0A140009-

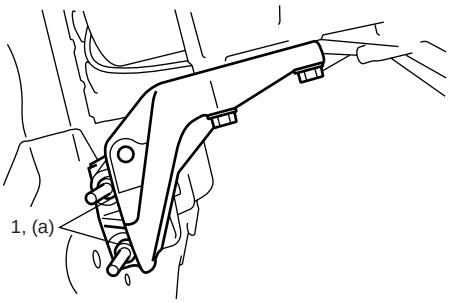
29) Disconnect transaxle from engine, referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B" or "Automatic Transaxle Unit Dismounting and Remounting: in Section 5A".

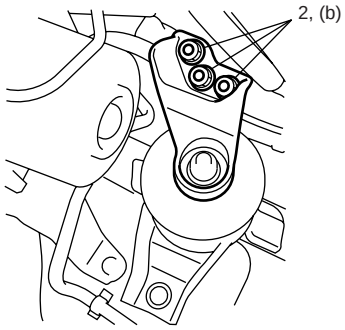
30) Remove clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation: in Section 5C".

Installation

1) Install clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation: in Section 5C".
2) Connect transaxle to engine referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B" or "Automatic Transaxle Unit Dismounting and Remounting: in Section 5A".
3) Lift engine and transaxle into engine compartment with jack.
4) Install engine left mounting bracket nuts (1) and engine right mounting nuts (2).
   Tighten these nuts to specified torque.

   Tightening torque
   Engine left mounting bracket nut (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
   Engine right mounting nut (b): 65 N·m (6.5 kg-m, 47.0 lb-ft)





I4RS0A140010-

5) Support engine assemble by using supporting device referring to "Engine Supporting Points: in Section 0A".
6) Install engine rear mounting to engine rear mounting No.1 bracket.

   Tightening torque
   Engine rear mounting bush bolt: 55 N·m (5.5 kg-m, 40.0 lb-ft)

7) Install suspension frame referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
8) Remove supporting device.
9) Install exhaust No.1, No.2 and center pipes referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".
10) Connect drive shaft joints referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
11) Reverse disconnected hoses, cables and electric wires for connection noting the followings.
    - Tighten nuts to specified torque.

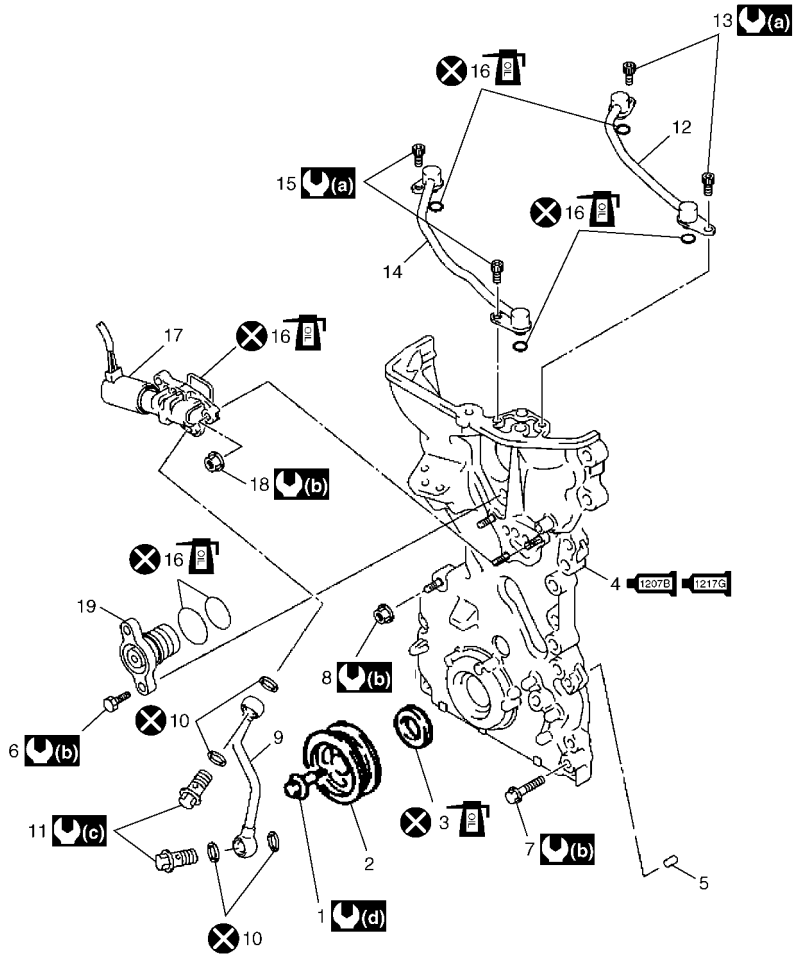
    Tightening torque
    Starting motor terminal nut: 11 N·m (1.1 kg-m, 8.0 lb-ft)
    Generator terminal nut: 6 N·m (0.6 kg-m, 4.5 lb-ft)

12) Install air cleaner case and resonator.
13) Install cowl top referring to "Cowl Top Components: in Section 9K".
14) Install A/C compressor to its bracket (if equipped) referring to "Compressor Assembly Removal and Installation: in Section 7B".

15) Adjust A/C compressor belt tension (if equipped) referring to “Compressor Drive Belt Inspection and Adjustment: in Section 7B”.
16) Adjust accelerator cable play referring to “Accelerator Cable Adjustment: ” in this section.
17) Check to ensure that all removed parts are back in place.
Reinstall any necessary parts which have not been reinstalled.
18) Refill cooling system with coolant referring to “Cooling System Flush and Refill: in Section 1F”.
19) Refill engine with engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
20) Refill transaxle with transaxle oil referring to “Manual Transaxle Oil Change: in Section 5B” or “A/T Fluid Change: in Section 5A”.
21) Install battery and tray.
22) Connect positive and negative cable at battery.
23) Verify that there is no fuel leakage, coolant leakage, oil leakage and exhaust gas leakage at each connection.

Timing Chain Cover Components

S4RS0A1406014



I4RS0A140011-

1. Crankshaft pulley bolt	9. Oil gallery pipe No.1	17. Oil control valve
2. Crankshaft pulley	10. Copper washer	18. Oil control valve mounting nut
3. Oil seal : Apply engine oil to oil seal lip.	11. Oil gallery pipe No.1 bolt	19. Cap
1207B 1217G 4. Timing chain cover : Apply sealant 99000-31140 to the mating surface of cylinder and cylinder head. : Apply sealant 99000-31260 to the mating surface of timing chain cover referring to the figure of Step 5) of “Installation” under “Timing Chain Cover Removal and Installation: ”.	12. Oil gallery pipe No.2	(a) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
5. Pin	13. Oil gallery pipe No.2 bolt	(b) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
6. Cap bolt	14. Oil gallery pipe No.3	(c) : 30 N·m (3.0 kg-m, 22.0 lb-ft)
7. Timing chain cover mounting bolts	15. Oil gallery pipe No.3 bolt	(d) : 150 N·m (15.0 kg-m, 108.5 lb-ft)
8. Timing chain cover mounting nut	16. O-ring : Apply engine oil.	: Do not reuse.

Timing Chain Cover Removal and Installation

S4RS0A1406015

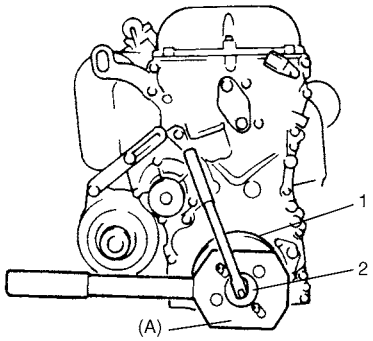
CAUTION:

- **Keep working table, tools and hands clean while overhauling.**
- **Use special care to handle aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Keep them always clean.**

Removal

1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation: ”.
2) Remove water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: in Section 1F”.
3) Remove crankshaft pulley bolt.
   To lock crankshaft pulley (1), use special tool with it as shown in the figure.

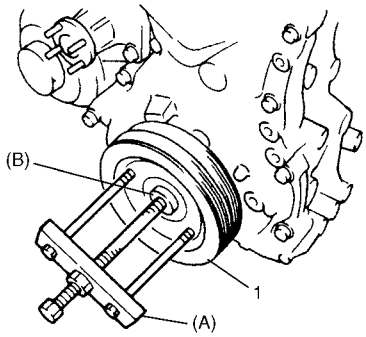
   Special tool
   (A): 09917–68221



I2RH0B140051-

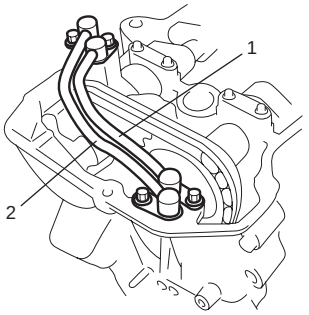
4) Remove crankshaft pulley (1).
   If it is hard to remove, use special tools as shown in the figure.

   Special tool
   (A): 09944–36011
   (B): 09926–58010



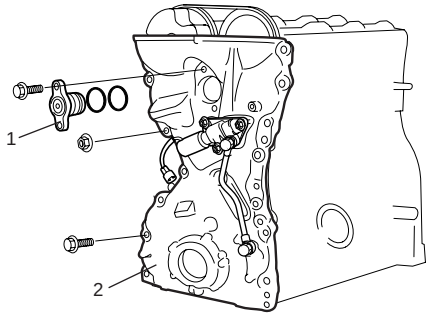
I2RH0B140052-

5) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
6) Remove oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E”.
7) Remove water pump pulley.
8) Remove A/C bracket from cylinder block.
9) Remove oil gallery pipes No.2 (1) and No.3 (2).



I3RH0B140021-

10) Remove cap (1) from timing chain cover (2).
11) Remove timing chain cover (2).



I3RH0B140022-

12) Remove oil control valve from timing chain cover referring to “Oil Control Valve Removal and Installation: ”.

Installation

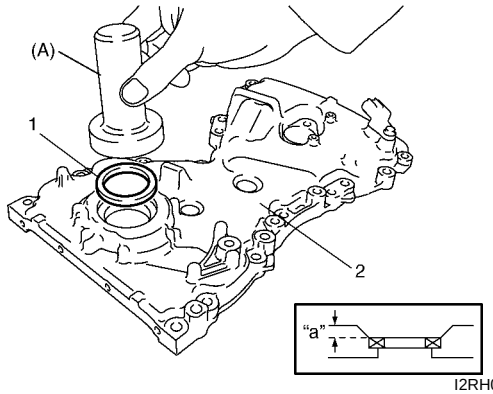
1) Clean sealing surface on timing chain cover, cylinder block and cylinder head.
   Remove oil, old sealant and dust from sealing surface.
2) Install oil seal (1) to timing chain cover, if removed.

   NOTE:

   When installing new oil seal, press fit to timing chain cover (2) by using special tool (bearing installer) as shown in the figure.

   Drive in dimension
   “a”: 1.5 mm (0.06 in.)

   Special tool
   (A): 09913–75810

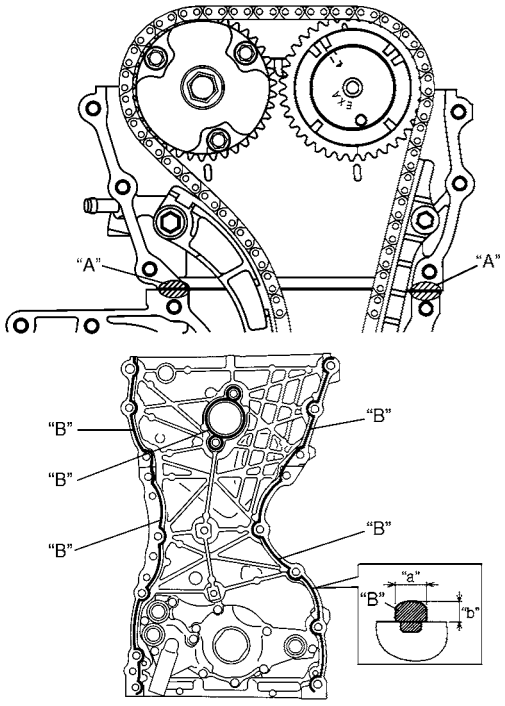


I2RH0B140058-

3) Install oil control valve to timing chain cover referring to “Oil Control Valve Removal and Installation: ”.
4) Apply sealant “A” to mating surface of cylinder and cylinder head and “B” to mating surface of timing chain cover as shown in the figure.

“A”: Sealant 99000–31140
“B”: Sealant 99000–31260

Sealant amount for timing chain cover
Width “a”: 3 mm (0.12 in.)
Height “b”: 2 mm (0.08 in.)



I3RH0B140025-

5) Apply engine oil to oil seal lip, then install timing chain cover (1). Tighten bolts and nut to specified torque.

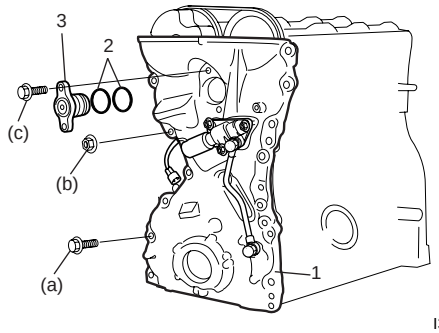
NOTE:

Before installing timing chain cover, check that pin is securely fitted.

Tightening torque
Timing chain cover bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
Timing chain cover nut (b): 25 N·m (2.5 kg-m, 18.0 lb-ft)

6) Apply engine oil to new O-rings (2) and install them to cap (3).
7) Install cap (3) to timing chain cover (1). Tighten bolts to specified torque.

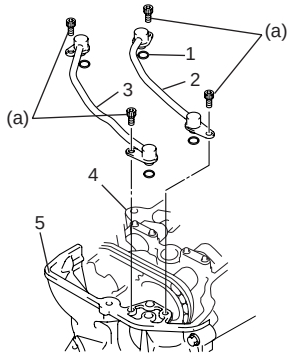
Tightening torque
Cap bolt (c): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I3RH0B140026-

8) Install new O-ring (1) to oil gallery pipes No.2 (2) and No.3 (3).
9) Install oil gallery pipes No.2 and No.3 to cylinder head (4) and timing chain cover (5). Tighten bolts to specified torque.

Tightening torque
Oil gallery pipe No.2 and No.3 bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



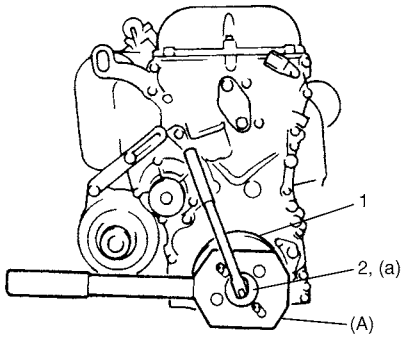
I3RH0B140027-

10) Install water pump pulley.
11) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
12) Install oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E”.

13) Install crankshaft pulley (1). Tighten bolt (2) to specified torque. To lock crankshaft pulley, use special tool with it as shown in the figure.

Special tool
(A): 09917–68221

Tightening torque
Crankshaft pulley bolt (a): 150 N·m (15.0 kg-m, 108.5 lb-ft)



I2RH0B140056-

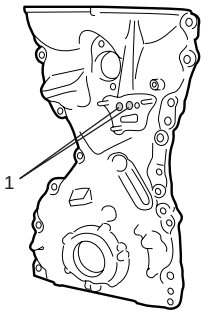
14) Install engine assembly to vehicle referring to "Engine Assembly Removal and Installation: ".

Timing Chain Cover Inspection

S4RS0A1406016

Oil Seal
Check oil seal lip for fault or other damage. Replace as necessary.

Timing Chain Cover
Inspect strainer (1) of oil passage for driving intake cam timing sprocket assembly (VVT actuator).
If clog or foreign matter exists, clean strainer.



I3RH0B140028-

Oil Control Valve Removal and Installation

S4RS0A1406043

Removal
Remove oil gallery pipe No.1 (1) and oil control valve (2) from timing chain cover (3).

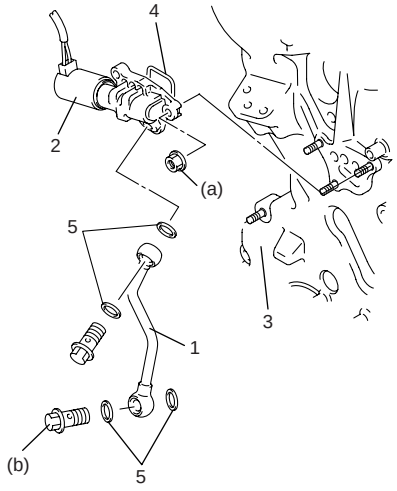
Installation

1) Install new O-ring (4) to oil control valve.
2) Install oil control valve to timing chain cover.
Tighten nuts to specification.

Tightening torque
Oil control valve mounting nut (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

3) Install oil gallery pipe No.1 with new copper washers (5) to timing chain cover.
Tighten bolts to specification.

Tightening torque
Oil gallery pipe No.1 bolt (b): 30 N·m (3.0 kg-m, 21.5 lb-ft)



I3RM0A140027-

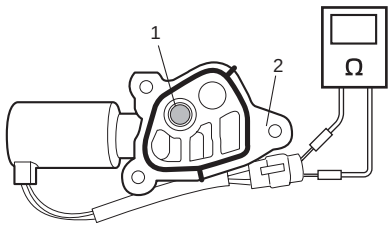
Oil Control Valve Inspection

S4RS0A1406044

Oil Control Valve

1) Inspect strainer (1) and mating surface (2) of oil control valve for clog or damage. Clean oil control valve if clog or foreign matter is present on strainer or mating surface of oil control valve.
   Replace oil control valve if its mating surface is damaged.
2) Check resistance between terminals of oil control valve.

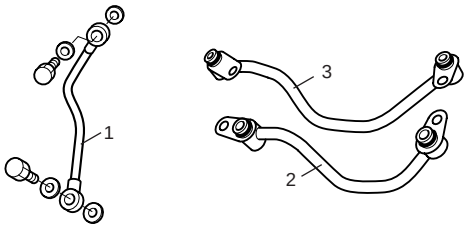
   Oil control valve resistance
   6.7 – 7.7 Ω (at 20 °C (68 °F))



I3RM0A140028-

Oil Gallery Pipe

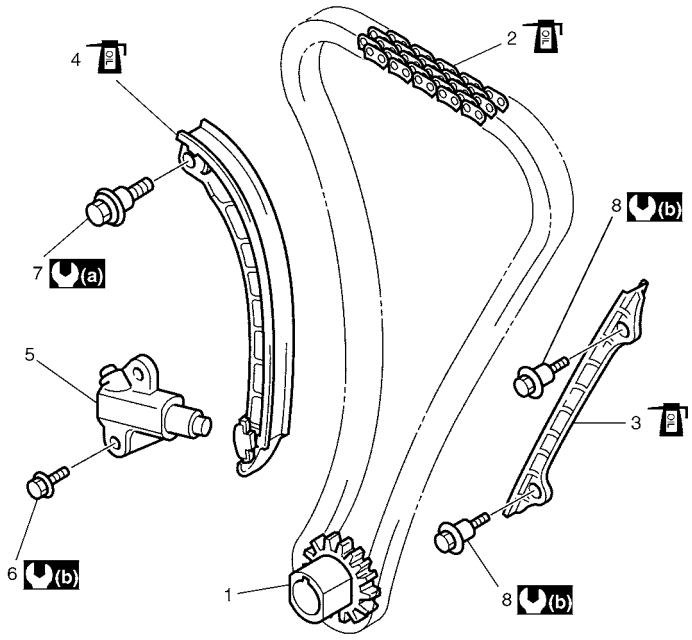
Inspect oil gallery pipes No.1, No.2 (2) and No.3 (3). Replace if crack, deformation or clog exists.



I3RH0B140030-

Timing Chain and Chain Tensioner Components

S4RS0A1406017



I4RS0A140012-

1. Crankshaft timing sprocket	5. Timing chain tensioner adjuster assembly	(a) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
2. Timing chain : Apply engine oil.	6. Chain tensioner adjuster mounting bolt	(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
3. Timing chain No.1 guide : Apply engine oil to sliding surface.	7. Timing chain tensioner bolt	
4. Timing chain tensioner : Apply engine oil to sliding surface.	8. Timing chain No.1 guide bolt	

Timing Chain and Chain Tensioner Removal and Installation

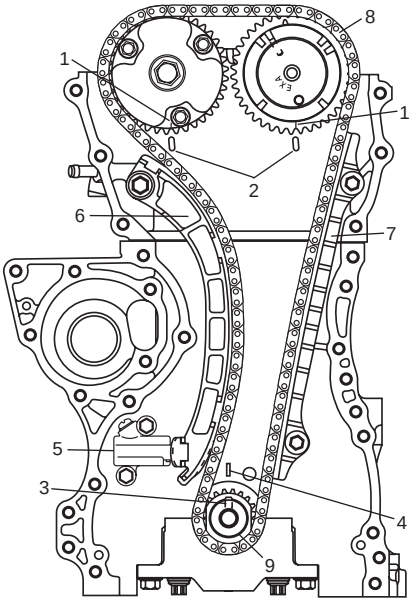
S4RS0A1406018

Removal

CAUTION:

After timing chain is removed, never turn crankshaft and camshafts independently more than its allowable turning range described in “Installation”.
If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

1) Remove timing chain cover referring to “Timing Chain Cover Removal and Installation: ”.
2) By turning crankshaft, align both intake and exhaust camshaft timing sprocket marks (1) with notches (2) of cylinder head respectively and align crankshaft sprocket key (3) with notch of cylinder block (4).
3) Remove timing chain tensioner adjuster assembly (5).
4) Remove timing chain tensioner (6).
5) Remove timing chain No.1 guide (7).
6) Remove timing chain (8) with crankshaft timing sprocket (9).



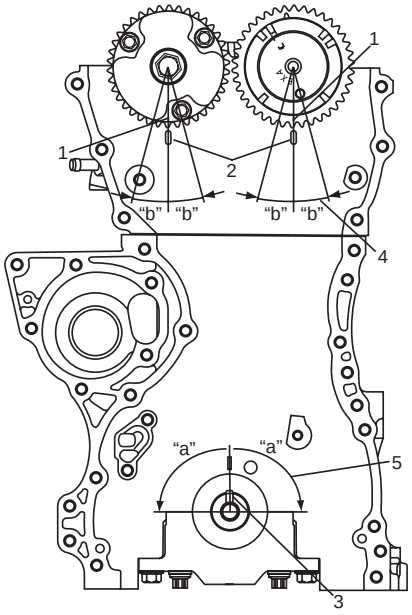
I3RH0B140032-

Installation

CAUTION:

After timing chain is removed, never turn crankshaft and camshafts independently more than such an extent (“a”, “b”) as shown in the figure.
If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

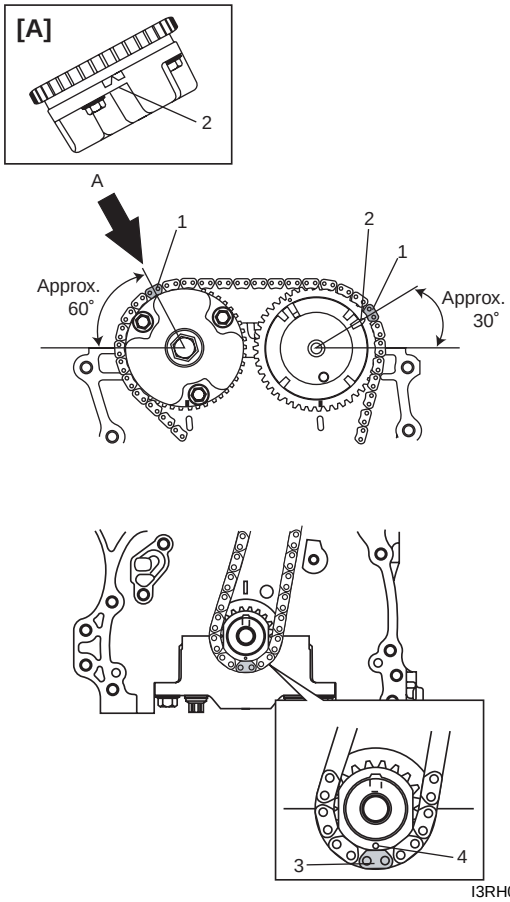
1) Check that match marks (1) on intake and exhaust camshaft timing sprockets are in match with notches (2) on cylinder head as shown in the figure.
2) Set key (3) and turn crankshaft to position key on upside of crankshaft.



I4RS0A140021-

“a”: 90°	4. Camshaft (IN and EX) allowable turning range. By marks on camshaft timing sprocket within 15° from notches on cylinder head on both right and left.
“b”: 15°	5. Crankshaft allowable turning range. By key on crankshaft, within 90° from top on both right and left.

3) Install timing chain by aligning dark blue plate (1) of timing chain and triangle mark (2) on camshaft timing sprocket as shown in the figure.
4) Fit crankshaft timing sprocket to timing chain by aligning gold plate (3) of timing chain and circle mark (4) on crankshaft timing sprocket. Then install crankshaft timing sprocket fitted with chain to crankshaft.

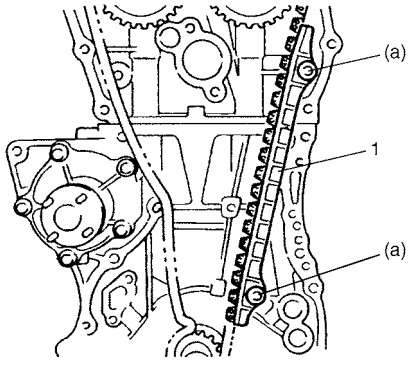


I3RH0B140034-

[A]: View A

5) Apply engine oil to sliding surface of timing chain No.1 guide (1) and install it as shown in the figure. Tighten guide bolts to specified torque.

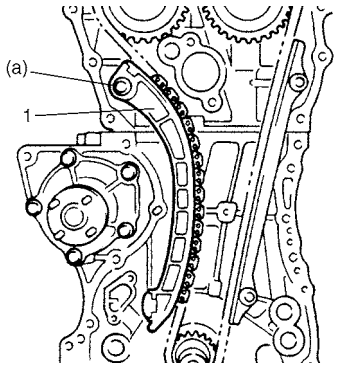
Tightening torque
Timing chain No.1 guide bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B140062-

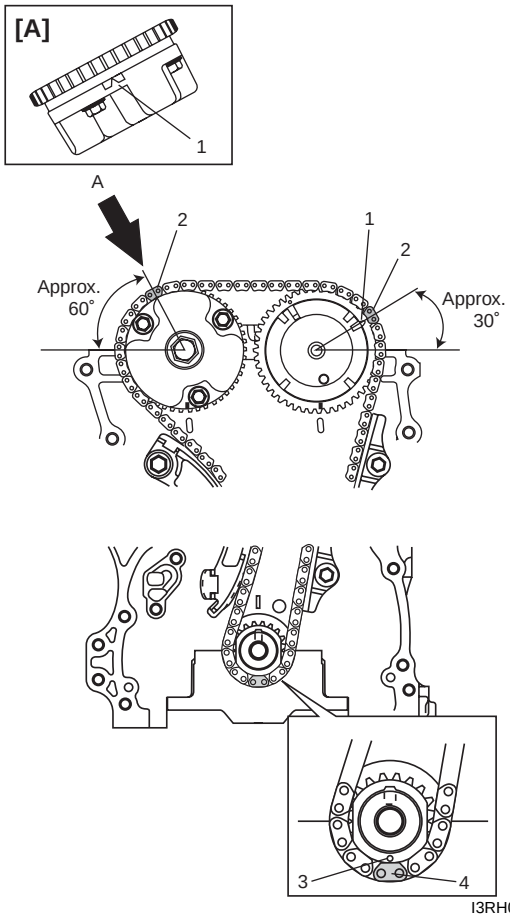
6) Apply engine oil to sliding surface of chain tensioner (1) and install chain tensioner and spacer. Tighten tensioner bolt to specified torque.

Tightening torque
Timing chain tensioner bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I2RH0B140063-

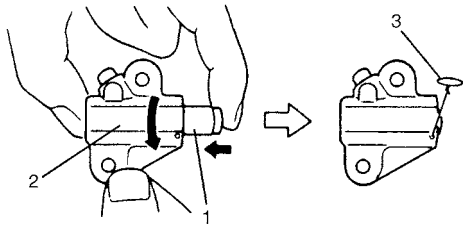
7) Check that match marks (1) on intake and exhaust camshaft timing sprockets are in match with dark blue plates (2) of timing chain and match mark (3) on crankshaft timing sprocket is in match with gold plate (4) of timing chain.



I3RH0B140035-

[A]: View A

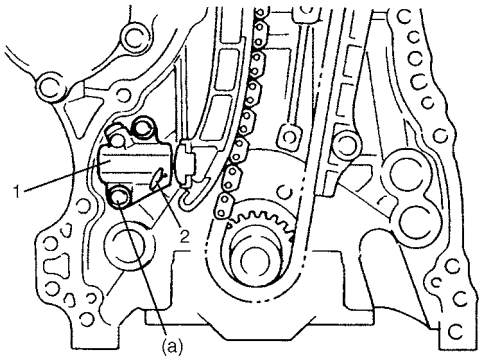
8) Screw in plunger (1) by turning body (2) in arrow direction and install a retainer (3) (wire) to hold plunger in place.



I2RH0B140065-

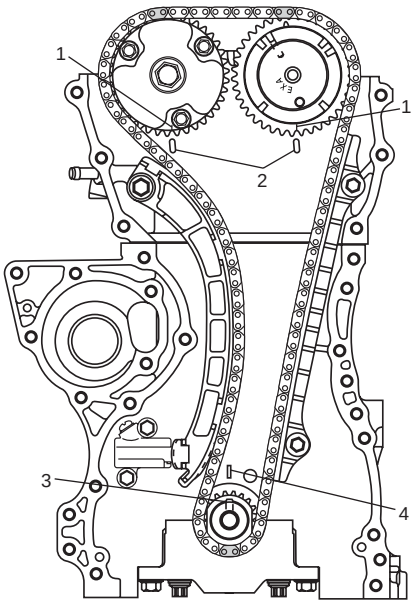
9) Install timing chain tensioner adjuster assembly (1) with a retainer (2).
Tighten adjuster bolts to specified torque and then remove a retainer from chain tensioner adjuster assembly.

Tightening torque
Timing chain tensioner adjuster bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B140066-

10) Apply engine oil to timing chain and then turn crankshaft clockwise by 2 revolutions and check that match marks (1) on intake and exhaust camshaft timing sprockets are in match with notches (2) on cylinder head and key (3) is in match with notch (4) on cylinder black as shown in the figure.
If each marking chain and each match mark are no matches, adjust each sprockets and timing chain.



I3RH0B140036-

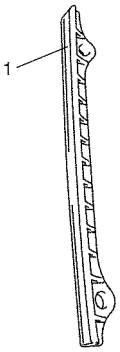
11) Install timing chain cover referring to “Timing Chain Cover Removal and Installation: ”.

12) Perform Steps 3) to 8) of “Installation” of “Timing Chain Cover Removal and Installation: ”.

Timing Chain and Chain Tensioner Inspection

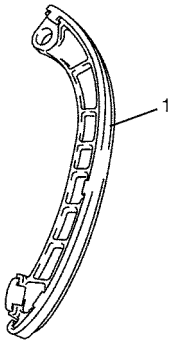
S4RS0A1406019

Timing Chain No.1 Guide
Check shoe (1) for wear or damage.



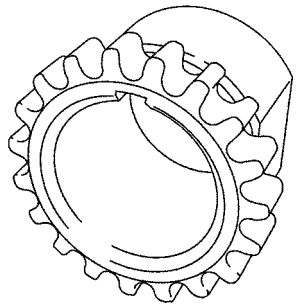
I2RH0B140068-

Timing Chain Tensioner
Check shoe (1) for wear or damage.



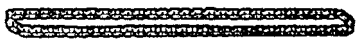
I2RH0B140069-

Crankshaft Timing Sprocket
Check teeth of sprocket for wear or damage.



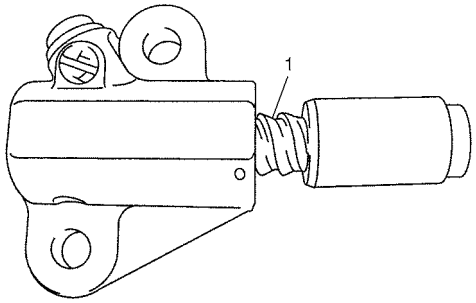
I2RH0B140070-

Timing Chain
Check timing chain for wear or damage.



I2RH01140077-

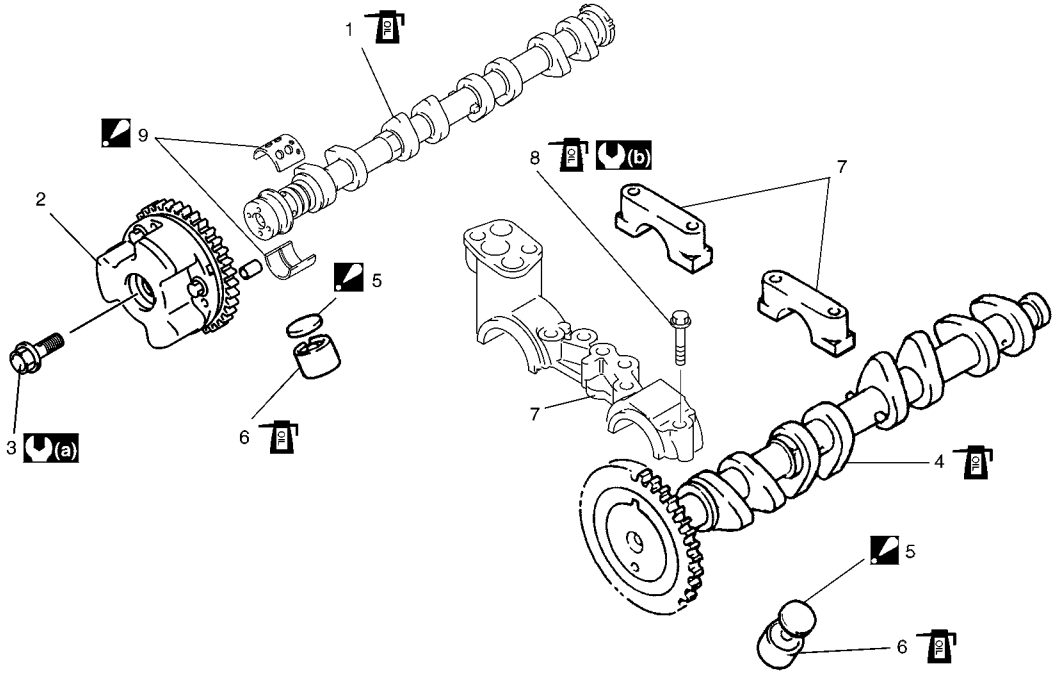
Timing Chain Tensioner Adjuster
Check that tooth surface (1) are free from damage.



I2RH0B140071-

Camshaft, Tappet and Shim Components

S4RS0A1406020



I4RS0A140013-

1. Intake camshaft	5. Shim : Shim No. on it faces tappet side.	9. Upper camshaft bearing : Install a bearing half with some holes to upper side of intake camshaft No.1 bearing.
2. Intake camshaft sprocket assembly	6. Tappet	(a) : 60 N·m (6.0 kg-m, 43.5 lb-ft)
3. Intake camshaft sprocket bolt	7. Camshaft housing	(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
4. Exhaust camshaft	8. Camshaft housing bolt	: Apply engine oil to sliding surface of each part.

Camshaft, Tappet and Shim Removal and Installation

S4RS0A1406021

CAUTION:

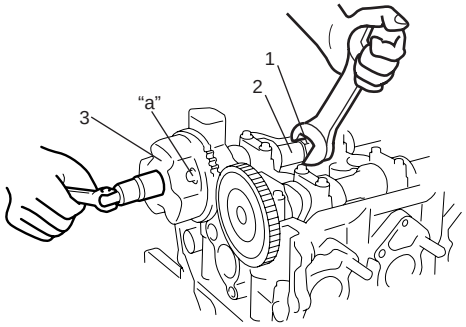
- **Keep working table, tools and hands clean while overhauling.**
- **Use special care to handle aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Keep them always clean.**

Removal

1) Remove timing chain cover referring to “Timing Chain Cover Removal and Installation: ”.
2) Remove timing chain referring to “Timing Chain and Chain Tensioner Removal and Installation: ”.
3) With hexagonal section (1) of intake camshaft (2) held stationary with spanner or the like, loosen mounting bolt of intake cam timing sprocket assembly (3) and remove it.

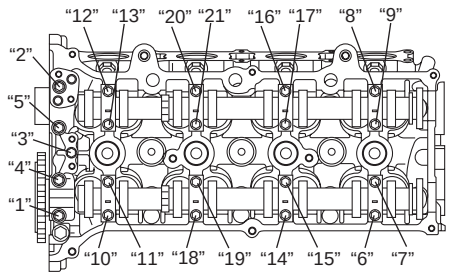
CAUTION:

Never attempt to loosen mounting bolt with intake cam timing sprocket assembly held stationary. Failure to follow this could result in damage to lock pin.
Do not loosen bolt “a” because intake cam timing sprocket assembly is not serviceable.



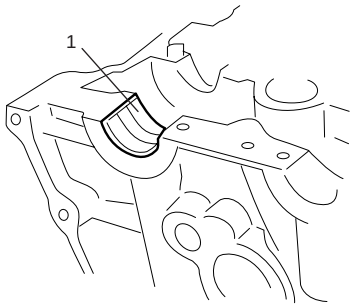
I3RM0A140030-

4) Loosen camshaft housing bolts in such order as indicated in the figure and remove them.



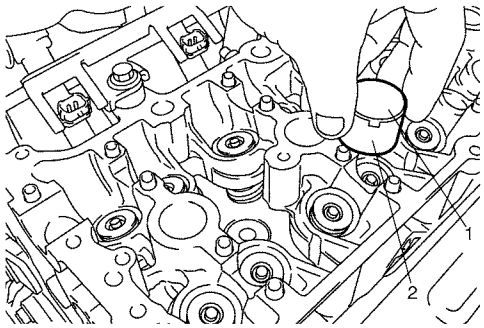
I3RM0A140031-

5) Remove camshaft housings.
6) Remove intake and exhaust camshafts.
7) Remove camshaft bearing (1).



I3RH0B140039-

8) Remove tappets (2) with shims (1).



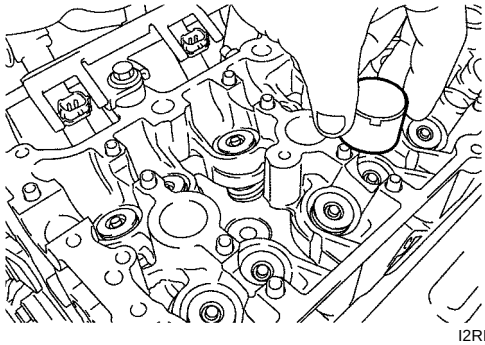
I2RH0B140074-

Installation

1) Install tappets and shims to cylinder head.
Apply engine oil around tappet and then install it to cylinder head.

NOTE:

When installing shim, make sure to direct shim No. side toward tappet.

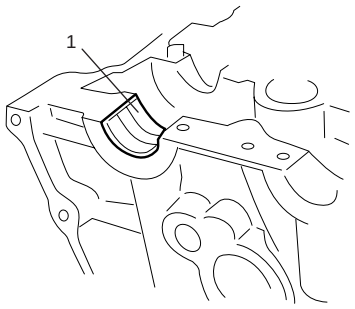


I2RH0B140075-

2) Install camshaft bearing (1) to cylinder head.

CAUTION:

Do not apply engine oil to camshaft bearing back.
Only a upper half bearing of intake camshaft bearing No.1 has some holes. Other bearings.

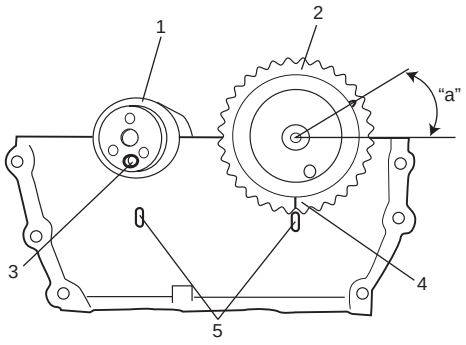


I3RH0B140039-

3) Install intake camshaft (1) and exhaust camshaft (2). Align knock pin (3) and match mark (4) with notches (5) as shown in the figure.

NOTE:

Before installing camshafts, turn crankshaft until key position faces upward.
Refer to "Timing Chain and Chain Tensioner Removal and Installation: ".

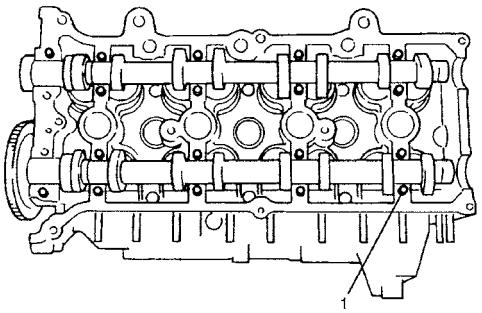


I4RS0A140014-

"a": Approx. 30°

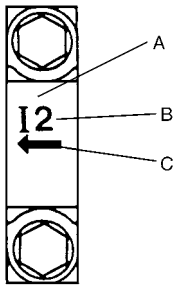
4) Apply engine oil to sliding surface of each camshaft and camshaft journal then install them as shown in the figure.

5) Install camshaft housing pins (1) as shown in the figure.



I3RM0A140033-

6) Check position of camshaft housings.
Embossed marks are provided on each camshaft housing, indicating position and direction for installation. Install housings as indicated by these marks.

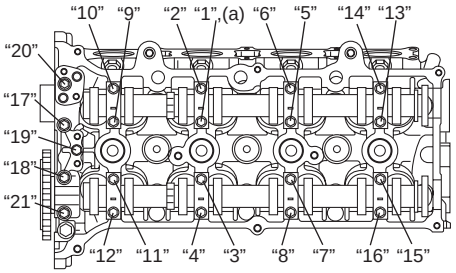


I2RH0B140078-

A: I: Intake side or E: Exhaust side
B: Position from timing chain side
C: Pointing to timing chain side

7) After applying engine oil to housing bolts, tighten them temporarily first. Then tighten them by the numerical order in the figure. Tighten a little at a time and evenly among bolts and repeat tightening sequence two or three times before they are tightened to specified torque.

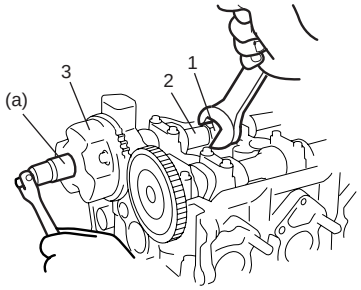
Tightening torque
Camshaft housing bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I3RH0B140041-

8) With hexagonal section (1) of intake camshaft (2) held stationary with spanner or the like, tighten bolt of intake cam timing sprocket assembly (3) to specification.

Tightening torque
Intake cam timing sprocket bolt (a): 60 N·m (6.0 kg-m, 43.5 lb-ft)



I3RH0B140042-

9) Install timing chain with crankshaft sprocket referring to "Timing Chain and Chain Tensioner Removal and Installation: ".

10) Install timing chain cover referring to "Timing Chain Cover Removal and Installation: ".

11) Check valve lashes referring to "Valve Lash (Clearance) Inspection: ".

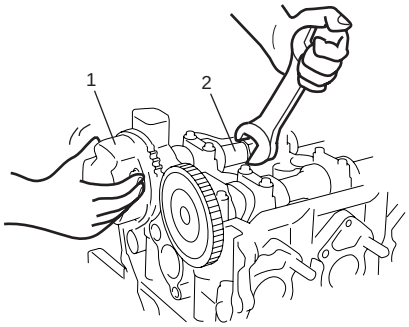
12) Perform Steps 3) to 8) of “Installation” of “Timing Chain Cover Removal and Installation: ”.

Camshaft, Tappet and Shim Inspection

S4RS0A1406022

Intake Cam Timing Sprocket Assembly

Fit intake cam timing sprocket assembly to camshaft (2) and hold hexagonal section of camshaft by using spanner or the like.
Check if sprocket (1) is not turned by hand.
If moved, replace intake cam timing sprocket assembly.



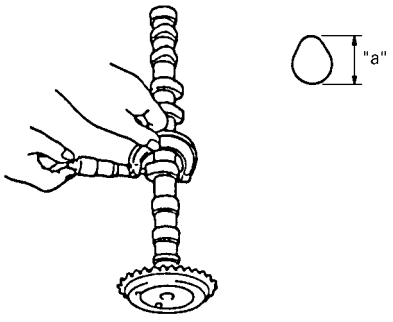
I3RH0B140043-

Cam Wear

Using a micrometer, measure cam height “a”. If measured height underruns its limit, replace camshaft.

Cam height “a”

Cam height	Standard	Limit
Intake cam	44.929 – 45.089 mm (1.769 – 1.775 in.)	44.80 mm (1.764 in.)
Exhaust cam	44.399 – 44.559 mm (1.748 – 1.754 in.)	44.28 mm (1.743 in.)

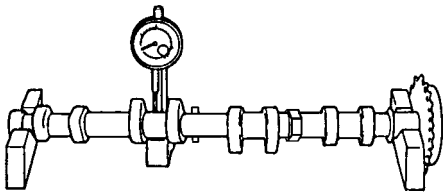


I2RH0B140080-

Camshaft Runout

Set camshaft between two “V” blocks, and measure its runout by using a dial gauge.
If measured runout exceeds limit, replace camshaft.

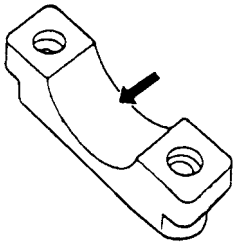
Camshaft runout limit
0.10 mm (0.0039 in.)



I2RH0B140081-

Camshaft Journal Wear

Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.
If any malcondition is found, replace camshaft or cylinder head with housing. Never replace cylinder head without replacing housings.



I2RH0B140082-

Check clearance by using gauging plastic. Checking procedure is as follows.

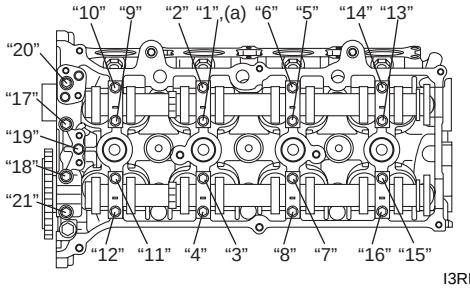
1) Clean housings and camshaft journals.
2) Remove all tappets with shims.
3) Install camshafts to cylinder head.
4) Place a piece of gauging plastic to full width of journal of camshaft (parallel to camshaft).
5) Install camshaft housing.

6) Tighten camshaft housing bolts in such order as indicated in the figure a little at a time till they are tightened to specified torque.

NOTE:

Do not rotate camshaft while gauging plastic is installed.

Tightening torque
Camshaft housing bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

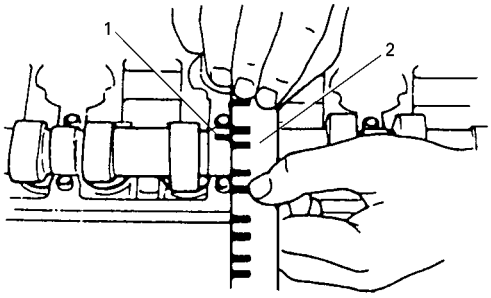


I3RH0B140041-

7) Remove housing, and using scale (2) on gauging plastic envelop, measure gauging plastic (1) width at its widest point.

Camshaft journal clearance

	Standard	Limit
Intake side No.1 housing	0.020 – 0.072 mm (0.0008 – 0.0028 in.)	0.10 mm (0.0039 in.)
Others	0.045 – 0.087 mm (0.0018 – 0.0034 in.)	0.12 mm (0.0047 in.)



I2RH0B140083-

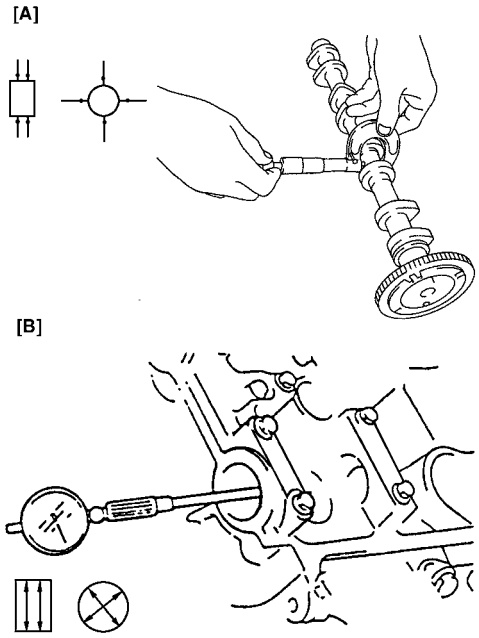
If measured camshaft journal clearance exceeds limit, measure journal (housing) bore and outside diameter of camshaft journal. Replace camshaft or cylinder head assembly whichever the difference from specification is greater.

Camshaft journal diameter [A]

Item	Standard
Intake side No.1 housing	26.940 – 26.955 mm (1.0606 – 1.0612 in.)
Exhaust side No.1 housing	26.934 – 26.955 mm (1.0604 – 1.0612 in.)
Others	22.934 – 22.955 mm (0.9029 – 0.9037 in.)

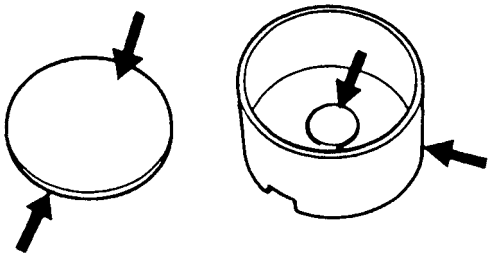
Camshaft journal bearing bore [B]

Item	Standard
Intake side No.1 housing	—
Exhaust side No.1 housing	27.000 – 27.021 mm (1.0630 – 1.0638 in.)
Others	23.000 – 23.021 mm (0.9055 – 0.9063 in.)



I2RH0B140084-

Wear of Tappet and Shim
Check tappet and shim for pitting, scratches, or damage. If any malcondition is found, replace.



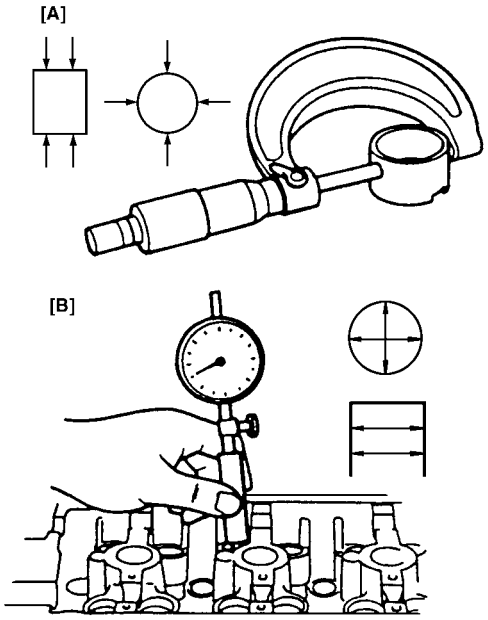
I2RH0B140085-

Measure cylinder head bore and tappet outside diameter to determine cylinder head-to-tappet clearance. If clearance exceeds limit, replace tappet or cylinder head.

Cylinder head to tappet clearance
Standard: 0.025 – 0.066 mm (0.0010 – 0.026 in.)
Limit: 0.15 mm (0.0059 in.)

Tappet outside diameter [A]
Standard: 30.959 – 30.975 mm (1.2189 – 1.2195 in.)

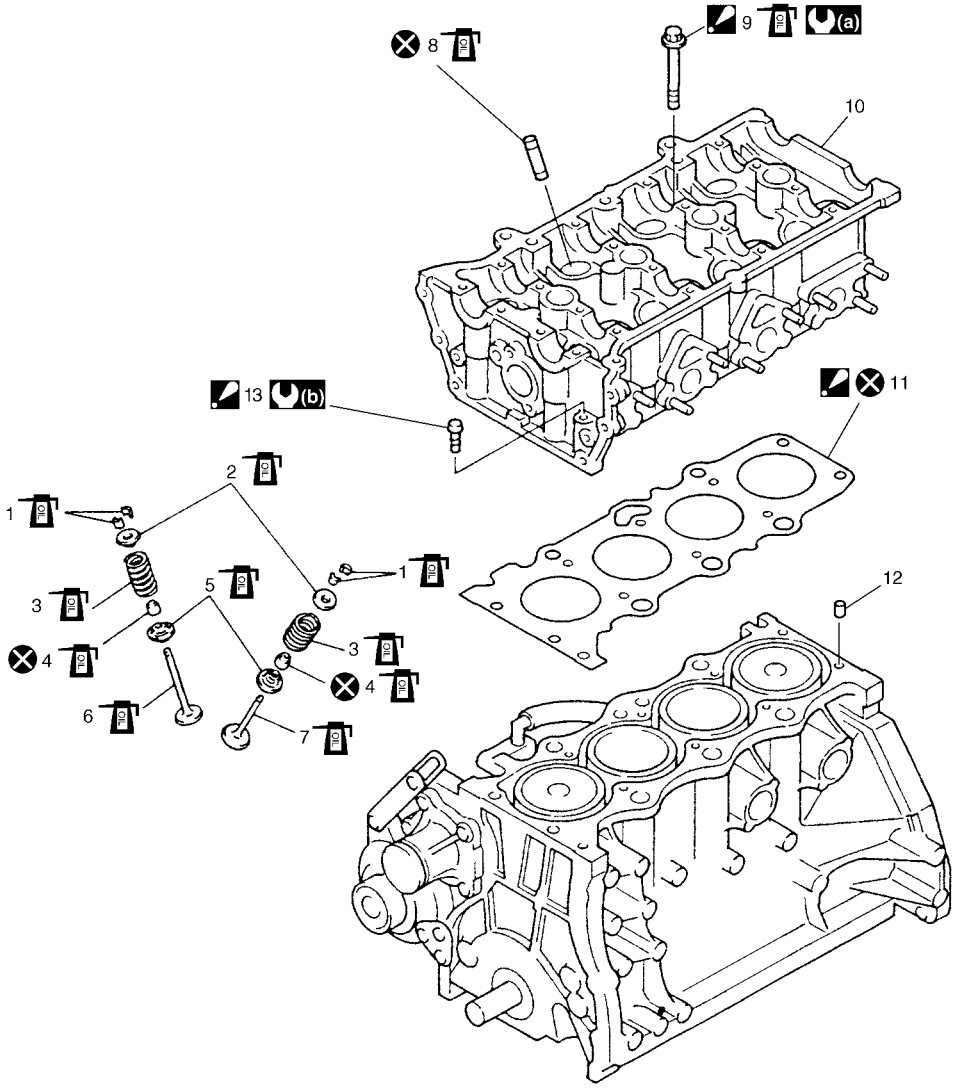
Cylinder head tappet bore [B]
Standard: 31.000 – 31.025 mm (1.2205 – 1.2215 in.)



I2RH0B140086-

Valves and Cylinder Head Components

S4RS0A1406023



I4RS0A140015-

1. Valve cotters	7. Exhaust valve	13. Cylinder head bolt (M8) : Be sure to tighten cylinder head bolt (M8) after securing the other cylinder head bolt (M10).
2. Valve spring retainer	8. Valve guide	(a) : Tighten 20 N·m (2.0 kg-m, 14.5 lb-ft), 40 N·m (4.0 kg-m, 29.0 lb-ft), 60° and 60° by the specified procedure.
3. Valve spring	9. Cylinder head bolt (M10) : Never reuse cylinder head bolts once disassembled it due to plastic deformation tightening. Be sure to use new cylinder head bolts when installing.	(b) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
4. Valve stem seal	10. Cylinder head	: Do not reuse.
5. Valve spring seat	11. Cylinder head gasket : "TOP" mark provided on gasket comes to crankshaft pulley side, facing up.	: Apply engine oil to sliding surface of each part.
6. Intake valve	12. Knock pin	

Valves and Cylinder Head Removal and Installation

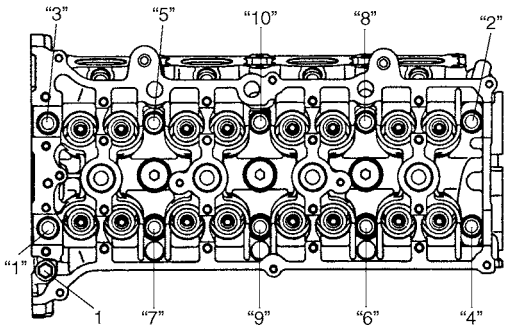
S4RS0A1406024

Removal

1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation: ”.
2) Remove oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E”.
3) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
4) Remove timing chain cover referring to Steps 2) to 7) of “Removal” in “Timing Chain Cover Removal and Installation: ”.
5) Remove timing chain referring to Steps 2) to 6) of “Removal” in “Timing Chain and Chain Tensioner Removal and Installation: ”.
6) Remove intake and exhaust camshafts referring to Steps 3) to 7) of “Removal” in “Camshaft, Tappet and Shim Removal and Installation: ”.
7) Loosen cylinder head bolts in such order as indicated in the figure by using a 12 corner socket wrenches and remove them.

NOTE:

- **Don’t forget to remove bolt (M8) (1) as shown in the figure.**
- **Never reuse cylinder head bolts once disassembled it due to plastic deformation tightening. Be sure to use new cylinder head bolts when installing.**

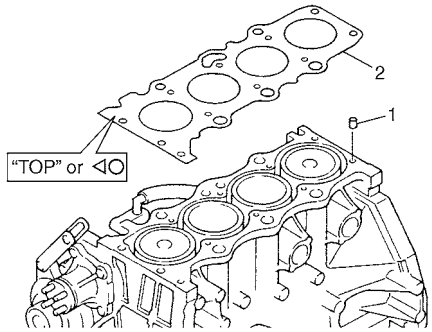


I2RH0B140088-

8) Check all around cylinder head for any other parts required to be removed or disconnected and remove or disconnect whatever necessary.
9) Remove exhaust manifold, if necessary referring to “Exhaust Manifold Removal and Installation: in Section 1K”.
10) Remove cylinder head with intake manifold and exhaust manifold. Use lifting device, if necessary.

Installation

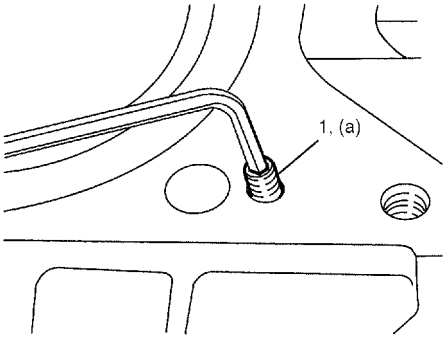
1) Clean mating surface of cylinder head and cylinder block. Remove oil, old gasket and dust from mating surface.
2) Install knock pins (1) to cylinder block.
3) Install new cylinder head gasket (2) to cylinder block. “Top” mark or “Triangle/circle” provided on gasket comes to crankshaft pulley side, facing up (toward cylinder head side).



I4RS0B140018-

4) Make sure that oil jet (venturi plug) (1) is not clogged. If it is not installed, install it as specified torque.

Tightening torque
Venturi plug (a): 5 N·m (0.5 kg-m, 3.5 lb-ft)



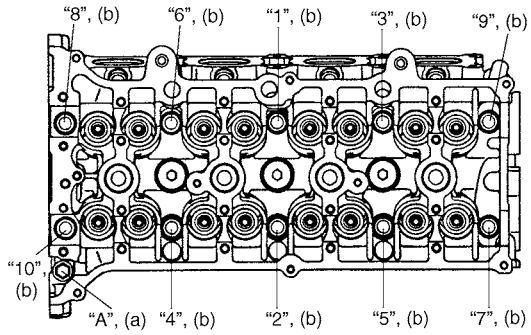
I2RH0B140089-

5) Install cylinder head to cylinder block.
Apply engine oil to new cylinder head bolts and tighten them gradually as follows.
   a) Tighten cylinder head bolts (“1” – “10”) to 20 N·m (2.0 kg-m, 14.5 lb-ft) according to numerical order as shown by using a 12 corner socket wrenches.
   b) In the same manner as in Step a), tighten them to 40 N·m (4.0 kg-m, 29.0 lb-ft).
   c) Turn all bolts 60° according to numerical order in the figure.
   d) Repeat Step c).
   e) Tighten bolt “A” to specified torque.

NOTE:

Be sure to tighten M8 bolt "A" after securing the other bolts.

Tightening torque
Cylinder head bolt for M8 (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
Cylinder head bolt for M10 (b): 20 N·m (2.0 kg-m, 14.5 lb-ft), 40 N·m (4.0 kg-m, 29.0 lb-ft) and then retighten by turning through to 60° twice



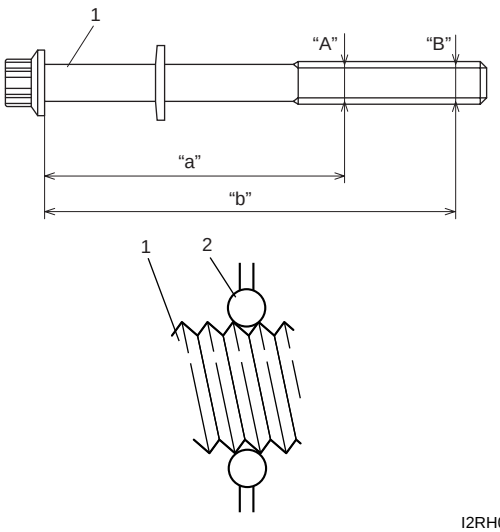
I2RH0B140091-

NOTE:

- **If they are reused, check thread diameters of cylinder head bolt (1) for deformation according to the follows and replace them with new ones if thread diameter difference exceeds limit.**
- **Measure each thread diameter of cylinder head bolt (1) at "A" on 83.5 mm (2.81 in.) from seat side of flange bolt and "B" on 115 mm (4.53 in.) from seat side of flange bolt by using a micrometer (2).**
  Then calculate difference in diameters ("A" – "B"). If it exceeds limit, replace with new one.

Cylinder head bolt diameter measurement points
"a": 83.5 mm (2.81 in.)
"b": 115 mm (4.53 in.)

Cylinder head bolt diameter difference (deformation)
Limit ("A" – "B"): 0.1 mm (0.004 in.)



I2RH0B140092-

6) Install camshafts, tappet and shim referring to "Camshaft, Tappet and Shim Removal and Installation: ".
7) Install timing chain referring to "Timing Chain and Chain Tensioner Removal and Installation: ".
8) Install timing chain cover referring to "Timing Chain Cover Removal and Installation: ".
9) Install cylinder head cover referring to "Cylinder Head Cover Removal and Installation: ".
10) Install oil pan referring to "Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E".

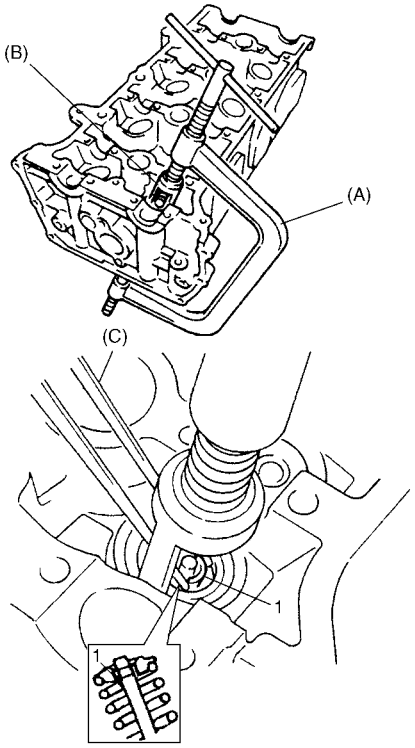
Valves and Cylinder Head Disassembly and Assembly

S4RS0A1406025

Disassembly

1) For ease in servicing cylinder head, remove intake manifold, injectors, exhaust manifold from cylinder head.
2) Using special tools (Valve lifter), compress valve spring and then remove valve cotters (1) also by using special tool (Forceps).

Special tool
(A): 09916–14510
(B): 09916–14521
(C): 09916–84511

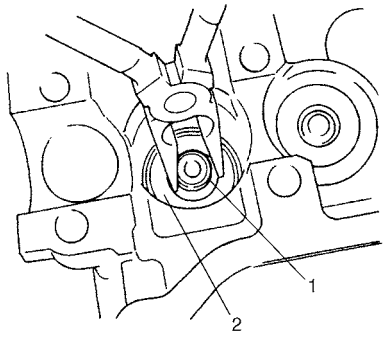


I2RH0B140093-

3) Release special tools (Valve lifter), and remove spring retainer and valve spring.
4) Remove valve from combustion chamber side.
5) Remove valve stem seal (1) from valve guide and valve spring seat (2).

NOTE:

Do not reuse valve stem seal once disassembled. Be sure to use new seal when assembling.



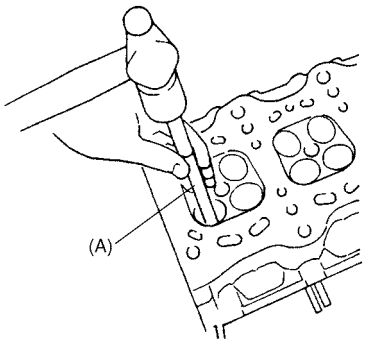
I2RH0B140094-

6) Using special tool (Valve guide remover), drive valve guide out from combustion chamber side to valve spring side.

Special tool
(A): 09916–44910

NOTE:

Do not reuse valve guide once disassembled. Be sure to use new valve guide (oversize) when assembling.



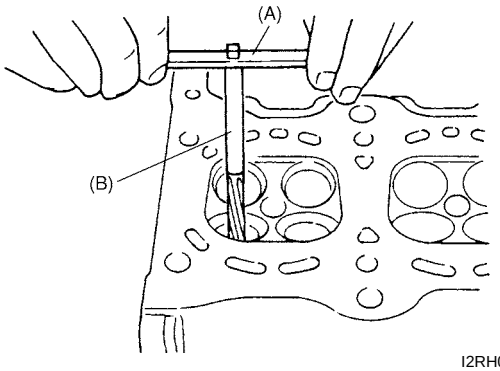
I2RH0B140095-

7) Place disassembled parts except valve stem seal and valve guide in order so that they can be installed in their original position.

Assembly

1) Before installing valve guide into cylinder head, ream guide hole with special tool (10.5 mm reamer) so as to remove burrs and make it truly round.

Special tool
(A): 09916–34542
(B): 09916–37320



I2RH0B140096-

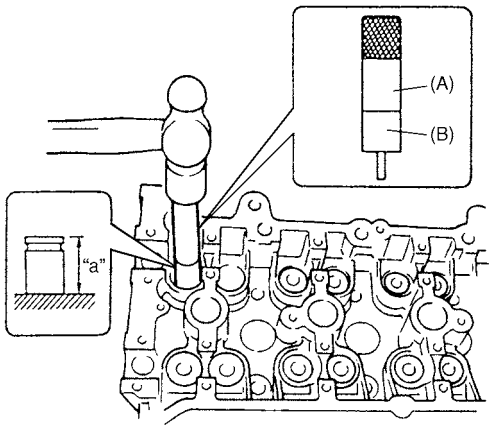
2) Install valve guide to cylinder head.
Heat cylinder head uniformly at a temperature of 80 to 100 °C (176 to 212 °F) so that head will not be distorted, and drive new valve guide into hole with special tools.
Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head.
After installing, make sure that valve guide protrudes by specified dimension “a” from cylinder head.

Special tool
(A): 09916–58210
(B): 09916–56011

NOTE:

- **Never reuse valve guide once disassembled. Make sure to install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

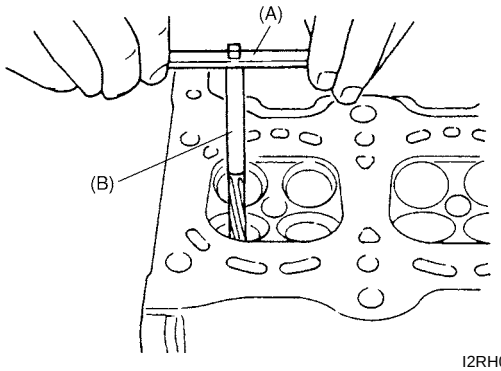
Valve guide protrusion (In and Ex)
“a”: 11.3 mm (0.44 in.)



I2RH0B140097-

3) Ream valve guide bore with special tool (5.5 mm reamer). After reaming, clean bore.

Special tool
(A): 09916–34542
(B): 09916–34550



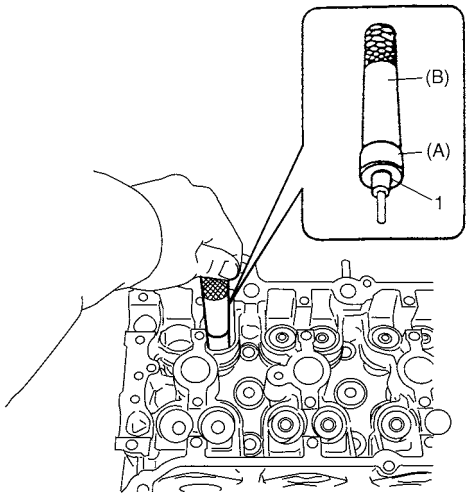
I2RH0B140096-

4) Install valve spring seat to cylinder head.
5) Install new valve stem seal (1) to valve guide.
After applying engine oil to seal and spindle of special tool (Valve guide installer handle), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand.
After installing, check to be sure that seal is properly fixed to valve guide.

Special tool
(A): 09917–98221
(B): 09916–58210

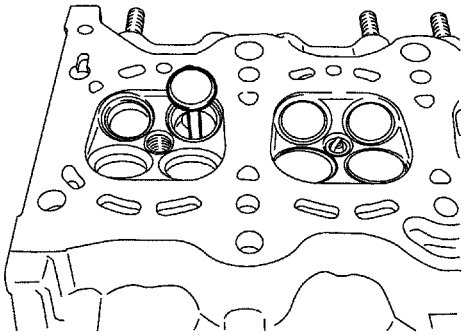
NOTE:

- **Do not reuse seal once disassembled. Be sure to install new seal.**
- **When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool by hand. Tapping or hitting special tool may cause damage to seal.**



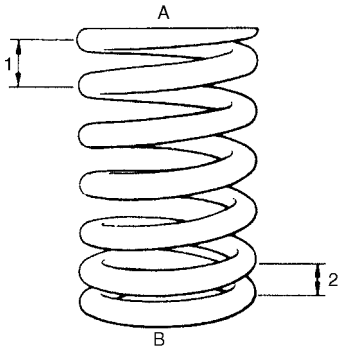
I2RH0B140098-

6) Install valve to valve guide.
Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore and valve stem.



I2RH0B140099-

7) Install valve spring and spring retainer.
Each valve spring has top end (large-pitch end (1)) and bottom end (small-pitch end (2)). Be sure to position spring in place with its bottom end (small-pitch end) facing the bottom (valve spring seat side).



I2RH0B140100-

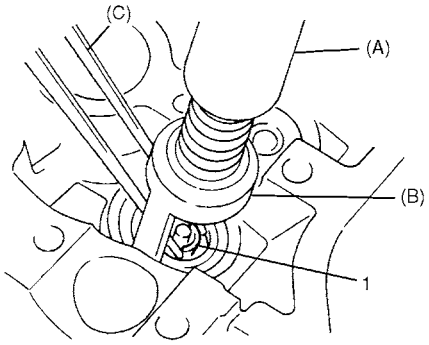
A:	Valve spring retainer side
B:	Valve spring seat side

8) Using special tools (Valve lifter), compress valve spring and fit two valve cotters (1) into groove in valve stem.

NOTE:

When compressing the valve spring, be carefully to free from damage in inside face of tappet installing hole.

Special tool
(A): 09916–14510
(B): 09916–14521
(C): 09916–84511



I2RH0B140101-

9) Install intake manifold referring to “Intake Manifold Removal and Installation: ”.
10) Install fuel injectors referring to “Fuel Injector Removal and Installation: in Section 1G”.
11) Install exhaust manifold referring to “Exhaust Manifold Removal and Installation: in Section 1K”.

Valves and Valve Guides Inspection

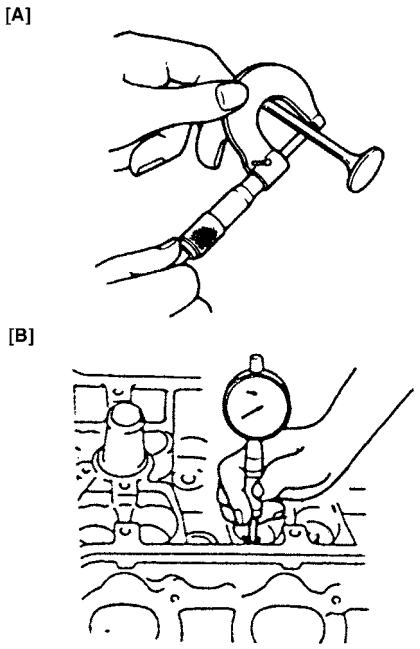
S4RS0A1406026

Valve Guide

Valve stem-to-guide clearance
Using a micrometer and bore gauge, take diameter readings on valve stems and guides to check stem-to-guide clearance.
Be sure to take reading at more than one place along the length of each stem and guide.
If clearance exceeds limit, replace valve and valve guide.

Valve stem and valve guide specification

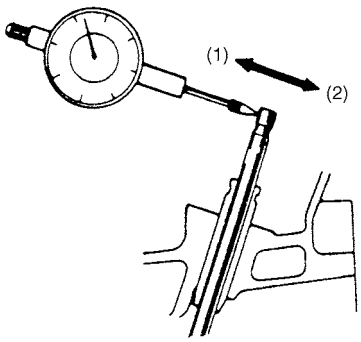
Item		Standard	Limit
Valve stem diameter [A]	In	5.465 – 5.480 mm (0.2150 – 0.2157 in.)	—
	Ex	5.440 – 5.455 mm (0.2142 – 0.2148 in.)	—
Valve guide bore [B]	In & Ex	5.500 – 5.512 mm (0.2165 – 0.2170 in.)	—
Stem-to-guide clearance	In	0.020 – 0.047 mm (0.0008 – 0.0018 in.)	0.070 mm (0.0028 in.)
	Ex	0.045 – 0.072 mm (0.0017 – 0.0028 in.)	0.090 mm (0.0035 in.)



I3RM0A140035-

Valve stem end deflection
If bore gauge is not available, check end deflection of valve stem with a dial gauge instead.
Move stem end in directions (1) and (2) to measure end deflection.
If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit
In: 0.14 mm (0.005 in.)
Ex: 0.18 mm (0.007 in.)

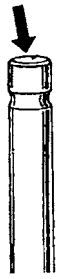


IYSQ01141096-

Valve

Visual inspection

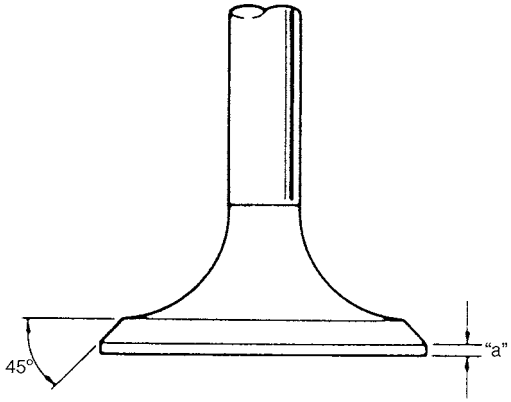
- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem end, as necessary, replace it.
- Inspect valve stem end face for pitting and wear. If pitting or wear is found there, valve stem end may be resurfaced, but not too much to grind off its chamber. When it is worn out too much that its chamber is gone, replace valve.



I2RH01140135-

Valve head thickness
Measure thickness “a” of valve head. If measured thickness exceeds limit, replace valve.

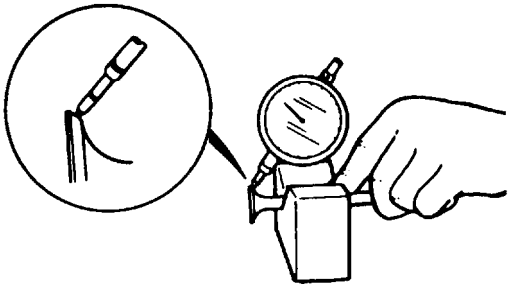
Valve head thickness “a” (In and Ex)
Standard: 1.25 – 1.55 mm (0.049 – 0.061 in.)
Limit: 0.9 mm (0.035 in.)



I2RH0B140102-

Valve head radial runout
Check each valve for radial runout with a dial gauge and "V" block. To check runout, rotate valve slowly. If runout exceeds its limit, replace valve.

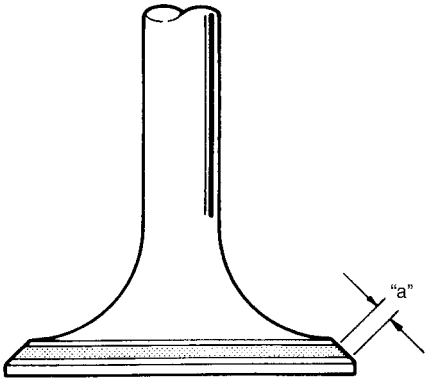
Valve head radial runout
Limit: 0.08 mm (0.003 in.)



I2RH01140136-

Seating contact width
Create contact pattern on each valve in the usual manner, i.e., by giving uniform coat of marking compound to valve seat and by rotatingly tapping seat with valve head. Valve lapper (tool used in valve lapping) must be used.
Pattern produced on seating face of valve must be a continuous ring without any break, and the width of pattern must be within specified range.

Standard seating width "a" revealed by contact pattern on valve face
Intake and Exhaust: 1.0 – 1.4 mm (0.0389 – 0.0551 in.)



I2RH0B140103-

Valve seat repair
A valve seat not producing a uniform contact with its valve or showing width of seating contact that is out of specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

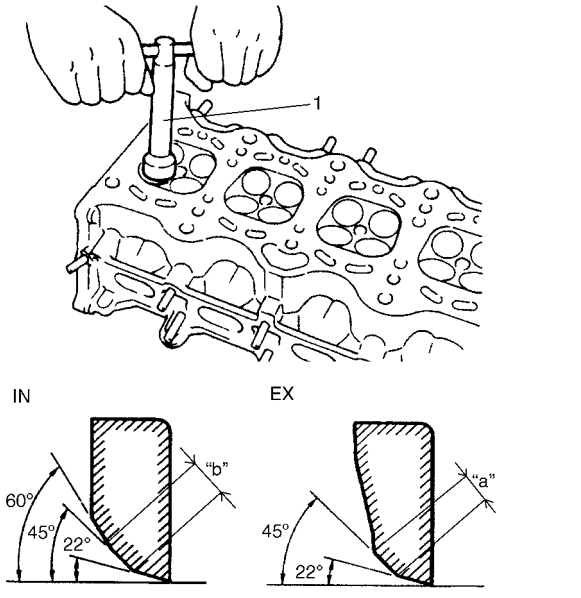
1) **Exhaust valve seat:**
Use valve seat cutters (1) to make two cuts as illustrated in the figure. Two cutters must be used: the first for making 22° angle, and the second for making 45° angle. The second cut must be made to produce desired seat width.

Seat width for exhaust valve seat
"a": 1.0 – 1.4 mm (0.0389 – 0.0551 in.)

2) **Intake valve seat:**
Use valve seat cutters (1) to make three cuts as illustrated in the figure. Three cutters must be used: the 1st for making 22° angle, the 2nd for making 60° angle, and 3rd for making 45° angle. The 3rd cut (45°) must be made to produce desired seat width.

Seat width for intake valve seat
"b": 1.0 – 1.4 mm (0.0389 – 0.0551 in.)

3) **Valve lapping:**
Lap valve on seat in two steps, first with coarse size lapping compound applied to face and the second with fine-size compound, each time using valve lapper according to usual lapping method.



I3RM0A140036-

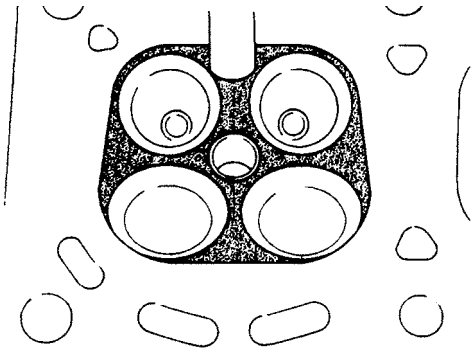
Cylinder Head Inspection

S4RS0A1406027

- Remove all carbon deposits from combustion chambers.

NOTE:

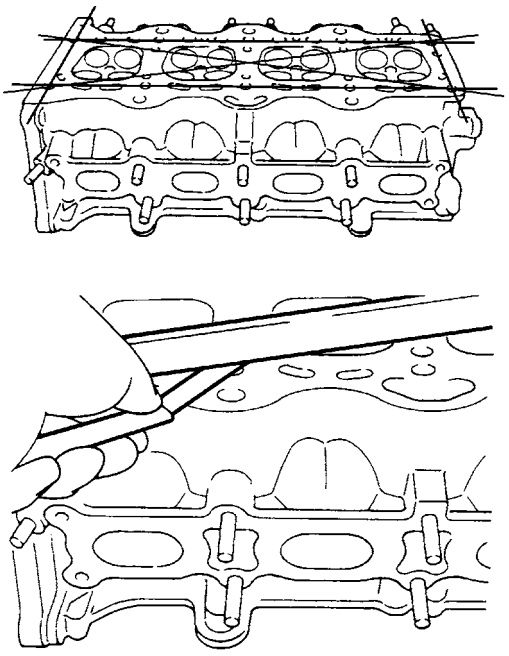
Do not use any sharp-edged tool to scrape off carbon deposits. Be careful not to scuff or nick metal surfaces when decarbonizing. The same applies to valves and valve seats, too.



I2RH0B140105-

- Check cylinder head for cracks on intake and exhaust ports, combustion chambers, and head surface. Using a straightedge and thickness gauge, check flatness of gasketed surface at a total of 6 locations. If distortion limit is exceeded, correct gasketed surface with a surface plate and abrasive paper of about #400 (Waterproof silicon carbide abrasive paper): place abrasive paper on and over surface plate, and rub gasketed surface against paper to grind off high spots. Should this fail to reduce thickness gauge readings to within limit, replace cylinder head.
  Leakage of combustion gases from this gasketed joint is often due to warped gasketed surface: such leakage results in reduced power output.

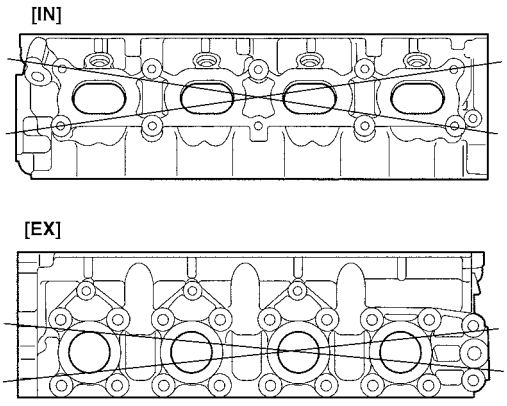
Distortion for cylinder head surface on piston side
Limit: 0.03 mm (0.001 in.)



I2RH0B140106-

- Distortion of manifold seating faces:
  Check seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, in order to determine whether these faces should be corrected or cylinder head replaced.

Distortion for cylinder head surface on intake and exhaust manifold
Limit: 0.05 mm (0.002 in.)



I2RH0B140107-

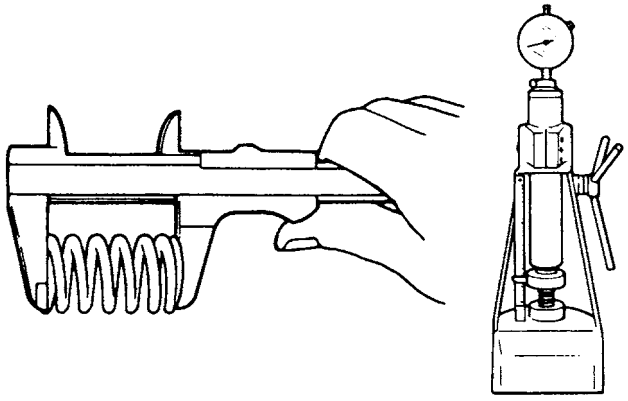
Valve Spring Inspection

S4RS0A1406028

Valve Spring Free Length and Preload
Referring to data, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Valve spring free length
Standard: 36.83 mm (1.450 in.)
Limit: 35.83 mm (1.411 in.)

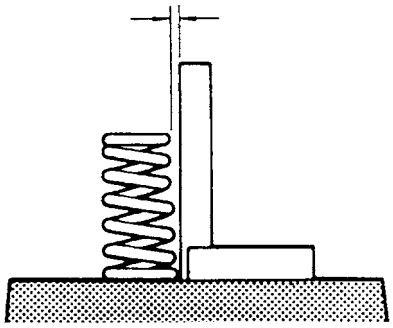
Valve spring preload
Standard: 107 – 125 N (10.7 – 12.5 kg) for 31.50 mm (23.6 – 27.6 lb/1.240 in.)
Limit: 102 N (10.2 kg) for 31.50 mm (22.5 lb/1.240 in.)



I2RH01140143-

Spring Squareness
Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve springs found to exhibit a larger clearance than limit must be replaced.

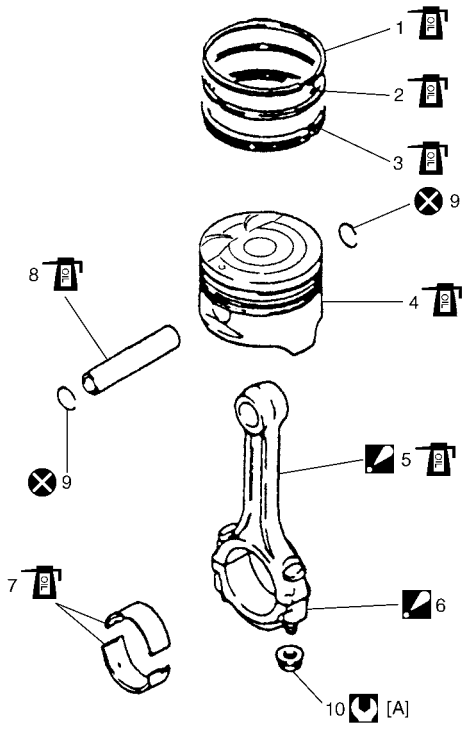
Valve spring squareness
Limit: 1.6 mm (0.063 in.)



I2RH01140144-

Pistons, Piston Rings, Connecting Rods and Cylinders Components

S4RS0A1406029



I2RH0B140108-

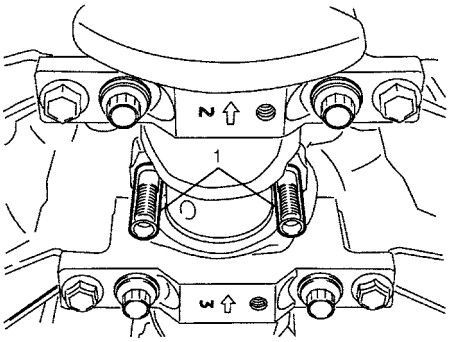
[A]: 1) Tighten all nuts to 15 N·m (1.5 kg-m). 2) Then retighten all nuts by turning through 45°. 3) Repeat Step 2) again.	7. Connecting rod bearing
1. Top ring	8. Piston pin
2. 2nd ring	9. Piston pin circlip
3. Oil ring	10. Bearing cap nut
4. Piston	: Tightening torque
5. Connecting rod : See “A”	: Apply engine oil to sliding surface of each part.
6. Connecting rod bearing cap : See “B”	: Do not reuse.
“A”: Apply engine oil to sliding surface except inner surface of big end, and rod bolts. Make sure rod bolt diameter when reuse it due to plastic deformation tightening. Refer to “Piston Pins and Connecting Rods Inspection: ”.	
“B”: Point arrow mark on cap to crankshaft pulley side.	

Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation

S4RS0A1406030

Removal

1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation: ”.
2) Remove cylinder head referring to “Valves and Cylinder Head Removal and Installation: ”.
3) Mark cylinder number on all pistons, connecting rods and connecting rod caps using silver pencil or quick drying paint.
4) Remove rod bearing caps.
5) Install guide hose (1) over threads of rod bolts. This prevents damage to bearing journal and rod bolt threads when removing connecting rod.



I2RH0B140109-

6) Decarbonize top of cylinder bore before removing piston from cylinder.
7) Push piston and connecting rod assembly out through the top of cylinder bore.

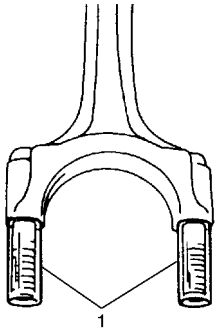
Installation

1) Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crank pins.

NOTE:

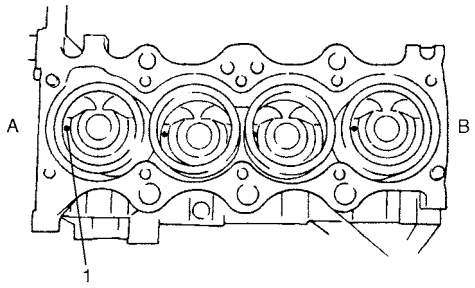
Do not apply oil between connecting rod and bearing or between bearing cap and bearing.

2) Install guide hoses (1) over connecting rod bolts. These guide hoses protect crank pin and threads of rod bolt from damage during installation of connecting rod and piston assembly.



I2RH01140147-

3) When installing piston and connecting rod assembly into cylinder bore, point front mark (1) on piston head to crankshaft pulley side.

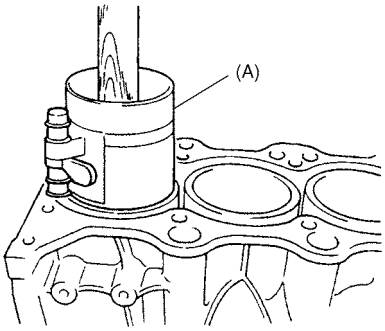


I2RH0B140110-

A: Crankshaft pulley side
B: Flywheel side

4) Install piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft.
Using a hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

Special tool
(A): 09916–77310



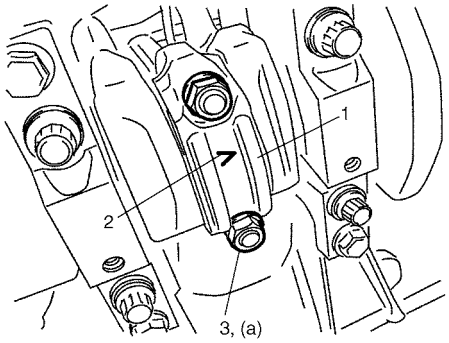
I2RH0B140111-

5) Install bearing cap (1):
Point arrow mark (2) on cap to crankshaft pulley side.
After applying engine oil to rod bolts and tighten cap nuts (3) gradually as follows.
   a) Tighten all cap nuts to 15 N·m (1.5 kg-m, 11.0 lb-ft).
   b) Retighten them to 45°
   c) Repeat Step b) once again.

NOTE:

Before installing bearing cap, make sure that checking for connecting rod bolt deformation. Refer to "Piston Pins and Connecting Rods Inspection: ".

Tightening torque
Connecting rod bearing cap nut (a): 15 N·m (1.5 kg-m, 11.0 lb-ft) and then retighten by turning through 45° twice



I2RH0B140112-

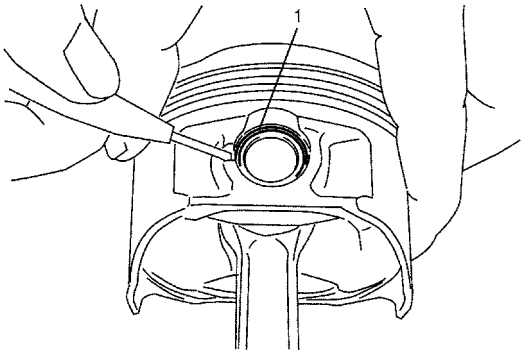
6) Install cylinder head referring to "Valves and Cylinder Head Removal and Installation: ".

Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly

S4RS0A1406031

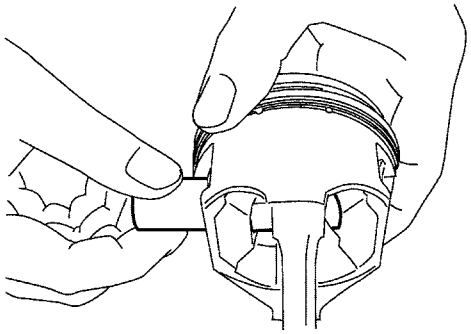
Disassembly

1) Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.
2) Remove piston pin from connecting rod as follows.
   a) Ease out piston pin circlips (1), as shown.



I2RH0B140113-

   b) Force piston pin out.



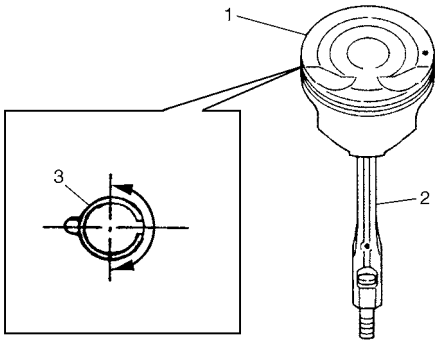
I2RH0B140114-

Assembly

1) Decarbonize piston head and ring grooves using a suitable tool.
2) Install piston pin to piston (1) and connecting rod (2):
   a) After applying engine oil to piston pin and piston pin holes in piston and connecting rod.
   b) Fit connecting rod as shown in the figure.
   c) Insert piston pin to piston and connecting rod.
   d) Install piston pin circlips (3).

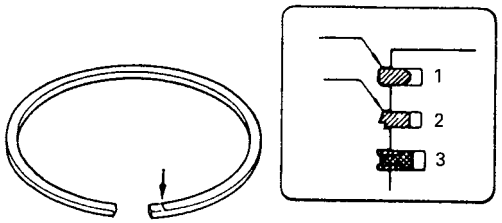
NOTE:

Circlip should be installed with its cut part facing as shown in the figure. Install so that circlip end gap comes within such range as indicated by arrow.



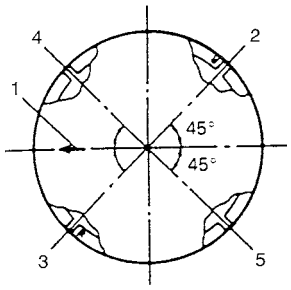
I2RH0B140115-

3) Install piston rings to piston:
   - As indicated in the figure, 1st and 2nd rings have "T" mark respectively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
   - 1st ring (1) differs from 2nd ring (2) in thickness, shape and color of surface contacting cylinder wall.
     Distinguish 1st ring from 2nd ring by referring to the figure.
   - When installing oil ring (3), install spacer first and then two rails.



I2RH0B140116-

4) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in the figure.



IYSQ01142102-

1. Arrow mark	4. Oil ring upper rail gap
2. 1st ring end gap	5. Oil ring lower rail gap
3. 2nd ring end gap and oil ring spacer gap	

Cylinders, Pistons and Piston Rings Inspection

S4RS0A1406032

Cylinder

Visual inspection

Inspect cylinder walls for scratches, roughness or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, rebore cylinder and use over size piston.

Cylinder bore diameter, taper and out-of-round

Using a cylinder gauge (1), measure cylinder bore in thrust and axial directions at two positions (“a” and “b”) as shown in the figure.
If any of the following conditions is noted, rebore cylinder.

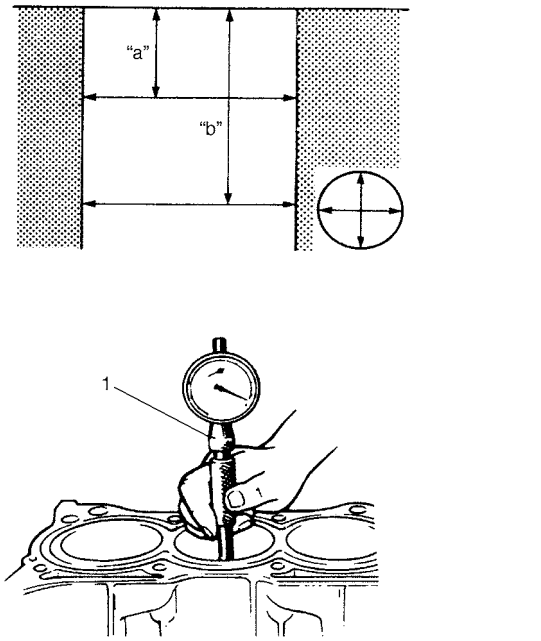
1) Cylinder bore dia. exceeds limit.
2) Difference of measurements at two positions exceeds taper limit.
3) Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore diameter
Standard: 78.00 – 78.014 mm (3.0709 – 3.0714 in.)
Limit: 78.050 mm (3.073 in.)

Cylinder taper and out-of-round
Limit: 0.10 mm (0.004 in.)

NOTE:

If any one of four cylinders has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.



I2RH0B140117-

“a”: 50 mm (1.96 in.)
“b”: 100 mm (3.94 in.)

Piston

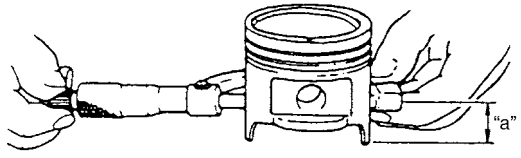
Visual inspection

Inspect piston for faults, cracks or other damages. Damaged or faulty piston should be replaced.

Piston diameter

As indicated in the figure, piston diameter should be measured at a position 19.5 mm (0.77 in.) (“a”) from piston skirt end in the direction perpendicular to piston pin.

Piston diameter specification
Standard size: 77.953 – 77.968 mm (3.0690 – 3.0696 in.)
Standard size (new one (with coating)): 77.969 – 77.984 mm (3.0696 – 3.0702 in.)
Oversize (0.50 mm (0.0196 in.)): 78.453 – 78.468 mm (3.0887 – 3.0893 in.)



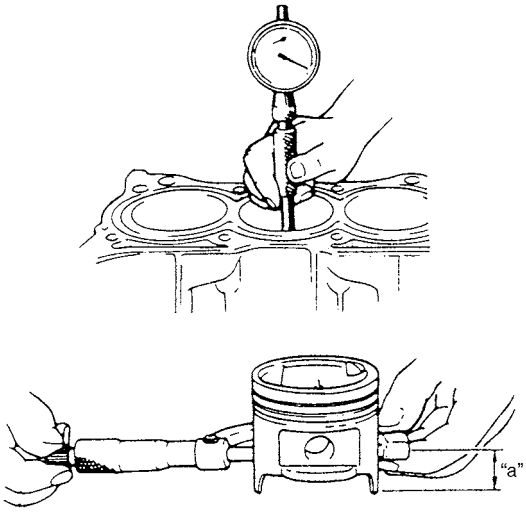
I2RH01140157-

Piston clearance
Measure cylinder bore diameter and piston diameter to find their difference which is piston clearance. Piston clearance should be within specification as follows. If it is out of specification, rebore cylinder and use oversize piston.

NOTE:

Cylinder bore diameters used here are measured in thrust direction at two positions.

Piston clearance
Standard: 0.032 – 0.061 mm (0.0013 – 0.0024 in.)
Standard (piston with coating (new one)): 0.016 – 0.045 mm (0.0006 – 0.0018 in.)
Limit: 0.161 mm (0.0065 in.)



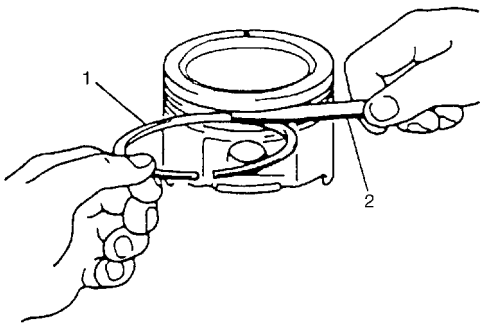
I4RS0A140022-

"a": 19.5 mm (0.77 in.)

Ring groove clearance
Before checking, piston grooves must be clean, dry and free of carbon deposits.
Fit new piston ring (1) into piston groove, and measure clearance between ring and ring land by using thickness gauge (2). If clearance is out of specification, replace piston.

Ring groove clearance

	Standard	Limit
Top ring	0.03 – 0.07 mm (0.0012 – 0.0028 in.)	0.12 mm (0.0047 in.)
2nd ring	0.02 – 0.06 mm (0.0008 – 0.0024 in.)	0.10 mm (0.0039 in.)
Oil ring	0.03 – 0.17 mm (0.0012 – 0.0067 in.)	—



I2RH01140159-

Piston Ring

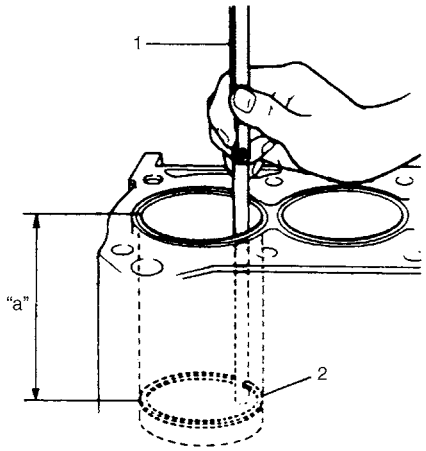
Piston ring end gap
To measure end gap, insert piston ring (2) into cylinder bore and then measure the gap by using thickness gauge (1).
If measured gap exceeds limit, replace ring.

NOTE:

Decarbonize and clean top of cylinder bore before inserting piston ring.

Piston ring end gap

Item	Standard	Limit
Top ring	0.20 – 0.35 mm (0.0079 – 0.0138 in.)	0.7 mm (0.0276 in.)
2nd ring	0.35 – 0.50 mm (0.0138 – 0.0197 in.)	1.0 mm (0.0394 in.)
Oil ring	0.20 – 0.70 mm (0.0079 – 0.0276 in.)	1.2 mm (0.0472 in.)



I2RH01140161-

"a": 120 mm (4.72 in.)

Piston Pins and Connecting Rods Inspection

S4RS0A1406033

Piston Pin

Visual inspection

Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod and/or piston.

Piston pin clearance

Check piston pin clearance in small end and piston. Replace connecting rod and/or piston if its small end is badly worn or damaged or if measured clearance exceeds limit.

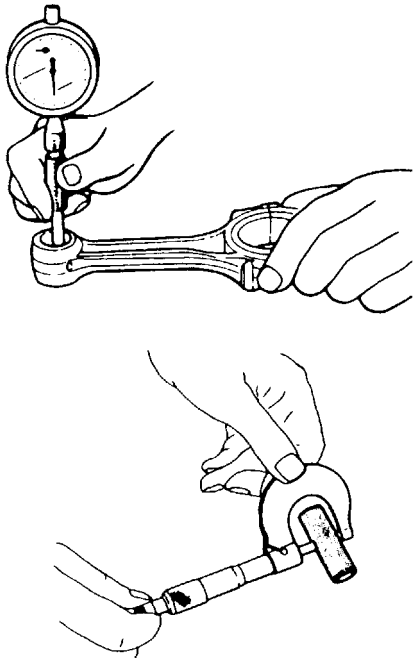
Piston pin clearance in connecting rod small end
Standard: 0.003 – 0.014 mm (0.0001 – 0.0006 in.)
Limit: 0.05 mm (0.00020 in.)

Piston pin clearance in piston
Standard: 0.006 – 0.017 mm (0.00024 – 0.00067 in.)
Limit: 0.05 mm (0.0020 in.)

Small-end bore
20.003 – 20.011 mm (0.7875 – 0.7878 in.)

Piston pin dia.
19.997 – 20.000 mm (0.7873 – 0.7874 in.)

Piston bore
20.006 – 20.014 mm (0.7876 – 0.7880 in.)



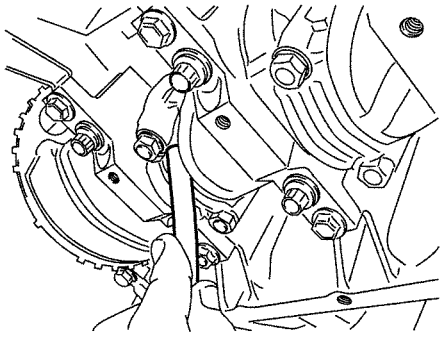
I4RS0A140023-

Connecting Rod

Big-end side clearance

Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

Big-end side clearance
Standard: 0.25 – 0.40 mm (0.0098 – 0.0157 in.)
Limit: 0.55 mm (0.0217 in.)

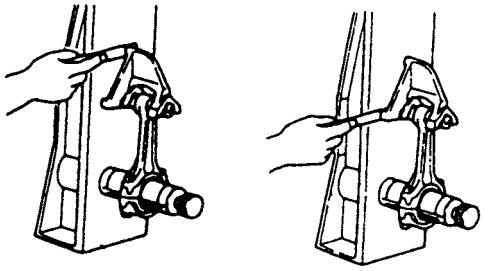


I2RH0B140148-

Connecting rod alignment

Mount connecting rod on aligner to check it for bow and twist. If measured value exceeds the limit, replace it.

Connecting rod alignment
Limit on bow: 0.05 mm (0.0020 in.)
Limit on twist: 0.10 mm (0.0039 in.)

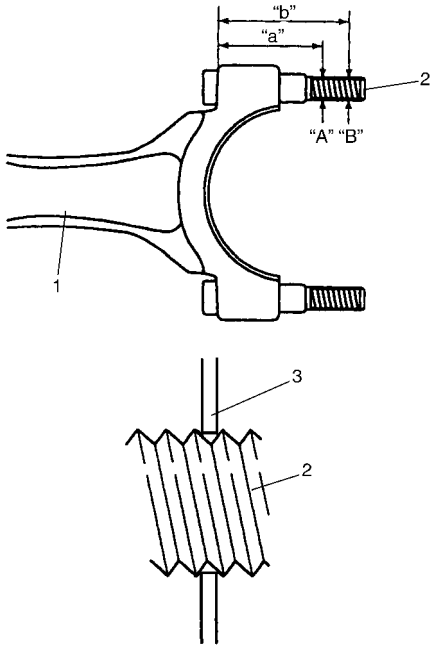


I4RH01140053-

Connecting rod bolt deformation (Plastic deformation tightening bolt)
Measure each thread diameter of connecting rod bolt (2) at “A” on 32 mm (1.25 in.) from bolt mounting surface and “B” on 40 mm (1.57 in.) from bolt mounting surface by using a micrometer (3).
Calculate difference in diameters (“A” – “B”). If it is exceeds limit, replace connected rod (1).

Connecting rod bolt measurement points
“a”: 32 mm (1.25 in.)
“b”: 40 mm (1.57 in.)

Connecting rod bolt diameter difference
Limit (“A” – “B”): 0.1 mm (0.004 in.)



I2RH0B140119-

Crank Pin and Connecting Rod Bearings Inspection

S4RS0A1406034

Crank Pin Diameter
Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged or out-of round or taper is out of limit, replace crankshaft or regrind crank pin to undersize and use undersize bearing.

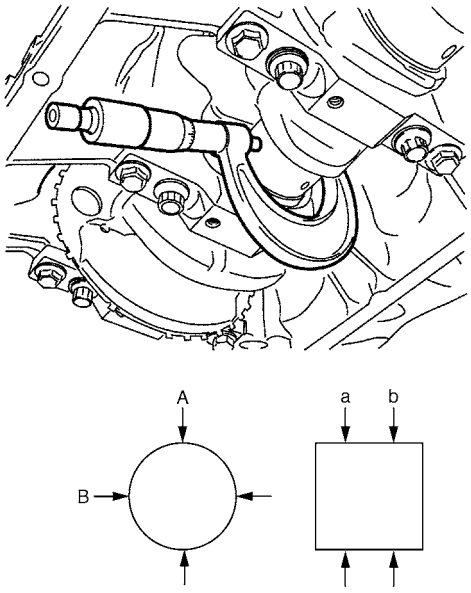
Crank pin diameter

Connecting rod bearing size	Crank pin diameter
Standard	41.982 – 42.000 mm (1.6528 – 1.6535 in.)
0.25 mm (0.0098 in.) undersize	41.732 – 41.750 mm (1.6430 – 1.6437 in.)

Out-of-round
A – B

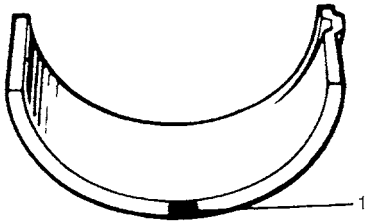
Taper
a – b

Crank pin taper and out-of-round
Limit: 0.01 mm (0.0004 in.)



I2RH0B140120-

Connecting Rod Bearing General Information
Service connecting rod bearings are available in standard size and 0.25 mm (0.0098 in.) undersize bearing, and standard size bearing has 5 kinds of bearings differing in tolerance.
For identification of undersize bearing, it is painted red at the position as indicated in the figure, undersize bearing thickness is 1.605 – 1.615 mm (0.0632 – 0.0635 in.) at the center of it.



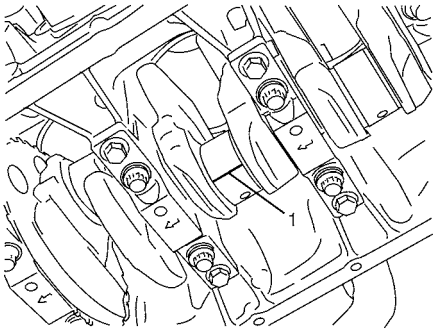
I2RH01140164-

1. Red paint

Connecting Rod Bearing Visual Inspection
Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.

Connecting Rod Bearing Clearance

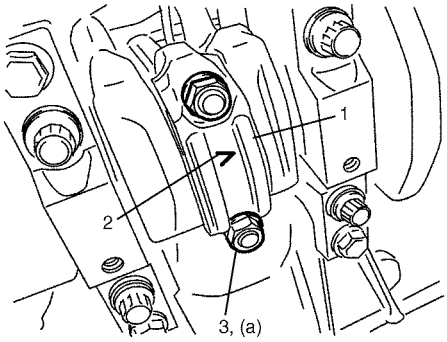
1) Before checking bearing clearance, clean bearing and crank pin.
2) Install bearing in connecting rod and bearing cap.
3) Place a piece of gauging plastic (1) to full width of crank pin as contacted by bearing (parallel to crankshaft), avoiding oil hole.



I2RH0B140121-

4) Install rod bearing cap (1) to connecting rod.
When installing cap, be sure to point arrow mark (2) on cap to crankshaft pulley side, as shown in the figure. After applying engine oil to rod bolts, tighten cap nuts (3) gradually as follows.
   a) Tighten all cap nuts to 15 N·m (1.5 kg-m, 11.0 lb-ft)
   b) Retighten them to 45°
   c) Repeat Step b) once again.

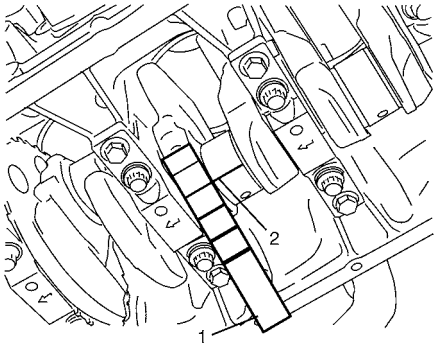
   Tightening torque
   Connecting rod bearing cap nut (a): 15 N·m (1.5 kg-m, 11.0 lb-ft) and then retighten by turning through 45° twice



I2RH0B140122-

5) Remove cap and using a scale (1) on gauging plastic envelope (2), measure gauging plastic (2) width at the widest point (clearance).
If clearance exceed its limit, use a new standard size bearing referring to “Selection of Connecting Rod Bearings: ”.
After selecting new bearing, recheck clearance.

   Connecting rod bearing clearance
   Standard: 0.029 – 0.047 mm (0.0011 – 0.0018 in.)
   Limit: 0.065 mm (0.0026 in.)



I2RH0B140123-

6) If clearance can not be brought to its limit even by using a new standard size bearing, use next thicker bearing and recheck clearance or regrind crank pin to undersize and use 0.25 mm undersize bearing.

Selection of Connecting Rod Bearings

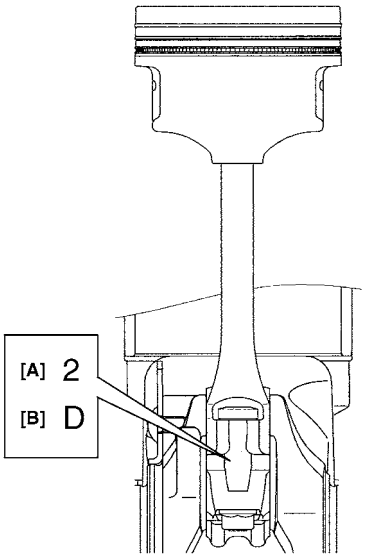
NOTE:

- **If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.**
- **When replacing crankshaft or connecting rod and its bearing due to any reason, select new standard bearings to be installed by referring to numbers stamped on connecting rod and its cap and/or alphabets stamped on crank web of No.3 cylinder.**

1) Check stamped numbers on connecting rod and its cap as shown.
Three kinds of numbers (“1”, “2” and “3”) represent the following connecting rod big end inside diameters.
For example, stamped number “1” indicates that corresponding connecting rod big end inside diameter is 45.000 – 45.006 mm (1.7717 – 1.7718 in.).

Connecting rod big end inside diameter

Stamped numbers	Connecting rod big end inside diameter
1	45.0000 – 45.0060 mm (1.7717 – 1.7718 in.)
2	45.0061 – 45.0120 mm (1.7719 – 1.7721 in.)
3	45.0121 – 45.0180 mm (1.7722 – 1.7723 in.)



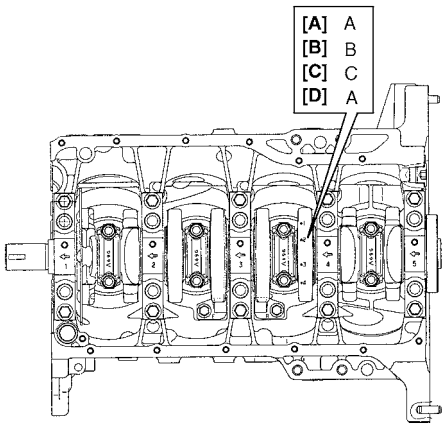
I3RH0A140017-

[A]: Connecting rod big end inside diameter number
[B]: Weight indication mark

2) Next, check crankshaft pin diameter. On crank web No.3, four alphabets are stamped as shown in the figure.
Three kinds of alphabet (“A”, “B” and “C”) represent the following crankshaft pin diameter respectively.
For example, stamped “A” indicates that corresponding crankshaft pin diameter is 41.994 – 42.000 mm (1.6533 – 1.6534 in.).

Crankshaft pin outer diameter

Stamped alphabet	Crankshaft pin diameter
A	41.9940 – 42.0000 mm (1.6533 – 1.6534 in.)
B	41.9880 – 41.9939 mm (1.6531 – 1.6532 in.)
C	41.9820 – 41.9879 mm (1.6529 – 1.6530 in.)



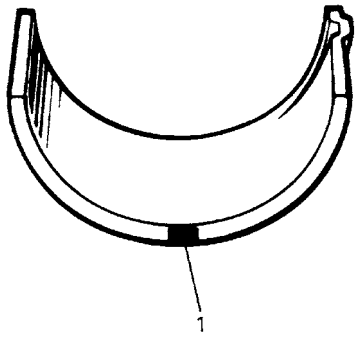
I3RH0A140018-

[A]: Crankshaft pin diameter for No.1 cylinder
[B]: Crankshaft pin diameter for No.2 cylinder
[C]: Crankshaft pin diameter for No.3 cylinder
[D]: Crankshaft pin diameter for No.4 cylinder

3) There are five kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in the figure.
Each color indicated the following thickness at the center of bearing.

Standard size of connecting rod bearing thickness

Color painted	Bearing thickness
Blue	1.4991 – 1.5020 mm (0.05902 – 0.05913 in.)
Yellow	1.4961 – 1.4990 mm (0.05890 – 0.05901 in.)
Nothing	1.4931 – 1.4960 mm (0.05878 – 0.05889 in.)
Black	1.4901 – 1.4930 mm (0.05867 – 0.05877 in.)
Green	1.4870 – 1.4900 mm (0.05855 – 0.05866 in.)



I3RH0A140019-

1. Paint

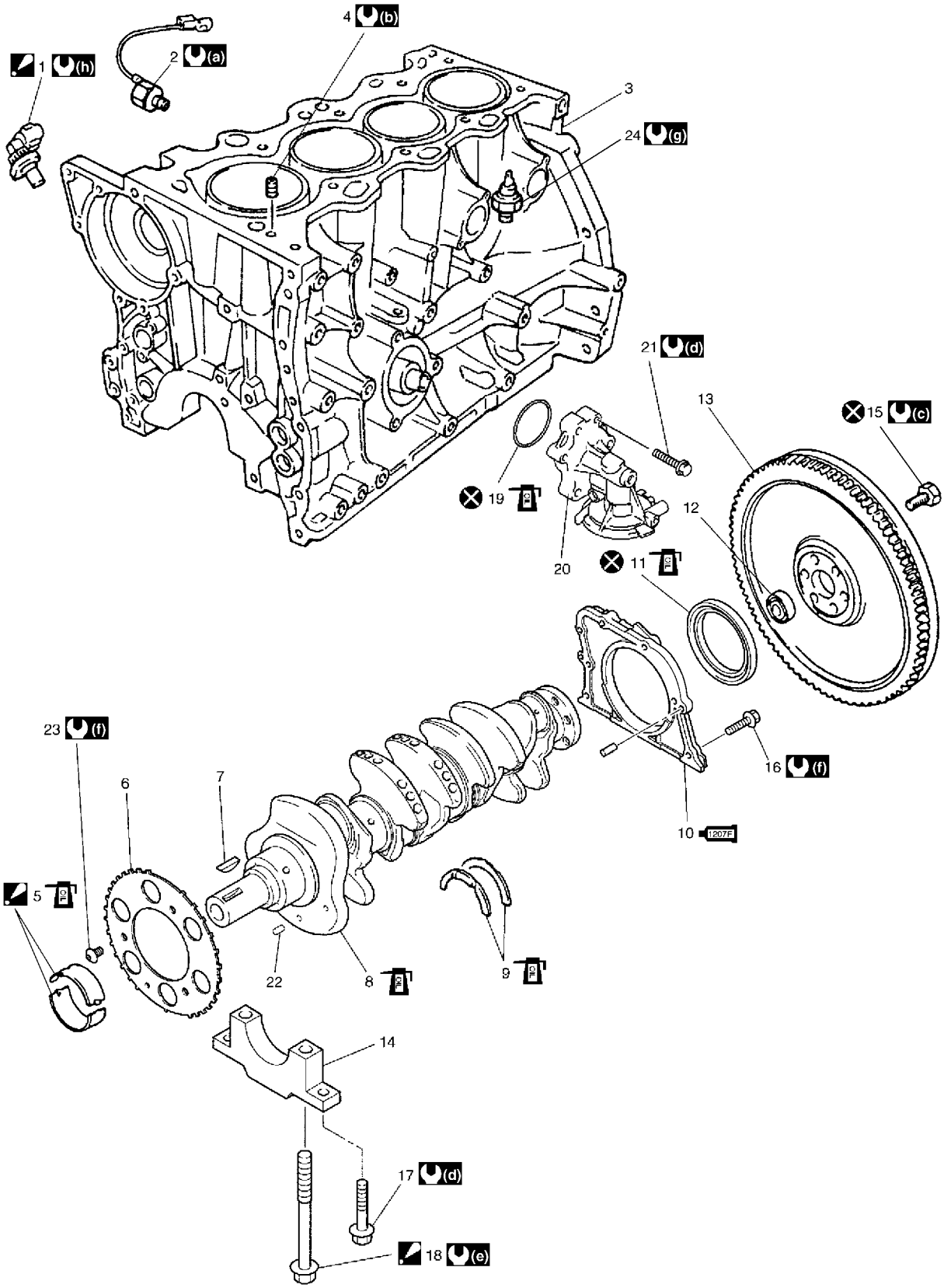
4) From number stamped on connecting rod and its cap and alphabets stamped on crank web No.3, determine new standard bearing to be installed to connecting rod big end inside, by referring to the table.
For example, if number stamped on connecting rod and its cap is “1” and alphabet stamped on crank web No.3 is “B”, install a new standard bearing painted in “Black” to its connecting rod big end inside.

Specification of new standard connecting rod bearing size

		Number stamped on connecting rod and its cap (connecting rod big end inside diameter)		
		1	2	3
Alphabet stamped on crank web No.3 (Crankshaft pin diameter)	A	Green	Black	Nothing
	B	Black	Nothing	Yellow
	C	Nothing	Yellow	Blue
		New standard bearing to be installed.		

Main Bearings, Crankshaft and Cylinder Block Components

S4RS0A1406035



I4RS0A140016-

1. CKP sensor (if equipped) : See “A”	11. Rear oil seal	21. Oil filter adapter bolt
2. Knock sensor	12. Input shaft bearing	22. Spring pin
3. Cylinder block	13. Flywheel	23. Sensor plate bolt
4. Venturi plug	14. Main bearing cap	24. Oil pressure switch
5. Main bearing : See “B”	15. Flywheel mounting bolt	(a) : 22 N·m (2.2 kg-m, 16.0 lb-ft)
6. Sensor plate	16. Rear oil seal housing mounting bolt	(b) : 5 N·m (0.5 kg-m, 4.0 lb-ft)
7. Crankshaft timing sprocket key	17. Main bearing cap No.2 bolt	(c) : 70 N·m (7.0 kg-m, 51.0 lb-ft)
8. Crankshaft	18. Main bearing cap No.1 bolt : See “D”	(d) : Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft) by the specified procedure.
9. Thrust bearing	19. O-ring	(e) : Tighten 30 N·m (3.0 kg-m, 22.0 lb-ft), 50 N·m (5.0 kg-m, 36.5 lb-ft) and 60° by the specified procedure.
1207F 10. Rear oil seal housing : See “C”	20. Oil filter adapter case	(f) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
“A”: When installing CKP sensor, use new sensor mounting bolt.		(g) : 13 N·m (1.3 kg-m, 9.5 lb-ft)
“B”: Upper half of bearing has an oil groove.		(h) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
“C”: Apply sealant 99000-31250 to mating surface.		: Do not reuse.
“D”: Make sure main bearing cap No.1 bolt deformation when reuse it due to plastic deformation tightening referring to “Main Bearings Inspection: ”.		: Apply engine oil to inside / sliding surface.

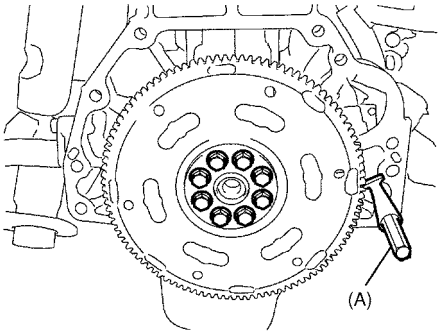
Main Bearings, Crankshaft and Cylinder Block Removal and Installation

S4RS0A1406036

Removal

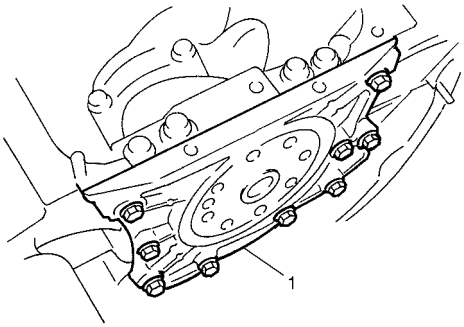
1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation: ”.
2) Remove clutch cover, clutch disc and flywheel (drive plate for A/T) by using special tool.

Special tool
(A): 09924–17810



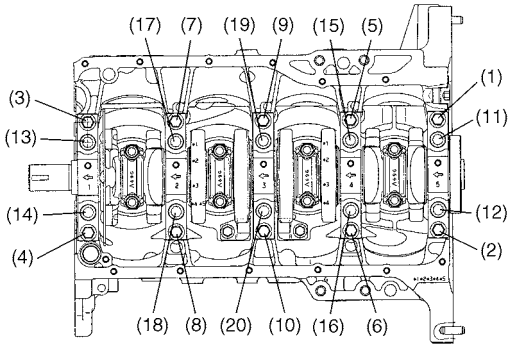
I2RH0B140125-

3) Remove piston and connecting rod referring to “Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: ”.
4) Remove rear oil seal housing (1).



I2RH0B140126-

5) Loosen main bearing cap No.1 and No.2 bolts in such order as indicated in the figure and remove them.



I2RH0B140127-

6) Remove crankshaft from cylinder block.

Installation

NOTE:

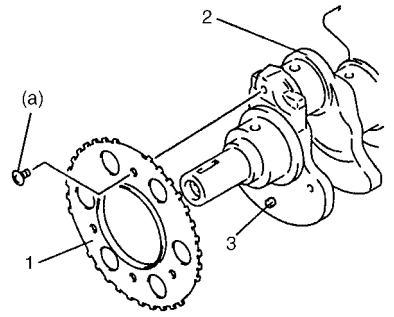
- **Use new bearing cap No.1 bolts. They are deformed once they are used because they are plastic deformation tightening bolts.**
- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb such combination and make sure that each part goes back to where it came from, when installing.**

1) Install sensor plate (1) to crankshaft (2) and tighten bolts to specified torque.

NOTE:

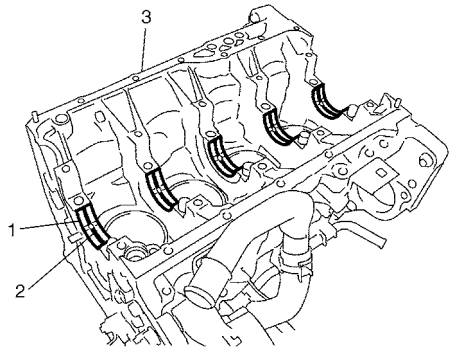
When installing sensor plate, align spring pin (3) on crankshaft and hole of sensor plate.

Tightening torque
Sensor plate bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B140128-

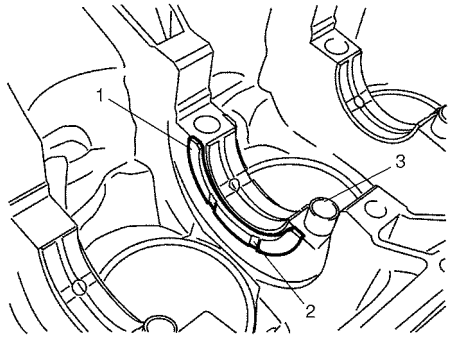
2) Install main bearings to cylinder block.
Upper half of bearing (1), has an oil groove (2). Install it to cylinder block (3), and the other half without oil groove to bearing cap.
Make sure that two halves are painted in the same color.



I2RH0B140129-

3) Install thrust bearings (1) to cylinder block between No.2 and No.3 cylinders. Face oil groove (2) sides to crank webs.

4) Confirm that dowel pins (3) are installed to intake side of each journal.



I2RH0B140130-

5) Install crankshaft to cylinder block.

6) Install bearing cap to cylinder block, making sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side.
After applying engine oil to main bearing cap No.1 bolts ((1) – (10)) and main bearing cap No.2 bolts ((11) – (20)), tighten them gradually as follows.

a) Tighten bolts ((1) – (10)) to 30 N·m (3.0 kg-m, 22.0 lb-ft) according to numerical order as shown by using a 12 corner socket wrenches.

b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kg-m, 36.5 lb-ft).

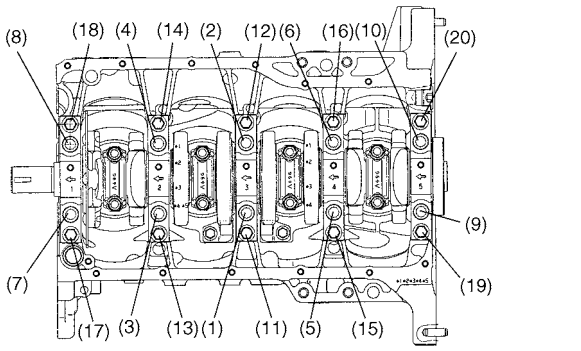
c) In the same manner as in Step a), retighten them to 60°.

d) Tighten bolts ((11) – (20)) to 25 N·m (2.5 kg-m, 18.0 lb-ft) according to numerical order as shown.

Tightening torque
Main bearing cap No.1 bolt ((1) – (10)): 30 N·m (3.0 kg-m, 22.0 lb-ft), 50 N·m (5.0 kg-m, 36.5 lb-ft) and then retighten by turning through 60°
Main bearing cap No.2 bolt ((11) – (20)): 25 N·m (2.5 kg-m, 18.0 lb-ft)

CAUTION:

After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turning it by 12 N·m (1.2 kg-m, 9.0 lb-ft) torque or below.

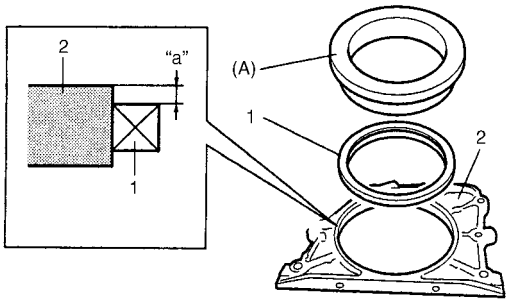


I2RH0B140131-

7) If necessary, press-fit rear oil seal (1) to oil seal housing (2) by using special tool as shown in the figure.

Special tool
(A): 09911–97820

Crank rear oil seal installing position (dimension)
"a": 2 mm (0.08 in.)

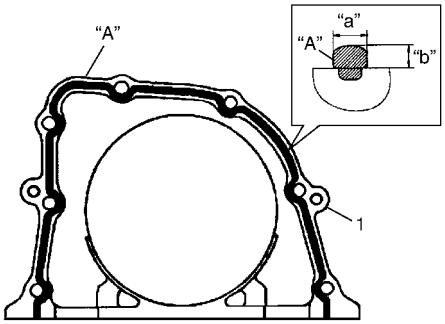


I4RS0A140017-

8) Apply sealant to mating surface of rear oil seal housing (1).

"A": Water tight sealant 99000–31250

Sealant amount for rear oil seal housing
Width: "a": 3 mm (0.12 in.)
Height "b": 2 mm (0.08 in.)

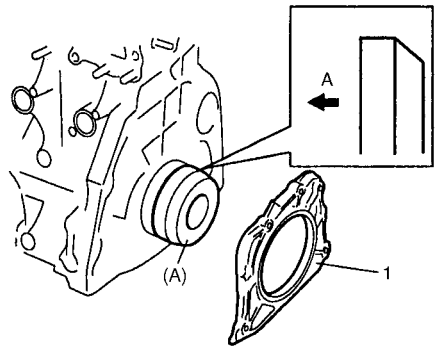


I4RS0A140018-

9) Install rear oil seal housing (1) and tighten bolts to specified torque by using special tool.

Special tool
(A): 09911–97720

Tightening torque
Rear oil seal housing bolt: 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A140019-

A: Crankshaft side

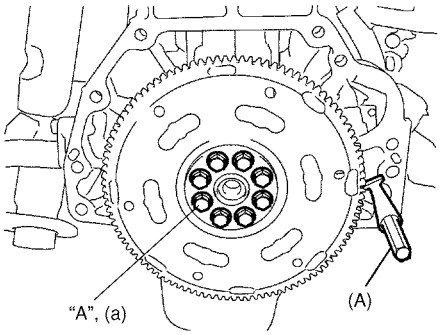
10) Install flywheel (for M/T).
Using special tool, lock flywheel, and tighten flywheel bolts to specified torque.

NOTE:

Use new flywheel bolts.

Special tool
(A): 09924–17810

Tightening torque
Flywheel bolt (a): 70 N·m (7.0 kg-m, 51.0 lb-ft)



I2RH0B140134-

11) Install piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: ".

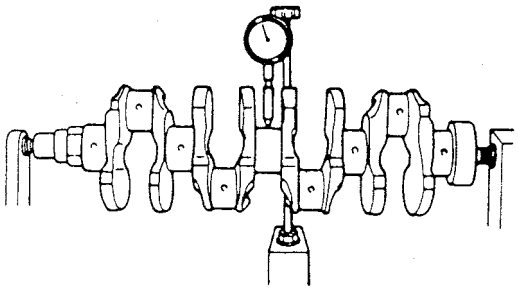
12) Install engine assembly to vehicle referring to "Engine Assembly Removal and Installation: ".

Crankshaft Inspection

S4RS0A1406037

Crankshaft Runout
Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

Crankshaft runout
Limit: 0.02 mm (0.0008 in.)

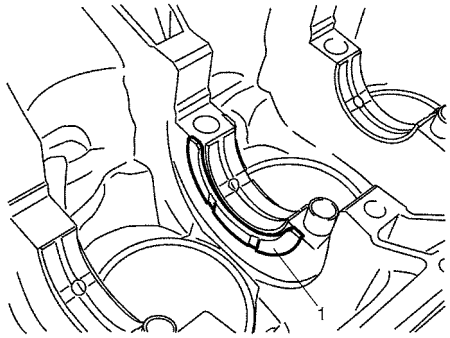


I2RH0B140135-

Crankshaft Thrust Play

1) Measure this play with crankshaft set in cylinder block in the normal manner, that is with thrust bearing (1) and journal bearing caps installed.

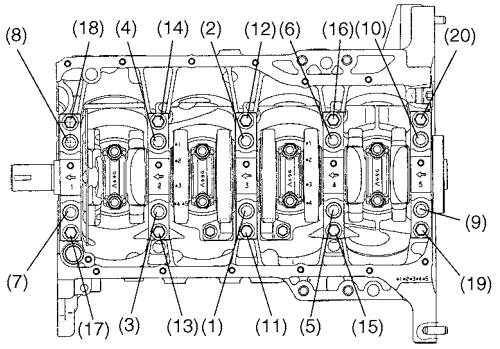
Thickness of crankshaft thrust bearing
Standard: 2.500 mm (0.0984 in.)
Oversize (0.125 mm (0.0049 in.)): 2.563 mm (0.1009 in.)



I2RH0B140136-

2) Tighten main bearing cap No.1 bolts (1) – (10) and main bearing cap No.2 bolts (11) – (20) gradually as follows.
   a) Tighten bolts (1) – (10) to 30 N·m (3.0 kg-m, 22.0 lb-ft) according to numerical order in the figure.
   b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kg-m, 36.5 lb-ft).
   c) In the same manner as in Step a), retighten them to 60°.
   d) Tighten bolts (11) – (20) to 25 N·m (2.5 kg-m, 18.0 lb-ft) according to numerical order in the figure.

Tightening torque
Main bearing cap No.1 bolt ((1) – (10)): 30 N·m (3.0 kg-m, 22.0 lb-ft), 50 N·m (5.0 kg-m, 36.5 lb-ft) and then retighten by turning through 60°
Main bearing cap No.2 bolt ((11) – (20)): 25 N·m (2.5 kg-m, 18.0 lb-ft)



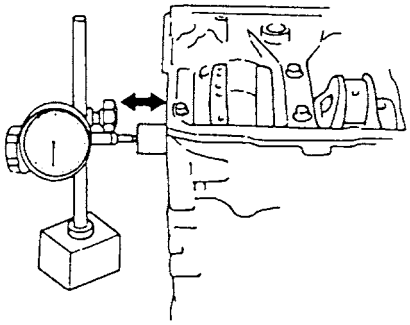
I2RH0B140137-

3) Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.
If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

Crankshaft thrust play
Standard: 0.11 – 0.31 mm (0.0043 – 0.0122 in.)
Limit: 0.35 mm (0.0138 in.)

NOTE:

After checking the thrust play, make sure that thread deformation of each bearing cap No.1 bolt referring to "Main Bearing Cap No.1 Bolt" in "Main Bearings Inspection: ".



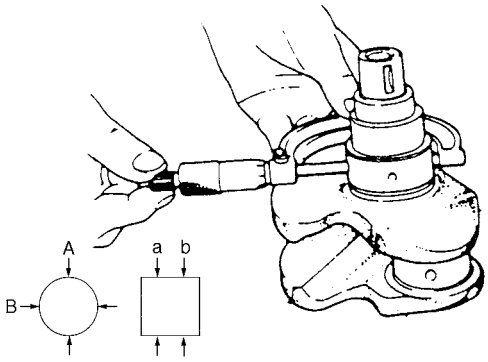
I2RH01140183-

Out-of-Round and Taper (Uneven Wear) of Journals
An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings. If any one of journals is badly damaged or if amount of uneven wear in the sense exceeds its limit, regrind or replace crankshaft.

Crankshaft out-of-round and taper
Limit: 0.01 mm (0.0004 in.)

Out-of-round
A – B

Taper
a – b



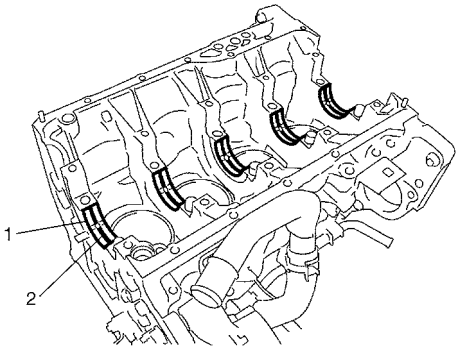
I2RH0B140138-

Main Bearings Inspection

S4RS0A1406038

General Information

- Service main bearings are available in standard size and 0.25 mm (0.0098 in.) undersize, and each of them has 5 kinds of bearings differing in tolerance.
- Upper half of bearing (1) has oil groove (2) as shown in the figure.
  Install this half with oil groove to cylinder block.
- Lower half of bearing does not have an oil groove.



I2RH0B140139-

Visual Inspection

Check bearings for pitting, scratches, wear or damage. If any malcondition is found, replace both upper and lower halves. Never replace either half without replacing the other half.

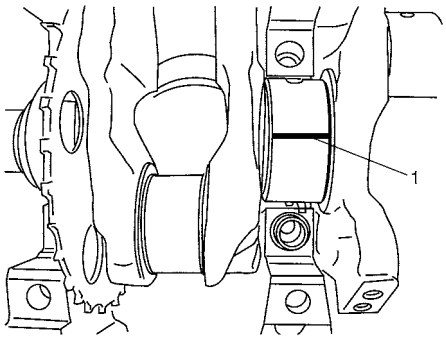
Main Bearing Clearance

NOTE:

Do not rotate crankshaft while gauging plastic is installed.

Check clearance by using gauging plastic according to the following procedure.

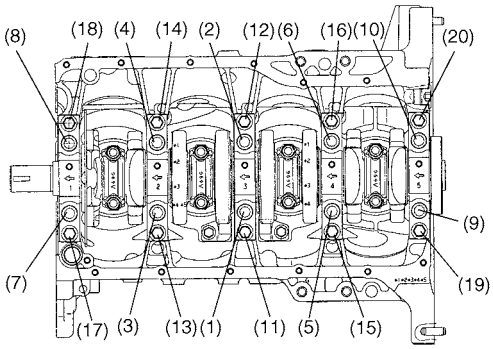
1) Remove bearing caps.
2) Clean bearings and main journals.
3) Place a piece of gauging plastic (1) the full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.



I2RH0B140140-

4) Tighten main bearing cap No.1 bolts (1) – (10) and main bearing cap No.2 bolts (11) – (20) gradually as follows.
   a) Tighten bolts (1) – (10) to 30 N·m (3.0 kg-m, 22.0 lb-ft) according to numerical order in the figure.
   b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kg-m, 36.5 lb-ft).
   c) In the same manner as in Step a), retighten them to 60°.
   d) Tighten bolts (11) – (20) to 25 N·m (2.5 kg-m, 18.0 lb-ft) according to numerical order in the figure.

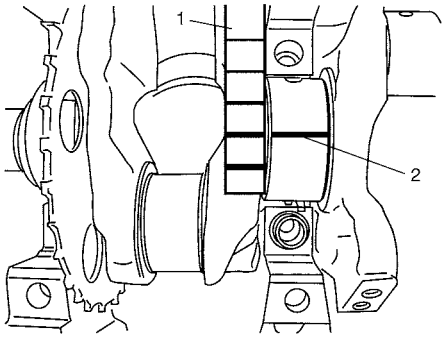
   Tightening torque
   Main bearing cap No.1 bolt ((1) – (10)): 30 Nm (3.0 kg-m, 22.0 lb-ft), 50 Nm (5.0 kg-m, 36.5 lb-ft) and then retighten by turning through 60°
   Main bearing cap No.2 bolt ((11) – (20)): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I2RH0B140137-

5) Remove bearing caps and using scale (1) on gauging plastic envelop (2), measure gauging plastic width at its widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.
   A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.
   After selecting new bearing, recheck clearance.

   Main bearing clearance
   Standard: 0.021 – 0.041 mm (0.0008 – 0.0016 in.)
   Limit: 0.054 mm (0.0021 in.)



I2RH0B140141-

Selection of Main Bearings

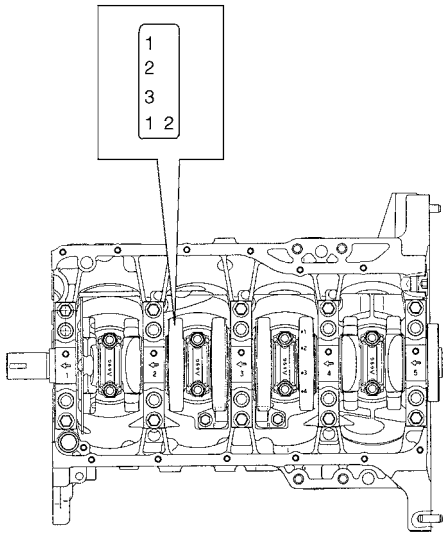
Standard bearing

If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.

1) First check journal diameter. As shown in the figure, crank web No.2 has stamped numbers.
   Three kinds of numbers (“1”, “2” and “3”) represent the following journal diameters.
   Stamped numbers on crank web No.2 represent journal diameters marked with an arrow in the figure respectively. For example, stamped number “1” indicates that corresponding journal diameter is 51.9940 – 52.0000 mm (2.0471 – 2.0472 in.).

Crankshaft journal diameter

Stamped numbers	Journal diameter
1	51.9940 – 52.0000 mm (2.0471 – 2.0472 in.)
2	51.9880 – 51.9939 mm (2.0468 – 2.0470 in.)
3	51.9820 – 51.9879 mm (2.0465 – 2.0467 in.)

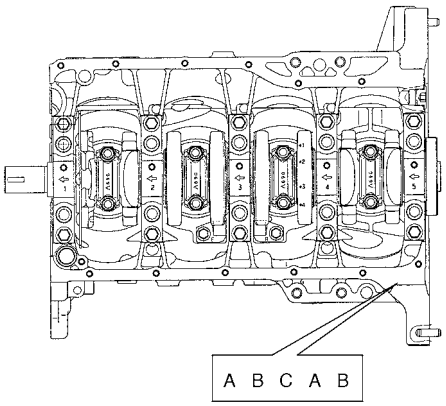


I2RH0B140142-

2) Next, check bearing cap bore diameter without bearing. On mating surface of cylinder block, five alphabets are stamped as shown in the figure.
   Three kinds of alphabets (“A”, “B” and “C”) or numbers (“1”, “2” and “3”) represent the following cap bore diameters.
   Stamped alphabets or numbers on cylinder block represent bearing cap bore diameter marked with an arrow in the figure respectively.
   For example, stamped “A” or “1” indicates that corresponding bearing cap bore diameter is 56.0000 – 56.0060 mm (2.2048 – 2.2049 in.).

Crankshaft bearing cap bore

Stamped alphabet (number)	Bearing cap bore diameter (without bearing)
A (1)	56.0000 – 56.0060 mm (2.2048 – 2.2049 in.)
B (2)	56.0061 – 56.0120 mm (2.2050 – 2.2051 in.)
C (3)	56.0121 – 56.0180 mm (2.2052 – 2.2054 in.)

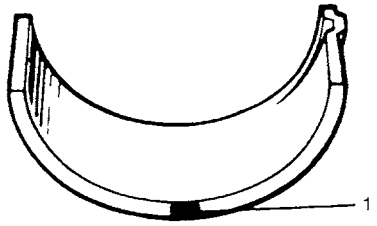


I2RH0B140143-

3) There are 5 kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in the figure.
   Each color indicated the following thickness at the center of bearing.

Standard size of crankshaft main bearing thickness

Color painted	Bearing thickness
Purple	1.992 – 1.996 mm (0.07843 – 0.07858 in.)
Brown	1.995 – 1.999 mm (0.07855 – 0.07870 in.)
Green	1.998 – 2.002 mm (0.07867 – 0.07882 in.)
Black	2.001 – 2.005 mm (0.07878 – 0.07893 in.)
Colorless (no paint)	2.004 – 2.008 mm (0.07890 – 0.07906 in.)



I2RH01140191-

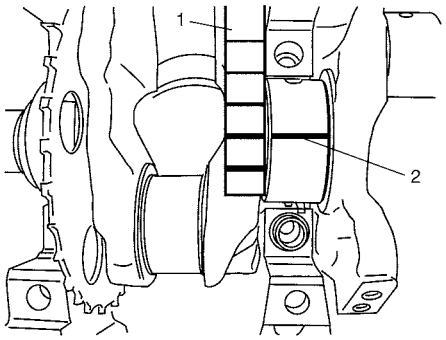
1. Paint

4) From number stamped on crank web No.2 and alphabets stamped on cylinder block, determine new standard bearing to be installed to journal, by referring to the table shown.
For example, if number stamped on crank web No.2 is “1” and alphabet stamped on cylinder block is “B”, install a new standard bearing painted in “Brown” to its journal.

New standard size crankshaft main bearing specification

		Number stamped on crank web No.2 (Journal diameter)		
		1	2	3
Alphabet stamped on cylinder block (Cap bore dia.)	A (1)	Purple	Brown	Green
	B (2)	Brown	Green	Black
	C (3)	Green	Black	Colorless
		New standard bearing to be installed		

5) Using scale (1) on gauging plastic (2), check bearing clearance with newly selected standard bearing.
If clearance still exceeds its limit, use next thicker bearing and recheck clearance.



I2RH0B140141-

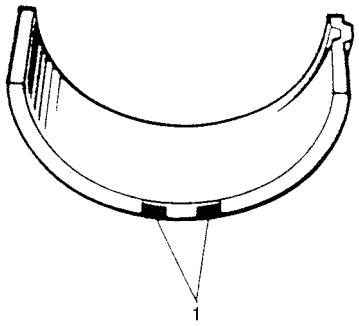
6) When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to number stamped on new crankshaft or alphabets stamped on new cylinder block.

Undersize bearing (0.25 mm (0.0098 in.))

- 0.25 mm (0.0098 in.) undersize bearing is available, in five kinds varying in thickness.
  To distinguish them, each bearing is painted in the following colors at such position as indicated in the figure.
  Each color represents the following thickness at the center of bearing.

Undersize of crankshaft main bearing thickness

Color painted	Bearing thickness
Red and Purple	2.117 – 2.121 mm (0.08335 – 0.08350 in.)
Red and Brown	2.120 – 2.124 mm (0.08347 – 0.08362 in.)
Red and Green	2.123 – 2.127 mm (0.08359 – 0.08374 in.)
Red and Black	2.126 – 2.130 mm (0.08371 – 0.08385 in.)
Red only	2.129 – 2.133 mm (0.08382 – 0.08397 in.)



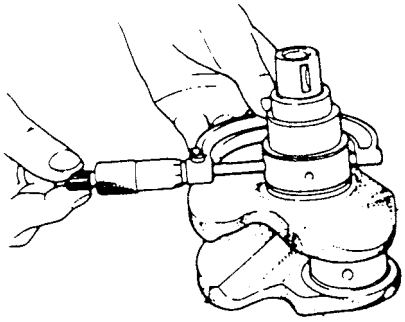
I2RH01140192-

1. Paint

- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.
  a. Regrind journal to the following finished diameter.

     Finished journal diameter
     51.732 – 51.750 mm (2.0367 – 2.0374 in.)

  b. Using micrometer, measure regrind journal diameter.
     Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
  c. Using journal diameter measured above and alphabets stamped on cylinder block, select an undersize bearing by referring to the following table.
     Check bearing clearance with newly selected undersize bearing.



I2RH0B140144-

New undersize crankshaft main bearing specification

		Measured journal diameter		
		51.7320 – 51.7379 mm (2.0367 – 2.0369 in.)	51.7380 – 51.7439 mm (2.0370 – 2.0371 in.)	51.7440 – 51.7500 mm (2.0372 – 2.0373 in.)
Alphabets stamped on cylinder block	A (1)	Red and Green	Red and Brown	Red and Purple
	B (2)	Red and Black	Red and Green	Red and Brown
	C (3)	Red only	Red and Black	Red and Green
		Undersize bearing to be installed		

Main Bearing Cap No.1 Bolt

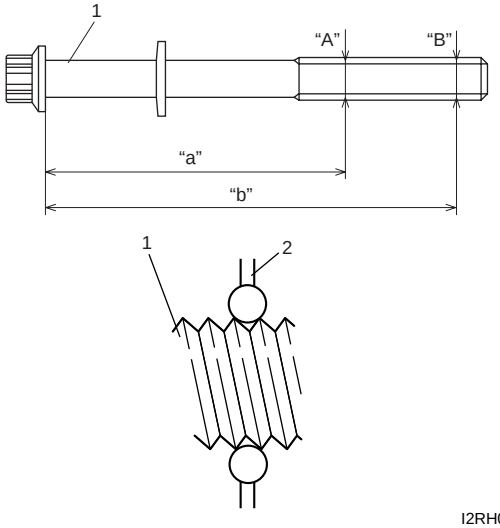
Measure each thread diameter main bearing cap No.1 bolts (1) at “A” on 60 mm (2.36 in.) from seat side of flange bolt and “B” on 90 mm (3.54 in.) from seat side of flange bolt by using a micrometer (2).
Calculate difference in diameters (“A” – “B”).
If it exceeds limit, replace with new one.

Main bearing cap No.1 bolt diameter measurement points

“a”: 60 mm (2.36 in.)
“b”: 90 mm (3.54 in.)

Main bearing cap No.1 bolt diameter difference

Limit (“A” – “B”): 0.2 mm (0.008 in.)

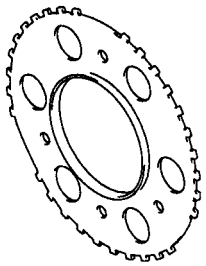


I2RH0B140145-

Sensor Plate Inspection

S4RS0A1406039

Check sensor plate for crack damage.
If malcondition is found, replace it.

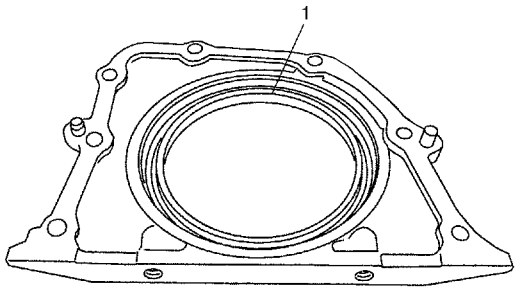


I2RH0B140151-

Rear Oil Seal Inspection

S4RS0A1406040

Carefully inspect oil seal (1) for wear or damage. If its lip is worn or damaged, replace it.



I4RS0A140020-

Flywheel Inspection

S4RS0A1406041

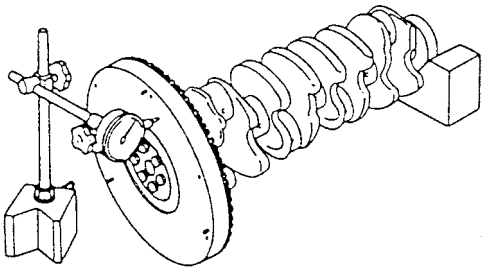
Visual Inspection

- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.

Flywheel Face Runout

Check flywheel face runout with a dial gauge.
If runout exceeds its limit, replace flywheel.

Flywheel face runout
Limit: 0.2 mm (0.0079 in.)



I2RH01140198-

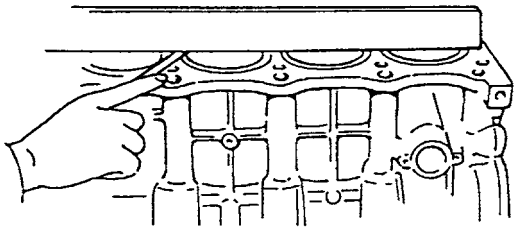
Cylinder Block Inspection

S4RS0A1406042

Distortion of Gasketed Surface

Using straightedge and thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct It.

Cylinder block flatness
Limit: 0.03 mm (0.0012 in.)



I2RH01140199-

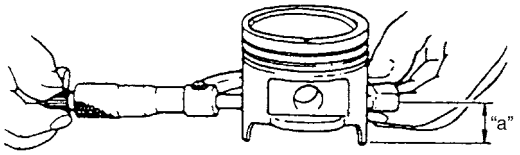
Honing or Reboring Cylinders

1) When any cylinder needs reboring, all other cylinders must also be rebored at the same time.
2) Select oversized piston according to amount of cylinder wear.

   Oversize piston specification
   Oversize 0.50: 78.453 – 78.468 mm (3.0887 – 3.0893 in.)

3) Using micrometer, measure piston diameter.

   Measurement position for piston diameter
   "a": 19.5 mm (0.77 in.)



I2RH01140157-

4) Rebore and hone cylinder to the following dimension.

   NOTE:

   Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

   Cylinder bore diameter to be rebored
   Oversize 0.50: 78.500 – 78.514 mm (3.0906 – 3.0911 in.)

5) Measure piston clearance after honing.

   Piston clearance
   0.032 – 0.061 mm (0.0013 – 0.0024 in.)

Specifications

Tightening Torque Specifications

S4RS0A1407001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Camshaft housing bolts	8	0.8	6.0	(for tightening of special tool) ☞
Camshaft housing bolt	11	1.1	8.0	☞ / ☞ / ☞
Cylinder head cover bolt	8	0.8	6.0	☞
Accelerator cable locking nut	12	1.2	9.0	☞
EVAP canister purge valve bracket bolt	5	0.5	4.0	☞
Engine left mounting bracket nut	55	5.5	40.0	☞
Engine right mounting nut	65	6.5	47.0	☞
Engine rear mounting bush bolt	55	5.5	40.0	☞
Starting motor terminal nut	11	1.1	8.0	☞
Generator terminal nut	6	0.6	4.5	☞
Timing chain cover bolt	25	2.5	18.0	☞
Timing chain cover nut	25	2.5	18.0	☞
Cap bolt	25	2.5	18.0	☞
Oil gallery pipe No.2 and No.3 bolt	11	1.1	8.0	☞
Crankshaft pulley bolt	150	15.0	108.5	☞
Oil control valve mounting nut	11	1.1	8.0	☞
Oil gallery pipe No.1 bolt	30	3.0	21.5	☞
Timing chain No.1 guide bolt	11	1.1	8.0	☞
Timing chain tensioner bolt	25	2.5	18.0	☞
Timing chain tensioner adjuster bolt	11	1.1	8.0	☞
Intake cam timing sprocket bolt	60	6.0	43.5	☞
Venturi plug	5	0.5	3.5	☞
Cylinder head bolt for M8	25	2.5	18.0	☞
Cylinder head bolt for M10	20 N·m (2.0 kg-m, 14.5 lb-ft), 40 N·m (4.0 kg-m, 29.0 lb-ft) and then retighten by turning through to 60° twice			☞
Connecting rod bearing cap nut	15 N·m (1.5 kg-m, 11.0 lb-ft) and then retighten by turning through 45° twice			☞ / ☞
Sensor plate bolt	11	1.1	8.0	☞
Main bearing cap No.1 bolt ((1) – (10))	30 N·m (3.0 kg-m, 22.0 lb-ft), 50 N·m (5.0 kg-m, 36.5 lb-ft) and then retighten by turning through 60°			☞ / ☞ / ☞
Main bearing cap No.2 bolt ((11) – (20))	25	2.5	18.0	☞ / ☞ / ☞
Rear oil seal housing bolt	11	1.1	8.0	☞
Flywheel bolt	70	7.0	51.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Throttle Body Components: ”
“Throttle Body and Intake Manifold Components: ”
“Engine Mountings Components: ”
“Timing Chain Cover Components: ”
“Timing Chain and Chain Tensioner Components: ”
“Camshaft, Tappet and Shim Components: ”
“Valves and Cylinder Head Components: ”
“Pistons, Piston Rings, Connecting Rods and Cylinders Components: ”
“Main Bearings, Crankshaft and Cylinder Block Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A1408001

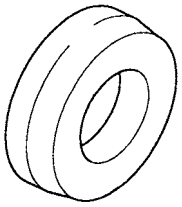
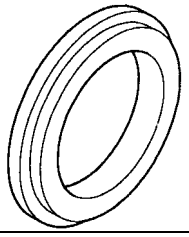
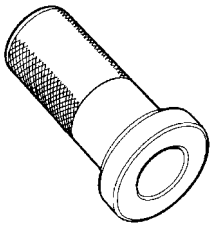
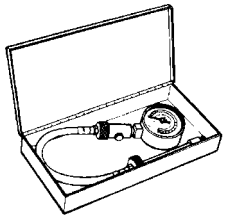
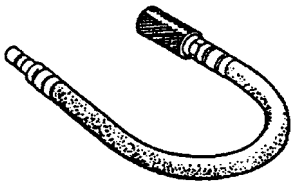
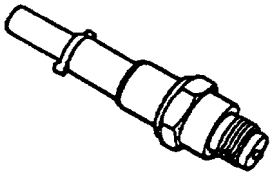
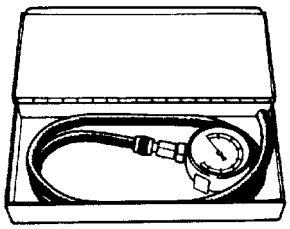
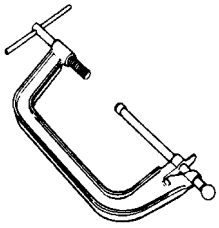
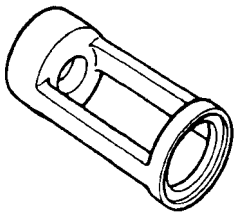
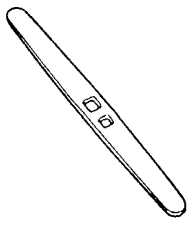
Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1207B	P/No.: 99000–31140	☞
	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞
Water tight sealant	SUZUKI Bond No.1207F	P/No.: 99000–31250	☞ / ☞ / ☞

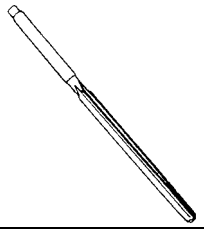
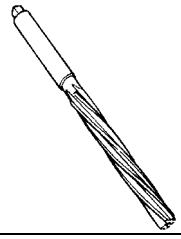
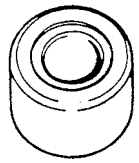
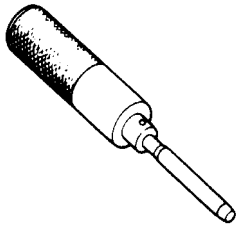
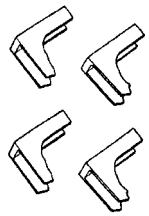
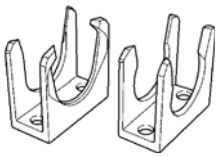
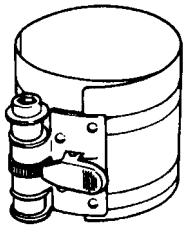
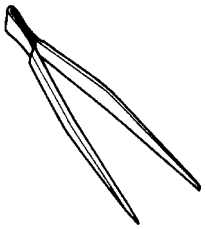
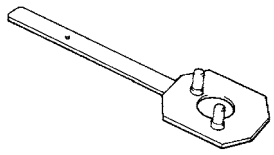
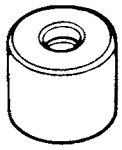
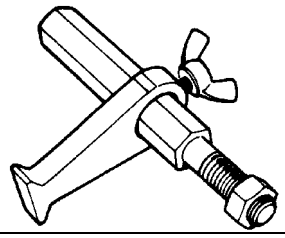
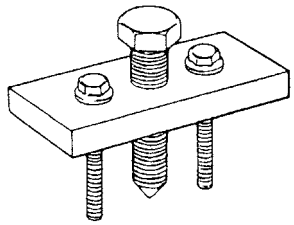
NOTE:

Required service material is also described in the following.
“Timing Chain Cover Components: ”
“Timing Chain and Chain Tensioner Components: ”
“Camshaft, Tappet and Shim Components: ”
“Valves and Cylinder Head Components: ”
“Pistons, Piston Rings, Connecting Rods and Cylinders Components: ”
“Main Bearings, Crankshaft and Cylinder Block Components: ”

Special Tool

S4RS0A1408002

09911–97720 Oil seal installer ☞ 	09911–97820 Oil seal installer ☞ 
09913–75810 Bearing installer ☞ 	09915–64512 Compression gauge ☞ 
09915–64530 Compression gauge hose ☞ 	09915–67010 Compression gauge attachment (C) ☞ 
09915–67311 Vacuum gauge ☞ 	09916–14510 Valve lifter ☞ / ☞ 
09916–14521 Valve spring compressor attachment ☞ / ☞ 	09916–34542 Reamer handle ☞ / ☞ 

09916–34550 Reamer handle ☞ 	09916–37320 Valve guide outer reamer (10.5 mm) ☞ 
09916–44910 Valve guide installer & remover ☞ 	09916–56011 Valve guide installer attachment (protrusion: 11.5 mm) ☞ 
09916–58210 Valve guide installer handle ☞ / ☞ 	09916–67020 Tappet holder (Overseas) ☞ / ☞ 
09916–67021 Tappet holder ☞ / ☞ 	09916–77310 Piston ring compressor (50-125 mm) ☞ 
09916–84511 Forceps ☞ / ☞ 	09917–68221 Camshaft pulley holder ☞ / ☞ 
09917–98221 Valve guide stem attachment ☞ 	09924–17810 Flywheel holder (drive plate stopper) ☞ / ☞ 
09926–58010 Bearing remover attachment ☞ 	09944–36011 Steering wheel remover ☞ 

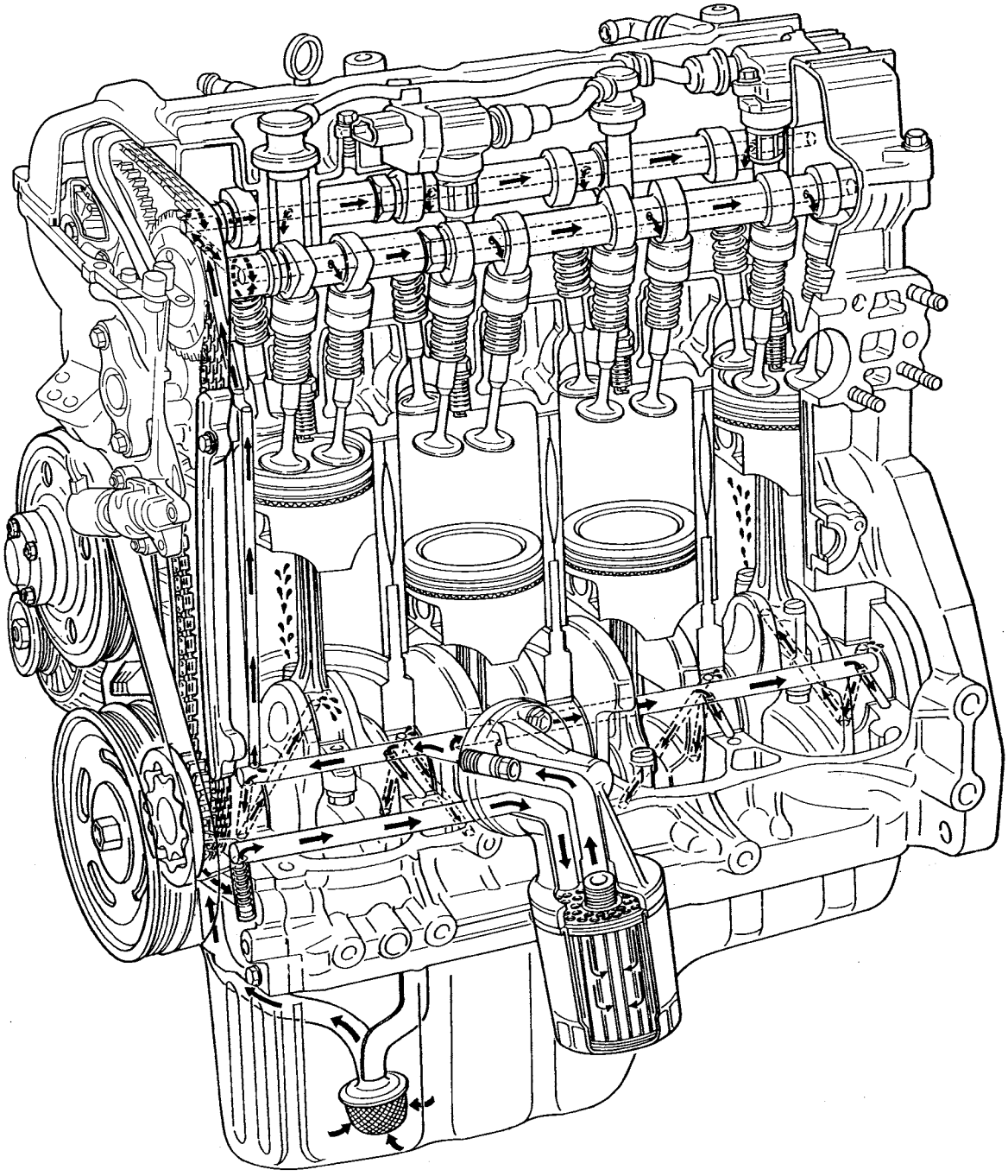
Engine Lubrication System

General Description

Engine Lubrication Description

S4RS0A1501001

The oil pump is of a trochoid type, and mounted on the crankshaft. Oil is drawn up through the oil pump strainer and passed through the pump to the oil filter.
The filtered oil flows into two paths in cylinder block.
In one path, oil reaches the crankshaft journal bearings. Oil from the crankshaft journal bearings is supplied to the connecting rod bearings by means of intersecting passages drilled in the crankshaft, and then injected from the big end of connecting rod to lubricate piston, rings and cylinder wall.
In the other path oil goes up to the cylinder head and lubricates valves and camshafts, etc., after passing through the internal oilway of camshafts.
An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure exceeds about 350 kPa (3.5 kg/cm^2, 49.8 psi).



I3RH0B150001-

Diagnostic Information and Procedures

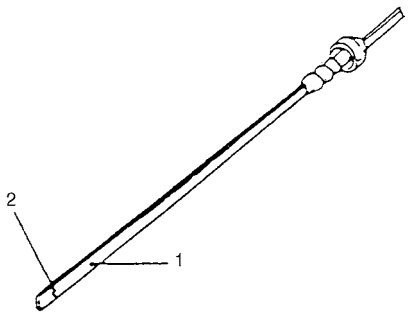
Oil Pressure Check

S4RS0A1504001

NOTE:

Prior to checking oil pressure, check the following.

- **Oil level in oil pan**
  If oil level is low, add oil up to Full level mark (hole) (1) on oil level gauge referring to "Engine Oil and Filter Change: in Section 0B".

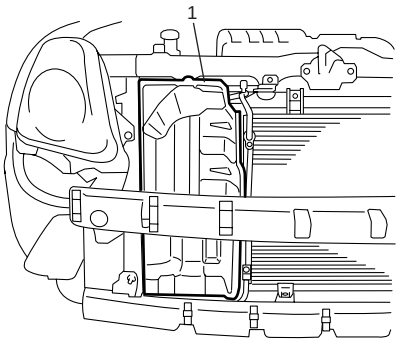


I2RH0B150002-

2. Low level mark (hole)

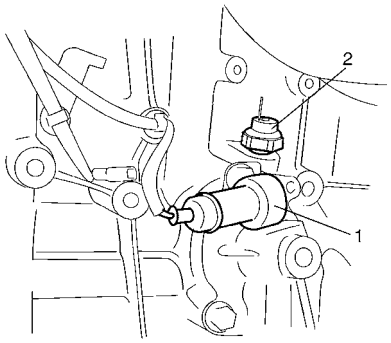
- **Oil quality**
  If oil is discolored or deteriorated, change it. For particular oil to be used, refer to "Engine Oil and Filter Change: in Section 0B".
- **Oil leaks**
  If leak is found, repair it.

1) Remove front bumper referring to "Front Bumper and Rear Bumper Components: in Section 9K".
2) Remove engine front cover (1).



I4RS0A150001-

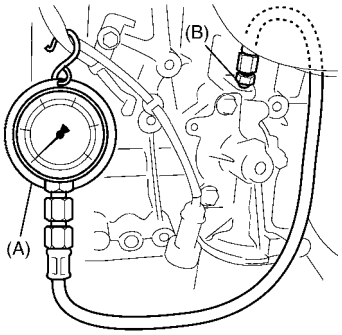
3) Disconnect oil pressure switch coupler (1).
4) Remove oil pressure switch (2) from cylinder block.



I2RH0B150003-

5) Install special tools (oil pressure gauge) to vacated threaded hole of oil pressure switch.

Special tool
(A): 09915–77310
(B): 09915–78211



I2RH0B150004-

6) Start engine and warm engine up to normal operating temperature.

NOTE:

Be sure to shift transaxle gear shift lever in "Neutral" (shift select lever in "P" range for A/T vehicle), set parking brake and block drive wheels.

7) After warming up, raise engine speed to 4,000 r/min. and measure oil pressure.

Oil pressure specification
More than 270 kPa (2.7 kg/cm^2, 39.8 psi) at 4,000 r/min. (rpm)

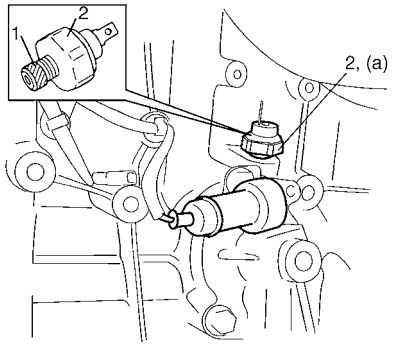
8) After checking oil pressure, stop engine and remove oil pressure gauge and attachment.

9) Before reinstalling oil pressure switch (2), be sure to wrap its screw threads with sealing tape (1) and tighten switch to specified torque.

NOTE:

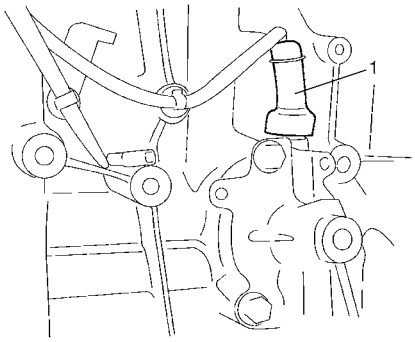
If sealing tape edge is bulged out from screw threads of switch, cut it off.

Tightening torque
Oil pressure switch (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I2RH0B150005-

10) Start engine and check oil pressure switch for oil leakage. If oil leakage is found, repair it.
11) Connect oil pressure switch coupler (1).

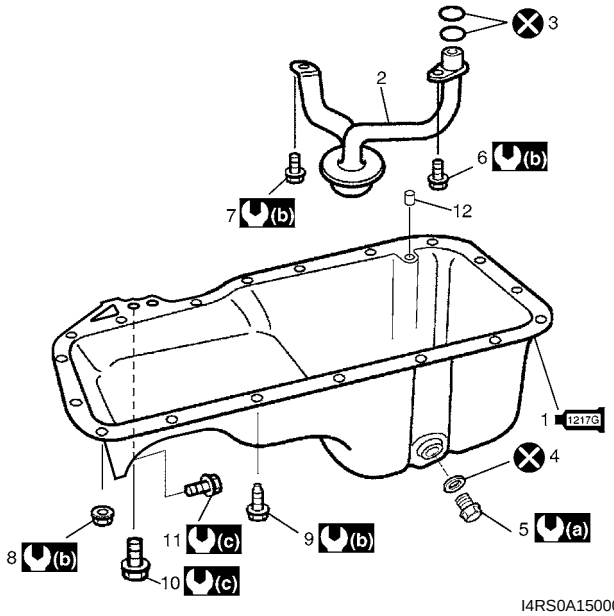


I2RH0B150006-

Repair Instructions

Oil Pan and Oil Pump Strainer Components

S4RS0A1506001



I4RS0A150002-

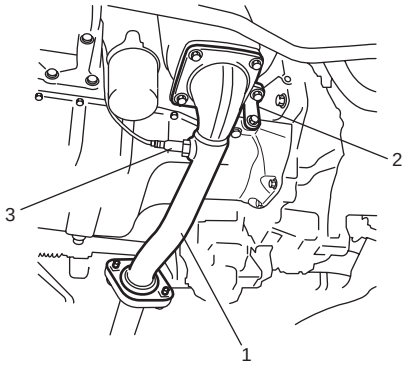
1217G 1. Oil pan : Apply sealant 99000-31260 to mating surface.	6. Strainer bolt	11. Transaxle stiffener bolt
2. Strainer	7. Bracket bolt	(a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
3. O-ring	8. Oil pan nut	(b) : Tighten 11 N·m (1.1 kg-m, 8.0 lb-ft) by the specified procedure.
4. Gasket	9. Oil pan bolt (M6)	(c) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
5. Drain plug	10. Oil pan bolt (M10)	: Do not reuse.

Oil Pan and Oil Pump Strainer Removal and Installation

S4RS0A1506002

Removal

1) Remove oil level gauge.
2) Drain engine oil by removing drain plug.
3) Remove exhaust No.1 pipe (1), exhaust manifold stiffener (2) and heated oxygen sensor No.1 (connector color: green) (3) referring to “Exhaust System Components: in Section 1K”.

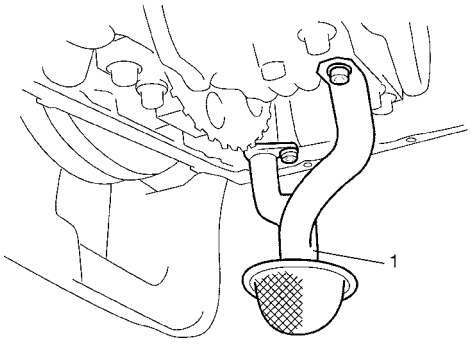


I4RS0A150003-

4) Remove clutch housing lower plate (1).

I4RS0A150004-

5) Remove oil pan and then oil pump strainer (1) from cylinder block.

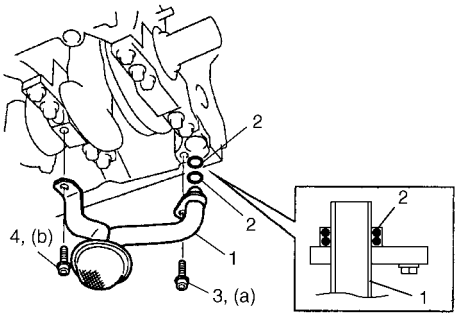


I2RH0B150010-

Installation

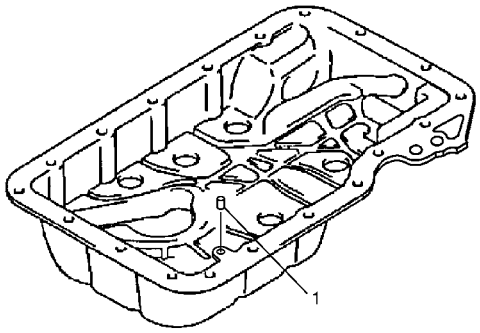
1) Install new O-rings (2) in the position as shown in the figure and install oil pump strainer (1).
Tighten strainer bolt (3) first and then bracket bolt (4) to specified torque.

Tightening torque
Oil pump strainer bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)
Oil pump strainer bracket bolt (b): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B150012-

2) Install dowel pin (1) to oil pan.

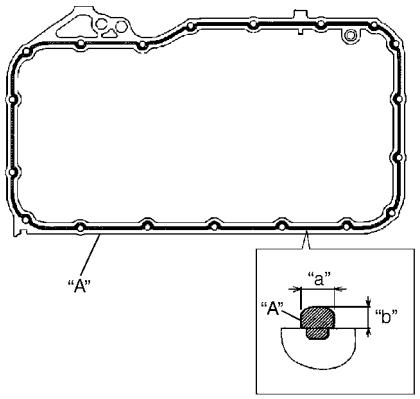


I4RS0A150005-

3) Apply sealant continuously to oil pan mating surface as shown in the figure.

“A”: Sealant 99000–31260

Sealant amount for oil pan
Width “a”: 3 mm (0.12 in.)
Height “b”: 2 mm (0.08 in.)

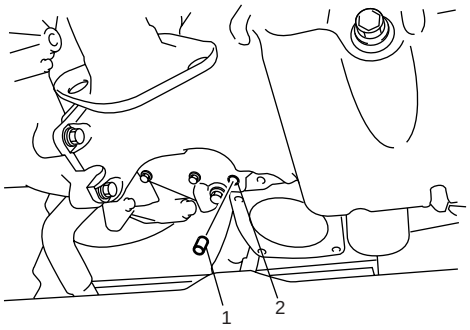


I4RS0A150006-

4) Install oil pan to cylinder block temporarily.
5) Insert knock pin (1) in hole (2) of oil pan in order to locate oil pan precisely.

NOTE:

Knock pin is available as a spare part (part number: 04211–13189).



I4RS0A150007-

6) After fitting oil pan to cylinder block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time. Tighten bolts and nuts to specified torque.

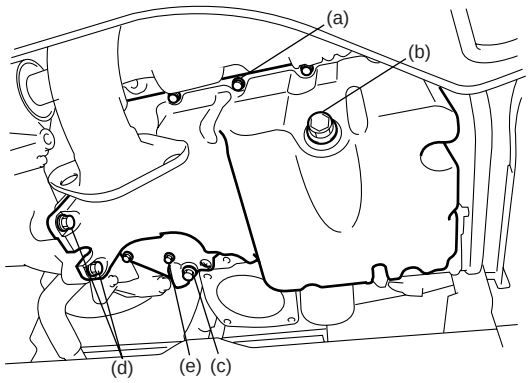
Tightening torque
Oil pan bolt (M6) (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)
Oil pan bolt (M10) (c): 55 N·m (5.5 kg-m, 40.0 lb-ft)
Oil pan nut (e): 11 N·m (1.1 kg-m, 8.0 lb-ft)

7) Install new gasket and drain plug to oil pan. Tighten drain plug to specified torque.

Tightening torque
Oil pan drain plug (b): 35 N·m (3.5 kg-m, 25.5 lb-ft)

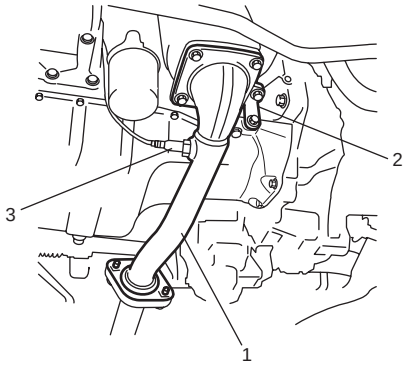
8) Tighten transaxle stiffener bolts to specified torque.

Tightening torque
Transaxle stiffener bolt (d): 55 N·m (5.5 kg-m, 40.0 lb-ft)



I4RS0A150008-

9) Install exhaust manifold stiffener (2) and exhaust No.1 pipe (1) and heated oxygen sensor No.1 (connector color: green) (3) referring to “Exhaust System Components: in Section 1K”.



I4RS0A150003-

10) Install clutch housing lower plate (1).

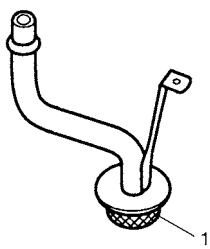
I4RS0A150004-

11) Install oil level gauge.
12) Refill engine with engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
13) Verify that there is no engine oil leakage and exhaust gas leakage at each connection.

Oil Pan and Oil Pump Strainer Cleaning

S4RS0A1506003

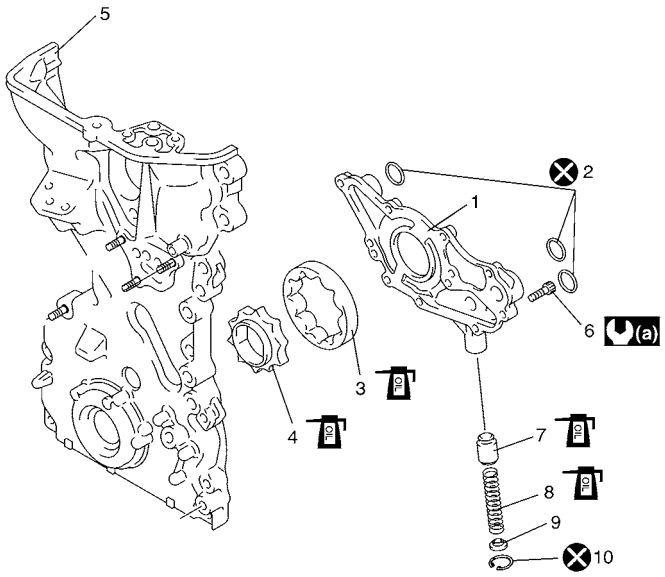
- Clean sealing surface between oil pan and cylinder block.
  Remove oil, old sealant, and dust from sealing surface.
- Clean oil pump strainer screen (1).



I2RH0B150016-

Oil Pump Components

S4RS0A1506004



I4RS0A150010-

1. Rotor plate	6. Rotor plate bolt	10. Circlip
2. O-ring	7. Relief valve	(a) : 11 N·m (1.1 kg-mm 8.0 lb-ft)
3. Outer rotor	8. Spring	: Do not reuse.
4. Inner rotor	9. Retainer	: Apply thin coat of engine oil to sliding surface.
5. Timing chain cover	10. Circlip	

Oil Pump Removal and Installation

S4RS0A1506005

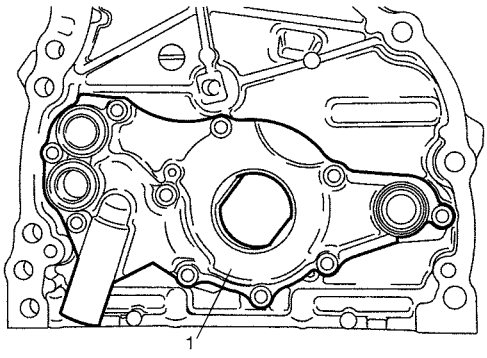
Oil pump is incorporated with timing chain cover.
For removal and installation, refer to “Timing Chain Cover Removal and Installation: in Section 1D”.

Oil Pump Disassembly and Reassembly

S4RS0A1506006

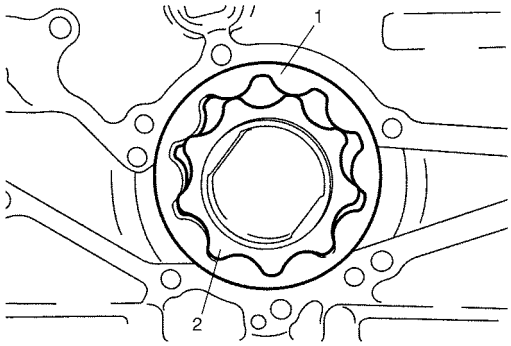
Disassembly

1) Remove rotor plate (1) by removing its mounting bolts.



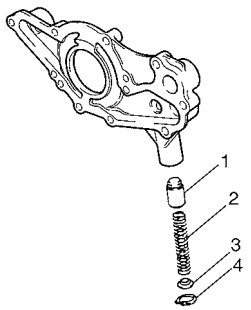
I2RH0B150018-

2) Remove outer rotor (1) and inner rotor (2).



I2RH0B150019-

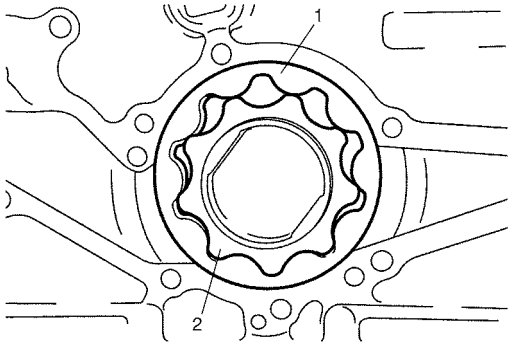
3) Remove relief valve (1), spring (2) and retainer (3) by removing circlip (4).



I2RH0B150020-

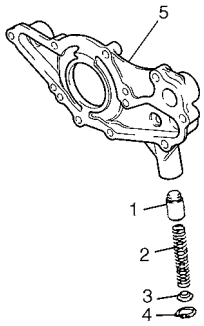
Reassembly

1) Wash, clean and then dry all disassembled parts.
2) Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, inside surfaces of oil pump case and plate.
3) Install outer (1) and inner rotors (2) to oil pump case.



I2RH0B150019-

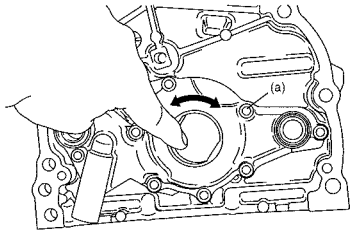
4) Apply engine oil to relief valve (1) and spring (2), and install them with retainer (3) and new circlip (4) to rotor plate (5).



I3RM0A150005-

5) Install rotor plate and tighten all bolts to specified torque. After installing plate, check to be sure that rotors turn smoothly by hand (0.3 N·m (0.03 kg-m, 0.25 lb-ft) torque or below).

Tightening torque
Oil pump rotor plate bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



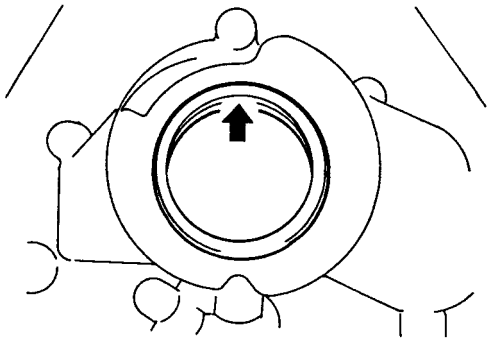
I2RH0B150022-

Oil Pump Inspection

S4RS0A1506007

Oil Seal

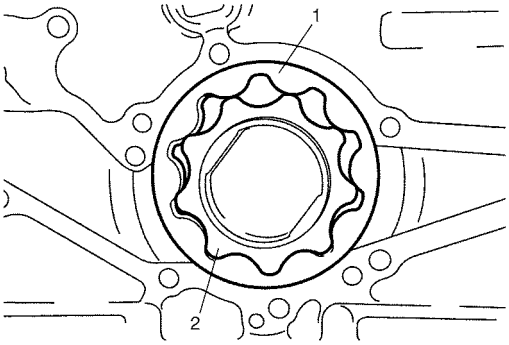
Check oil seal lip for fault or other damage. Replace as necessary.



I2RH0B150023-

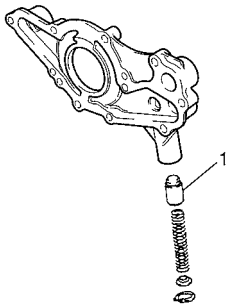
Oil Pump

- Check outer (1) and inner rotors (2), rotor plate, and oil pump case for excessive wear or damage.



I2RH0B150019-

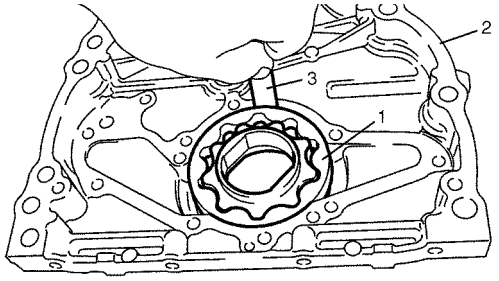
- Check relief valve (1) for excessive wear or damage and operates smoothly.



I2RH0B150025-

Radial clearance
Check radial clearance between outer rotor (1) and case (2) using thickness gauge (3).
If clearance exceeds its limit, replace outer rotor or case.

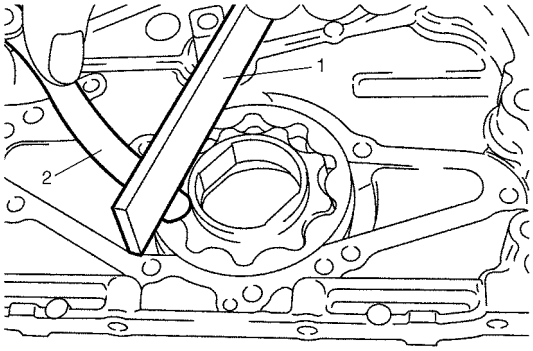
Radial clearance between outer rotor and case for oil pump
Limit: 0.310 mm (0.0122 in.)



I2RH0B150026-

Side clearance
Using straightedge (1) and thickness gauge (2), measure side clearance.
If side clearance exceeds its limit, replace oil pump assembly.

Side clearance for oil pump inner rotor
Limit: 0.15 mm (0.0059 in.)

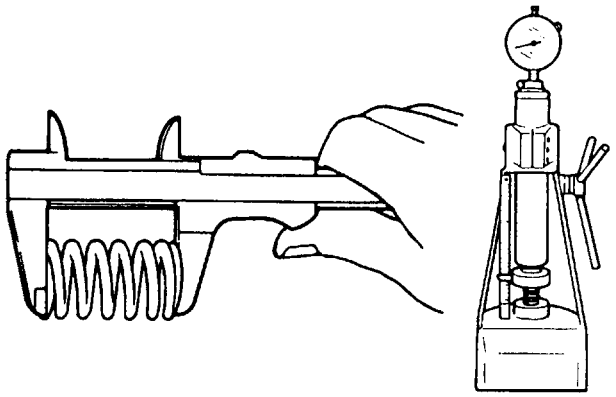


I2RH0B150027-

Relief valve spring free length and load
Check relief valve spring free length and load as shown in the figure. If the measured valve spring length is lower than the specification, replace relief valve spring.

Relief valve spring free length and load

	Standard	Limit
Free length	52.4 mm (2.06 in.)	—
Load at spring length 38.5 mm (1.52 in.)	77 N (7.7 kgf, 17.0 lb)	69 N (6.9 kgf, 15.0 lb)



I2RH01150023-

Specifications

Tightening Torque Specifications

S4RS0A1507001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Oil pressure switch	13	1.3	9.5	☞
Oil pump strainer bolt	11	1.1	8.0	☞
Oil pump strainer bracket bolt	11	1.1	8.0	☞
Oil pan bolt (M6)	11	1.1	8.0	☞
Oil pan bolt (M10)	55	5.5	40.0	☞
Oil pan nut	11	1.1	8.0	☞
Oil pan drain plug	35	3.5	25.5	☞
Transaxle stiffener bolt	55	5.5	40.0	☞
Oil pump rotor plate bolt	11	1.1	8.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Oil Pan and Oil Pump Strainer Components: ”
“Oil Pump Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A1508001

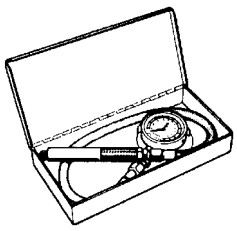
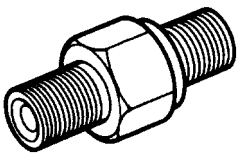
Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞

NOTE:

Required service material is also described in the following.
“Oil Pan and Oil Pump Strainer Components: ”
“Oil Pump Components: ”

Special Tool

S4RS0A1508002

09915–77310 Oil pressure gauge (0-10kg/cm2) ☞		09915–78211 Oil pressure gauge attachment ☞	

Engine Cooling System

General Description

Cooling System Description

S4RS0A1601001

The cooling system consists of the radiator cap, radiator, coolant reservoir, hoses, water pump, cooling fan and thermostat. The radiator is of tube-and-fin type.

Coolant Description

S4RS0A1601002

WARNING:

- **Do not remove radiator cap to check engine coolant level; check coolant visually at the see-through coolant reservoir. Coolant should be added only to reservoir as necessary.**
- **As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.**
- **Check to make sure that engine coolant temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cable from battery terminal before removing any part.**

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the coolant is overflowed to the reservoir.
When the system cools down, the coolant is drawn back into the radiator.
The cooling system has been filled with a quality coolant that is a 50/50 mixture of water and ethylene glycol antifreeze.
This 50/50 mixture coolant solution provides freezing protection to –36 °C (–33 °F).

- Maintain cooling system freeze protection at –36 °C (–33 °F) to ensure protection against corrosion and loss of coolant from boiling. This should be done even if freezing temperatures are not expected.
- Add ethylene glycol base coolant when coolant has to be added because of coolant loss or to provide added protection against freezing at temperature lower than –36 °C (–33 °F).

NOTE:

- **Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Coolant must be mixed with deminerated water or distilled water.**

Anti-freeze proportioning table

		For M/T vehicle	For A/T vehicle
Freezing temperature	°C	–36	–36
	°F	–33	–33
Anti-freeze / Anti-corrosion coolant concentration	%	50	50
Ratio of compound to cooling water	ltr.	3.10/3.10	3.05/3.05
	US pt.	6.55/6.55	6.44/6.44
	Imp pt.	5.46/5.46	5.37/5.37

Coolant capacity

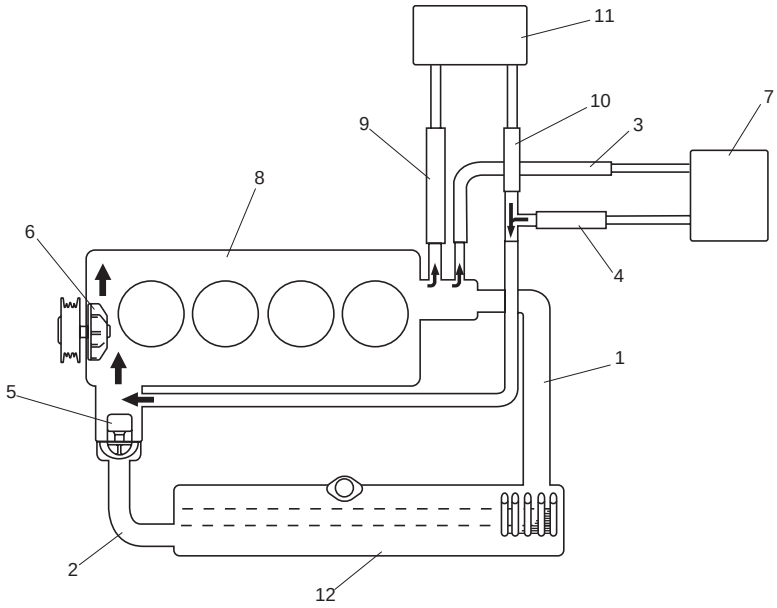
- **For M/T vehicle**
  Engine, radiator and heater: 5.5 liters (11.62/9.68 US/Imp pt.)
  Reservoir: 0.7 liters (1.48/1.23 US/Imp pt.)
  Total: 6.2 liters (13.10/10.91 US/Imp pt.)
- **For A/T vehicle**
  Engine, radiator and heater: 5.4 liters (11.41/9.50 US/Imp pt.)
  Reservoir: 0.7 liters (1.48/1.23 US/Imp pt.)
  Total: 6.1 liters (12.89/10.74 US/Imp pt.)

Schematic and Routing Diagram

Coolant Circulation

S4RS0A1602001

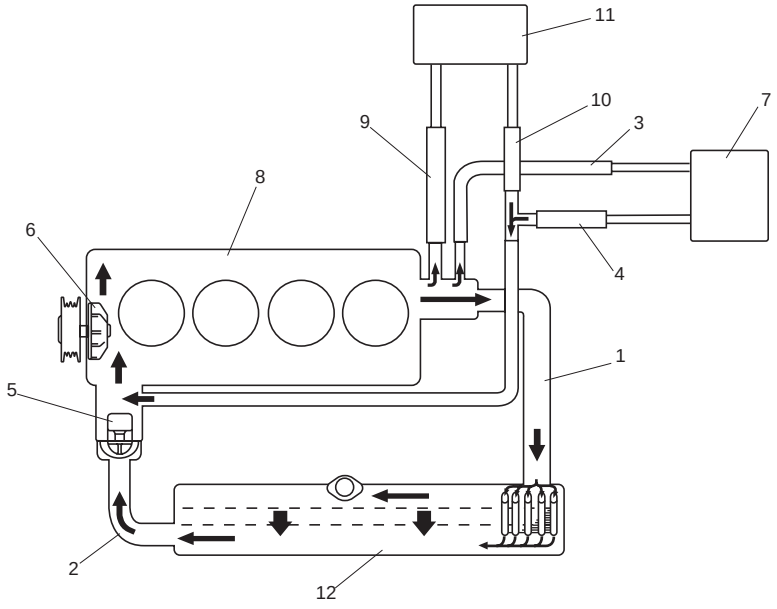
While the engine is warmed up (thermostat closed), coolant circulates as follows.



I3RM0A160001-

1. Radiator inlet hose	5. Thermostat	9. Heater core inlet hose
2. Radiator outlet hose	6. Water pump	10. Heater core outlet hose
3. Throttle body inlet hose	7. Throttle body	11. Heater core
4. Throttle body outlet hose	8. Engine	12. Radiator

When coolant is warmed up to normal temperature and the thermostat opens, coolant passes through the radiator core to be cooled as follows.



I3RM0A160002-

1. Radiator inlet hose	5. Thermostat	9. Heater core inlet hose
2. Radiator outlet hose	6. Water pump	10. Heater core outlet hose
3. Throttle body inlet hose	7. Throttle body	11. Heater core
4. Throttle body outlet hose	8. Engine	12. Radiator

Diagnostic Information and Procedures

Engine Cooling Symptom Diagnosis

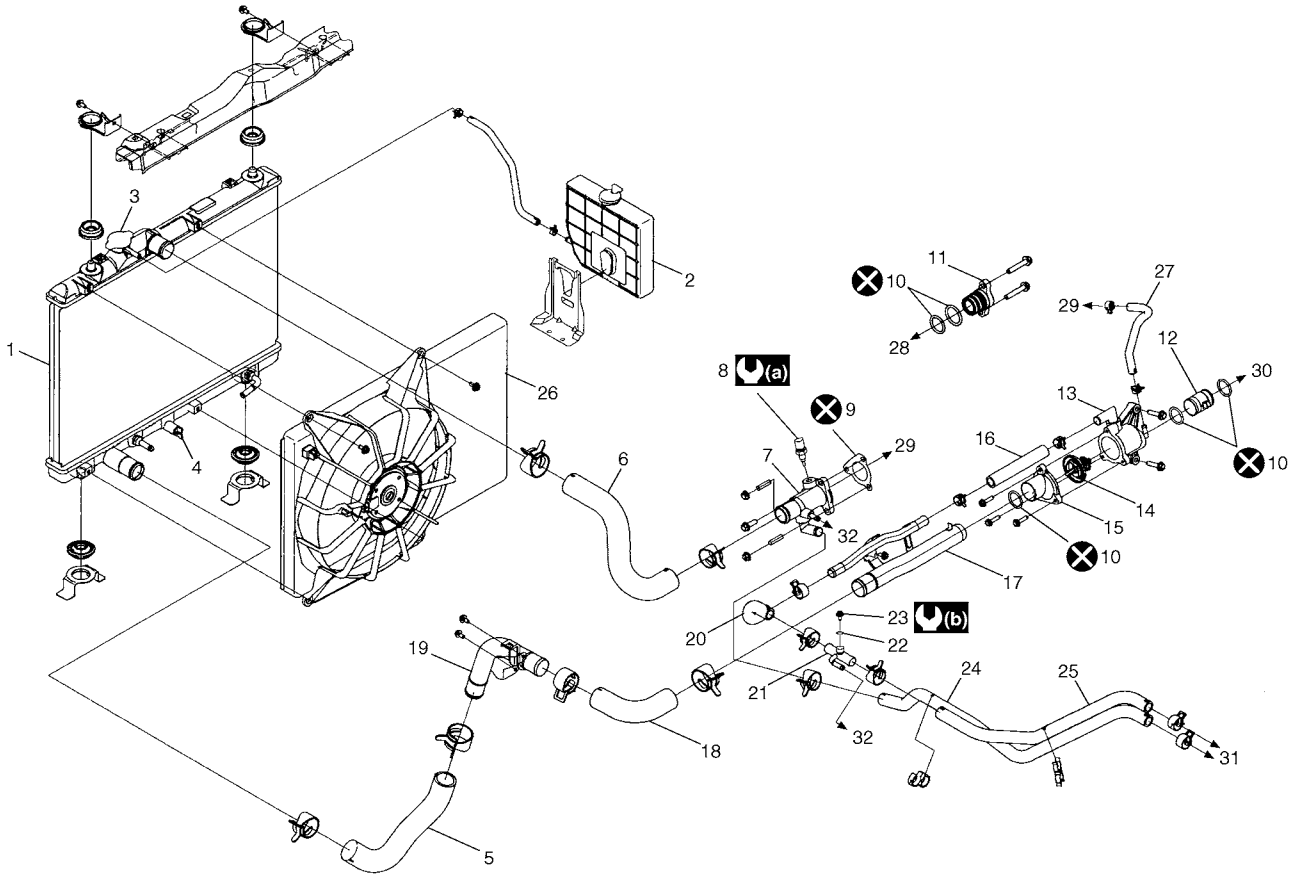
S4RS0A1604001

Condition	Possible cause	Correction / Reference Item
Engine overheats (Radiator fan operates)	Loose or broken water pump belt	*Adjust or replace.*
	Not enough coolant	*Check coolant level and add as necessary.*
	Faulty thermostat	*Replace.*
	Faulty water pump	*Replace.*
	Dirty or bent radiator fins	*Clean or remedy.*
	Coolant leakage on cooling system	*Repair.*
	Clogged radiator	*Check and replace radiator as necessary.*
	Faulty radiator cap	*Replace.*
	Improper ignition timing	*Adjust.*
	Dragging brakes	*Adjust brake.*
	Slipping clutch	*Adjust or replace.*
	Poor charge battery	*Check and replace as necessary.*
	Poor generation generator	*Check and repair.*
	ECT sensor faulty	*Check and replace as necessary.*
	Radiator cooling fan relay No.2 and/or No.3 faulty	*Check and replace as necessary.*
	Radiator fan motor faulty	*Check and replace as necessary.*
	ECM faulty	*Check and replace as necessary.*
	Wiring or grounding faulty	*Repair as necessary.*
	Equipped with too much electric load part(s)	*Dismount.*
Engine overheats (Radiator fan does not operate)	Fuse blown	*Check 30 A fuse of relay/fuse box and check for short circuit to ground.*
	Radiator cooling fan relay No.1 faulty	*Check and replace as necessary.*
	ECT sensor faulty	*Check and replace as necessary.*
	Radiator cooling fan motor faulty	*Check and replace as necessary.*
	Wiring or grounding faulty	*Repair as necessary.*
	ECM faulty	*Check and replace as necessary.*

Repair Instructions

Cooling System Components

S4RS0A1606001



I4RS0A160001-

1. Radiator	13. Thermostat case	25. Heater outlet No.1 hose
2. Reservoir	14. Thermostat	26. Engine cooling fan assembly
3. Radiator cap	15. Thermostat cap	27. Water bypass No.2 hose
4. Drain plug	16. Water bypass No.1 hose	28. To timing chain cover
5. Radiator outlet hose	17. Water inlet No.1 pipe	29. To cylinder head
6. Radiator inlet hose	18. Water inlet hose	30. To water pump
7. Water outlet cap	19. Water inlet No.2 pipe	31. To heater core
8. ECT sensor	20. Heater outlet No.2 hose	32. To throttle body
9. Water outlet cap gasket	21. Heater union	(a) : 15 N·m (1.5 kg-m, 11.0 lb-ft)
10. O-ring	22. Heater union gasket	(b) : 4.5 N·m (0.45 kg-m, 3.5 lb-ft)
11. Water outlet plug	23. Air ventilation bolt	: Do not reuse.
12. Thermostat case water outlet pipe	24. Heater inlet hose	

Coolant Level Check

S4RS0A1606002

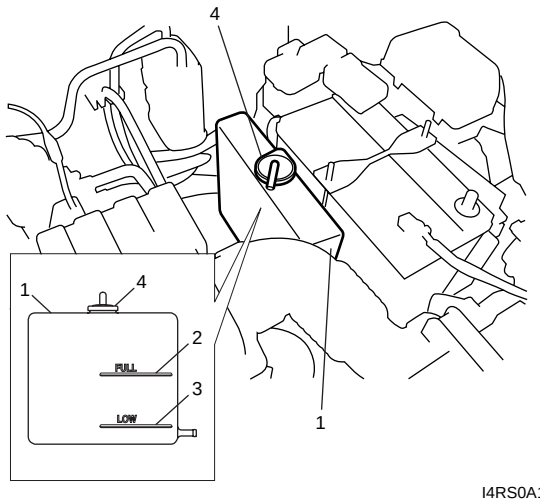
WARNING:

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if radiator cap is taken off too soon.

To check level, lift hood and look at “see-through” coolant reservoir.
It is not necessary to remove radiator cap to check coolant level.
When engine is cool, check coolant level in reservoir (1). A normal coolant level should be between FULL mark (2) and LOW mark (3) on reservoir (1).
If coolant level is below LOW mark (3), remove reservoir cap (4) and add proper coolant to reservoir to bring coolant level up to FULL mark (2).

NOTE:

If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.



I4RS0A160002-

Engine Cooling System Inspection and Cleaning

S4RS0A1606003

WARNING:

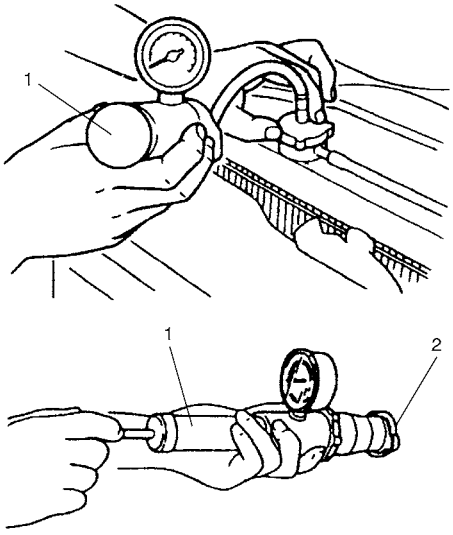
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

1) Check cooling system for leakage or damage.
2) Wash radiator cap and filler neck with clean water by removing radiator cap when engine is cold.
3) Check coolant for proper level and freeze protection.
4) Using a pressure tester (1), check system and radiator cap (2) for proper pressure holding capacity. If replacement of cap is required, use a proper cap for this vehicle.

NOTE:

After installing radiator cap to radiator, make sure that the ear of cap lines is parallel to radiator.

Cooling system and radiator cap holding pressure (for inspection)
110 kPa (1.1 kg/cm^2, 15.6 psi)



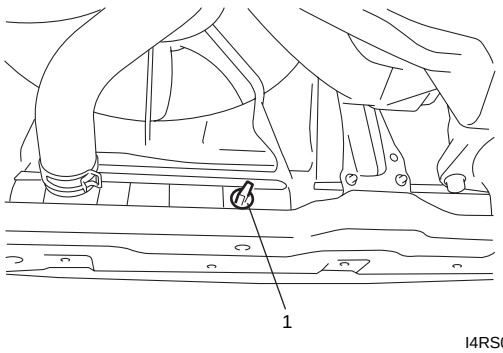
I5RH01160001-

5) Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
6) Clean frontal area of radiator core.

Cooling System Draining

S4RS0A1606019

1) Remove radiator cap.
2) Drain coolant from radiator drain plug (1).
3) After draining coolant, be sure to tighten drain plug (1) securely.



I4RS0A160003-

Cooling System Flush and Refill

S4RS0A1606004

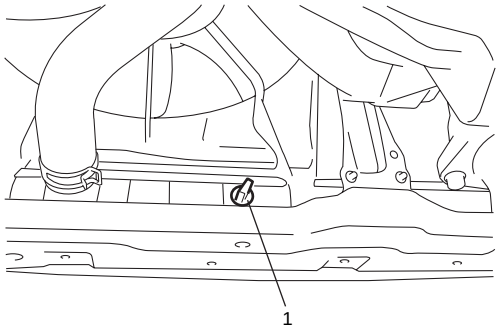
WARNING:

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

NOTE:

For detail of coolant specification, refer to "Coolant Description: ".

1) Remove radiator cap when engine is cool as follows.
   a) Turn cap counterclockwise slowly until it reaches a "stop" (Do not press down while turning it).
   b) Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it counterclockwise.
2) With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).
3) Stop engine and drain coolant from radiator drain plug (1).
4) Close radiator drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
5) Repeat Steps 3) and 4) several times until drained liquid is nearly colorless.
6) Close radiator drain plug (1) tightly.



I4RS0A160003-

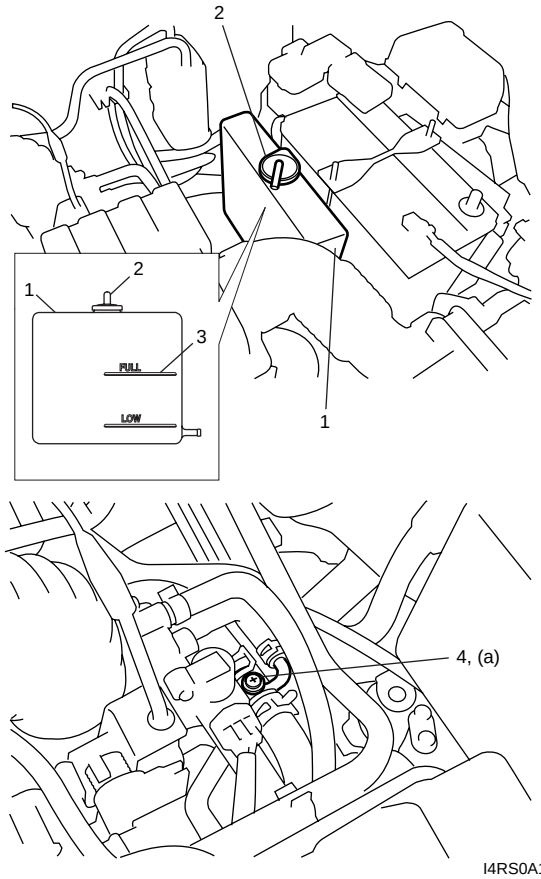
7) Remove reservoir (1) and remove cap (2) from reservoir (1).
8) Pour out any fluid, scrub and clean inside of reservoir with soap and water.
   Flush it well with clean water and drain, Reinstall reservoir.
9) Fill reservoir with coolant up to "Full" level mark (3).
10) Install reservoir cap (2) on reservoir.
11) Loosen air ventilation bolt (4) one and a half turns.
12) Fill radiator with coolant up to spilling coolant from air ventilation bolt (4).
13) Tighten air ventilation bolt (4) to specified torque.

    Tightening torque
    Air ventilation bolt (a): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

14) Fill radiator with coolant up to bottom of radiator filler neck and install radiator cap, making sure that the ear of cap lines is parallel to radiator.
15) Run engine at idle speed.
16) Loosen air ventilation bolt (4) one and a half turns.
17) Run engine at 2000 – 3000 rpm, and tighten air ventilation bolt (4) to specified torque after spilling coolant from air ventilation bolt (4).

    Tightening torque
    Air ventilation bolt (a): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

18) Run engine until radiator fan motor is operated.
19) Stop engine and wait until engine comes cooled down to help avoid danger of being burned.
20) Add coolant to radiator up to bottom of radiator filler neck, and install radiator cap, making sure that the ear of cap lines is parallel to radiator.
21) Repeat Step 15) through 20).
22) Confirm that reservoir coolant level is "Full" level mark (3). If coolant is insufficient, repeat Step 9) and 10).



I4RS0A160004-

Cooling Water Pipes or Hoses Removal and Installation

S4RS0A1606005

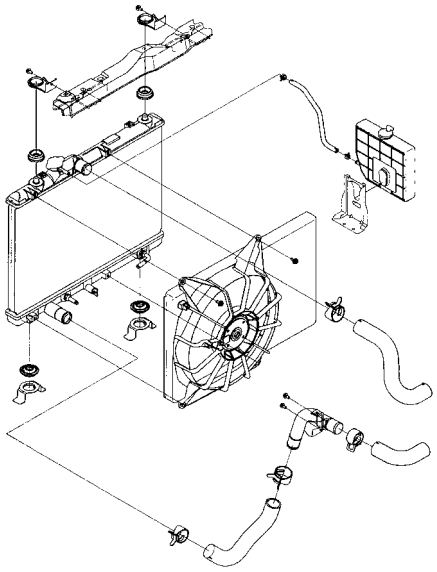
Removal

1) Drain coolant referring to “Cooling System Draining: ”.
2) To remove these pipes or hoses, loosen clamp on each hose and pull hose end off.

Installation

Install removed parts in reverse order of removal procedure, noting the following.

- Tighten each clamp securely.
- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.



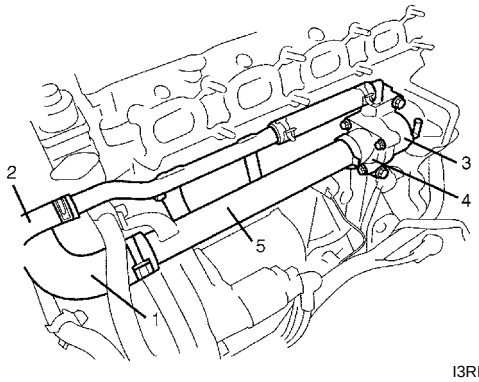
I4RS0A160005-

Thermostat Removal and Installation

S4RS0A1606006

Removal

1) Drain coolant referring to “Cooling System Draining: ”.
2) Remove intake manifold referring to “Intake Manifold Removal and Installation: in Section 1D”.
3) Remove generator referring to “Generator Dismounting and Remounting: in Section 1J”.
4) Disconnect water hose (1) and heater hose (2) from each pipe.
5) Remove thermostat case (3) with thermostat cap (4) and water inlet pipe (5).
6) Remove water inlet pipe with thermostat cap from thermostat case.
7) Remove thermostat from thermostat case (3).

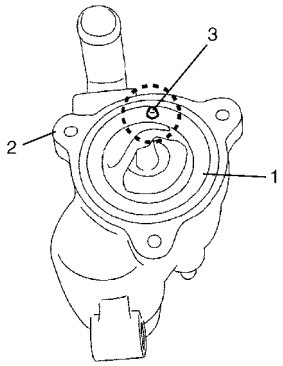


I3RM0A160007-

Installation

Reverse removal procedure for installation noting the following points.

- When positioning thermostat (1) on thermostat case (2), be sure to position it so that air bleed valve (3) comes at position as shown in the figure.



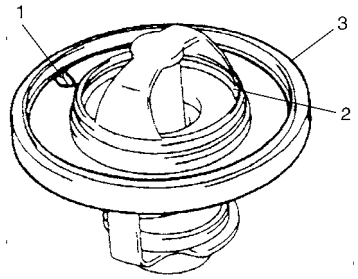
I2RH0B160006-

- Use new O-rings when installing.
- Adjust water pump belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: ”.
- Adjust A/C compressor belt tension referring to “Compressor Drive Belt Inspection and Adjustment: in Section 7B”.
- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.
- Verify that there is no coolant leakage at each connection.

Thermostat Inspection

S4RS0A1606007

- Make sure that air bleed valve (1) of thermostat is clean.
  Should this valve be clogged, engine would tend to overheat.
- Check to make sure that valve seat (2) is free from foreign matters which would prevent valve from seating tight.
- Check thermostat seal (3) for breakage, deterioration or any other damage.



I3RM0A160008-

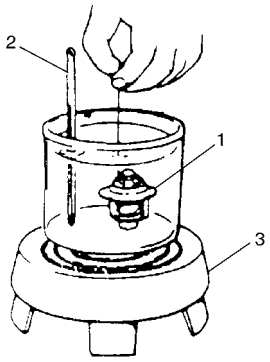
- Check thermostatic movement of wax pellet as follows:
  a. Immerse thermostat (1) in water, and heat water gradually.
  b. Check that valve starts to open at specific temperature.

  Temperature at which valve begins to open
  80 – 84 °C (176 – 183 °F)

  Temperature at which valve become fully open
  95 – 97 °C (203 °F)

  Valve lift
  More than 8 mm at 95 °C (203 °F)

If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if reused, will bring about overcooling or overheating tendency.



I2RH01160012-

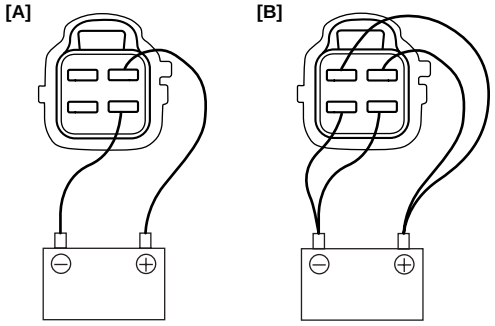
2. Thermometer	3. Heater

Radiator Cooling Fan Motor On-Vehicle Inspection

S4RS0A1606010

1) Check low speed operation of radiator cooling fan as follows.
   a) Connect battery to fan motor coupler as shown in figure.
   b) Check that radiator cooling fan rotates smoothly. If any abnormality is found, replace fan motor.
2) Check high speed operation of radiator cooling fan as follows.
   a) Connect battery to fan motor coupler as shown in figure.
   b) Check that radiator cooling fan rotates smoothly and its rotational speed is faster than low speed operation.
   If any abnormality is found, replace fan motor.

   Reference: Fan motor specified current at 12 V
   Low speed operation: 14.0 A maximum
   High speed operation: 18.0 A maximum



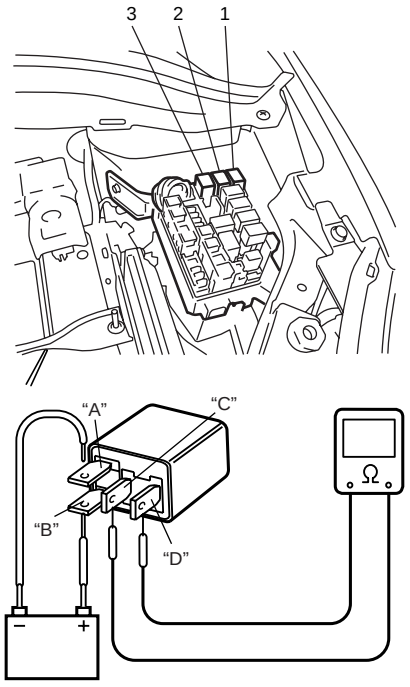
I4RS0A160006-

[A]: Low speed operation
[B]: High speed operation

Radiator Cooling Fan Relay Inspection

S4RS0A1606020

1) Disconnect negative (–) cable at battery.
2) Remove radiator cooling fan relay No.1 (1), No.2 (2) and/or No.3 (3) from relay box.
3) Check that there is no continuity between terminal “C” and “B”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “B” of relay.
5) Connect battery negative (–) terminal “A” of relay.
6) Check continuity between terminal “C” and “D”. If there is no continuity when relay is connected to the battery, replace relay.



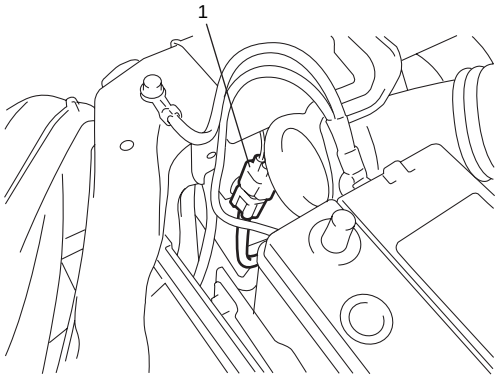
I4RS0A160007-

Radiator Cooling Fan Removal and Installation

S4RS0A1606021

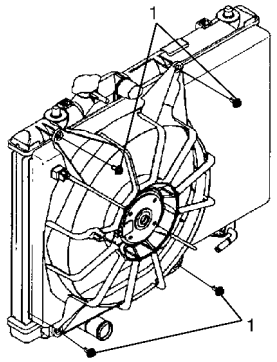
Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect connector (1) of cooling fan motor.



I4RS0A160008-

3) Drain coolant.
4) Remove front bumper, front bumper upper absorber and upper member referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
5) Remove radiator inlet hose and reservoir hose.
6) Remove cooling fan mounting bolts (1).



I4RS0A160009-

7) Slide condenser with radiator, and then remove radiator cooling fan.

CAUTION:

Be sure not to damage condenser outlet pipe.

Installation

Reverse removal procedure for installation noting the following.

- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.
- After installation, verify there is no coolant leakage at each connection.

Radiator On-Vehicle Inspection and Cleaning

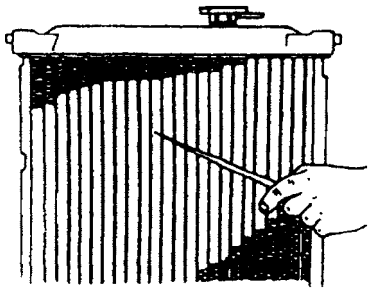
S4RS0A1606013

Inspection

Check radiator for leakage or damage. Straighten bent fins, if any.

Cleaning

Clean frontal area of radiator cores.



I2RH01160014-

Radiator Removal and Installation

S4RS0A1606014

Removal

1) Disconnect negative cable at battery.
2) Drain A/T fluid.
3) Drain coolant.
4) Remove cooling fan assembly referring to “Radiator Cooling Fan Removal and Installation: ”.
5) Remove A/T fluid cooler inlet and outlet hoses.
6) Remove radiator outlet hose from radiator.
7) Remove radiator from vehicle.

Installation

Reverse removal procedures, noting the following.

- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.
- After installation, verify there is no coolant leakage each connection.
- Refill A/T fluid referring to “A/T Fluid Change: in Section 5A”.

Water Pump / Generator Drive Belt Tension Inspection and Adjustment

S4RS0A1606015

WARNING:

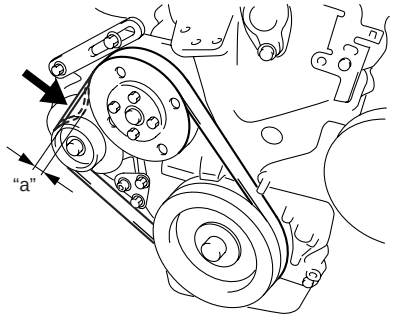
- **Disconnect negative cable at battery before checking and adjusting belt tension.**
- **To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to “Water Pump / Generator Drive Belt Removal and Installation: ”.
2) Check belt for tension. Belt is in proper tension when it deflects the following specification under thumb pressure (about 10 kg or 22 lb.).

   Water pump / generator drive belt tension
   “a”: 4.5 – 5.5 mm (0.18 – 0.22 in.) as deflection / 10 kg (22 lbs)

NOTE:

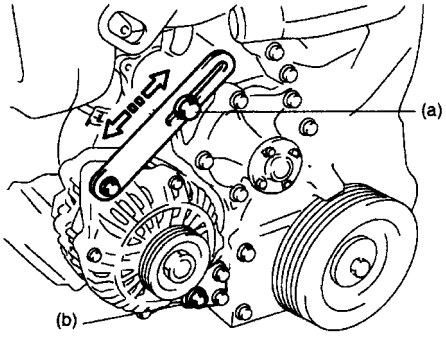
When replacing belt with a new one, adjust belt tension to 3 – 4 mm (0.12 – 0.16 in.).



I2RH0B160012-

3) If belt is too tight or too loose, adjust it to proper tension by displacing generator position.
4) Tighten generator adjusting bolt and pivot bolts as specified torque.

   Tightening torque
   Generator adjusting bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)
   Generator pivot bolt (b): 50 N·m (5.0 kg-m, 36.0 lb-ft)



I2RH0B160013-

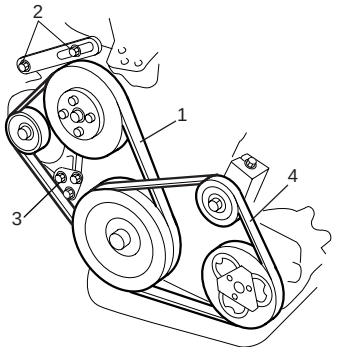
5) Connect negative cable at battery.

Water Pump / Generator Drive Belt Removal and Installation

S4RS0A1606016

Removal

1) Disconnect negative cable at battery.
2) If vehicle equipped with A/C, remove compressor drive belt (4) before removing water pump belt (1). Refer to “Compressor Drive Belt Removal and Installation: in Section 7B”.
3) Loosen drive belt adjusting bolt (2) and generator pivot bolt (3).

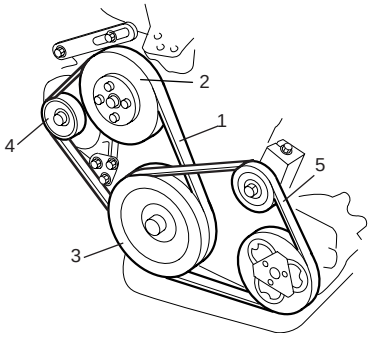


I3RM0A160014-

4) Slacken belt by displacing generator and then remove it.

Installation

1) Install belt (1) to water pump pulley (2), crankshaft pulley (3) and generator pulley (4).
2) Adjust belt tension by referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: ”.
3) If vehicle equipped with A/C, install compressor drive belt (5) referring to “Compressor Drive Belt Removal and Installation: in Section 7B”.



I3RM0A160015-

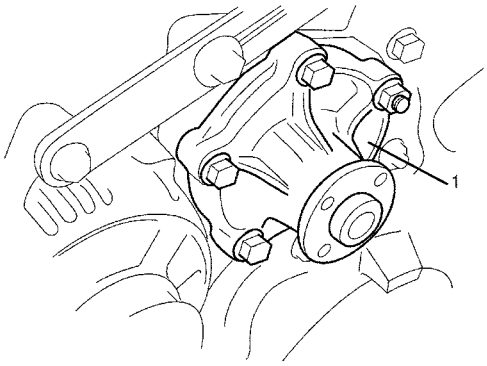
4) Connect negative cable at battery.

Water Pump Removal and Installation

S4RS0A1606017

Removal

1) Disconnect negative cable at battery.
2) Drain coolant.
3) Remove water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: ”.
4) Remove water pump assembly (1).



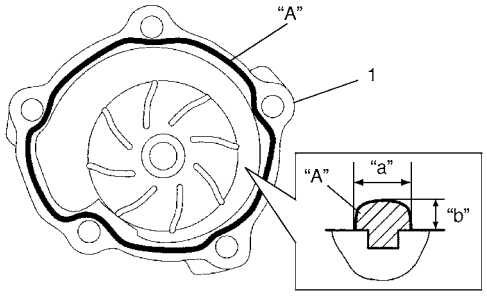
I2RH0B160016-

Installation

1) Apply sealant to mating surface of water pump (1) as shown in the figure.

“A”: Water tight sealant 99000–31250

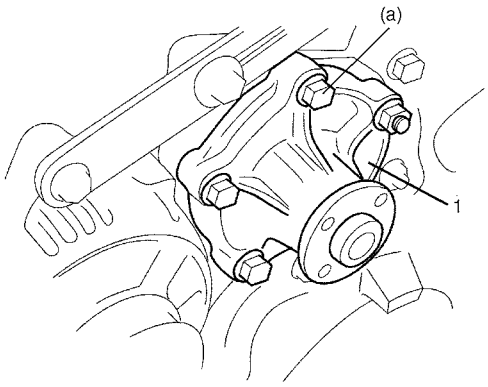
Sealant quantity (to mating surface of water pump)
Width “a”: 3 mm (0.12 in.)
Height “b”: 2 mm (0.08 in.)



I3RM0A160016-

2) Install water pump assembly (1) to cylinder block and tighten bolts and nut to specified torque.

Tightening torque
Water pump bolt and nut (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I2RH0B160018-

3) Install water pump pulley.
4) Install water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: ”.
5) Install A/C compressor belt (if equipped) referring to “Compressor Drive Belt Removal and Installation: in Section 7B”.
6) Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.
7) Connect negative cable at battery.
8) Check each part for leakage.

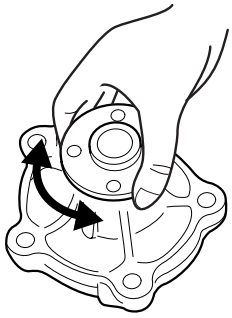
Water Pump Inspection

S4RS0A1606018

CAUTION:

Do not disassemble water pump.
If any repair is required on pump, replace it as assembly.

Rotate water pump by hand to check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.



I2RH0B160019-

Specifications

Tightening Torque Specifications

S4RS0A1607001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Air ventilation bolt	4.5	0.45	3.5	☞ / ☞
Generator adjusting bolt	23	2.3	17.0	☞
Generator pivot bolt	50	5.0	36.0	☞
Water pump bolt and nut	25	2.5	18.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Cooling System Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A1608001

Material	SUZUKI recommended product or Specification		Note
Water tight sealant	SUZUKI Bond No.1207F	P/No.: 99000–31250	☞

Fuel System

Precautions

Precautions on Fuel System Service

S4RS0A1700001

WARNING:

Before attempting service of any type on fuel system, the following should be always observed in order to reduce the risk or fire and personal injury.

- **Disconnect negative cable at battery.**
- **Do not smoke, and place no smoking signs near work area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).**
- **Wear safety glasses.**
- **To relieve fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.**
- **As fuel feed line is still under high fuel pressure even after stopping engine, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel. Before loosening or disconnecting fuel feed line, make sure to relieve fuel pressure referring to "Fuel Pressure Relief Procedure: ".**
- **A small amount of fuel may be released when the fuel line is disconnected. In order to reduce the risk of personal injury, cover a shop cloth to the fitting to be disconnected. Be sure to put that cloth in an approved container after disconnecting.**
- **Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.**
- **Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to "Fuel Hose Disconnecting and Reconnecting: ".**
  After connecting, make sure that it has no twist or kink.
- **When installing injector or fuel feed pipe, lubricate its O-ring with gasoline.**

General Description

Fuel System Description

S4RS0A1701001

CAUTION:

This engine requires the unleaded fuel only. The leaded and/or low lead fuel can result in engine damage and reduce the effectiveness of the emission control system.

The main components of the fuel system are fuel tank, fuel pump assembly (with fuel filter, fuel level gauge, fuel pressure regulator, fuel feed line and fuel vapor line.
For the details of fuel flow, refer to "Fuel Delivery System Diagram: ".

Fuel Delivery System Description

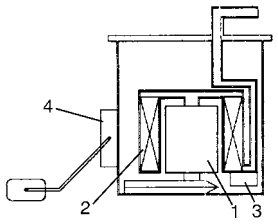
S4RS0A1701002

The fuel delivery system consists of the fuel tank, fuel pump assembly (with built-in fuel filter and fuel pressure regulator), delivery pipe, injectors and fuel feed line.
The fuel in the fuel tank is pumped up by the fuel pump, sent into delivery pipe and injected by the injectors.
As the fuel pump assembly is equipped with built-in fuel filter and fuel pressure regulator, the fuel is filtered and its pressure is regulated before being sent to the feed pipe.
The excess fuel at fuel pressure regulation process is returned back into the fuel tank.
Also, fuel vapor generated in fuel tank is led through the fuel vapor line into the EVAP canister.
For system diagram, refer to "Fuel Delivery System Diagram: ".

Fuel Pump Description

S4RS0A1701003

The fuel pump (1) is an in-tank type electric pump. Incorporated in the pump assembly are;
a fuel filter (2) and a fuel pressure regulator (3) are included and a fuel level gauge (4) is attached.
Addition of the fuel pressure regulator to the fuel pump makes it possible to maintain the fuel pressure at constant level and ECM controls compensation for variation in the intake manifold pressure.

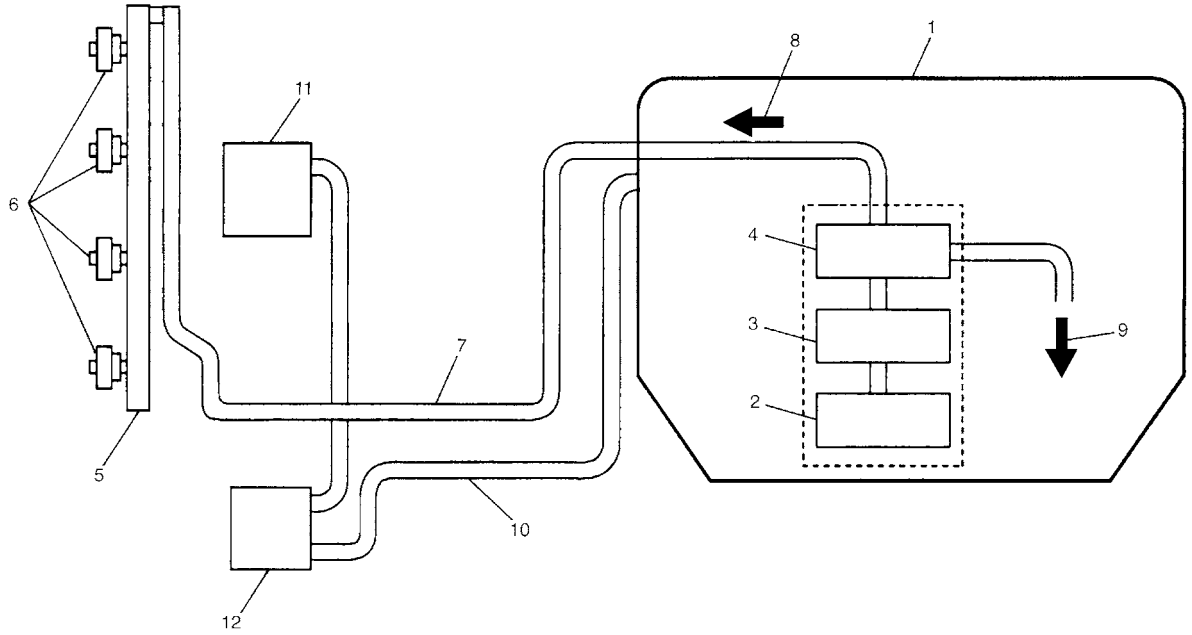


I4RS0A170001-

Schematic and Routing Diagram

Fuel Delivery System Diagram

S4RS0A1702001



I4RS0A170002-

1. Fuel tank	6. Fuel injector	11. Intake manifold
2. Fuel pump	7. Fuel feed line	12. EVAP canister
3. Fuel filter	8. Fuel	
4. Fuel pressure regulator	9. Returned back fuel	
5. Delivery pipe	10. Fuel vapor line	

Diagnostic Information and Procedures

Fuel Pressure Inspection

S4RS0A1704001

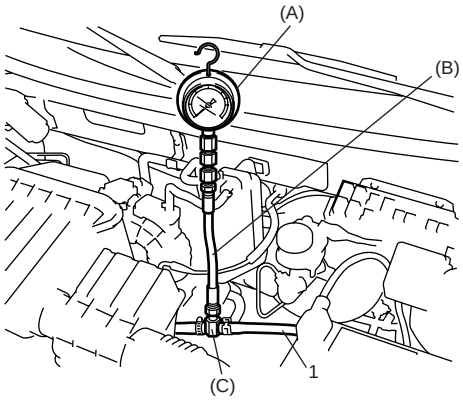
WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

1) Relieve fuel pressure in fuel feed line referring to “Fuel Pressure Relief Procedure: ”.
2) Disconnect fuel feed hose from fuel delivery pipe.

3) Connect special tools and hose between fuel feed hose (1) and fuel delivery pipe as shown in the figure, and clamp hoses securely in order to ensure that no leaks occur during checking.

Special tool
(A): 09912–58442
(B): 09912–58432
(C): 09912–58490



I3RM0A170004-

4) Check that battery voltage is 11 V or more.
5) Measure fuel pressure at each condition.
If measured pressure is out of specification, refer to "Fuel Pressure Check: in Section 1A" and check each possibly defective part. Replace if found defective.
   a) Turn ignition switch ON to operate fuel pump and after 2 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.

      Fuel pressure specification
      With fuel pump operating and engine stopped: 270 – 310 kPa (2.7 – 3.1 kg/cm^2, 38.4 – 44.0 psi)

   b) Start engine and warm it up to normal operating temperature, and measure fuel pressure at idling.

      Fuel pressure specification
      At specified idle speed: 270 – 310 kPa (2.7 – 3.1 kg/cm^2, 38.4 – 44.0 psi)

   c) Stop engine, and measure fuel pressure at one minute after stopping.

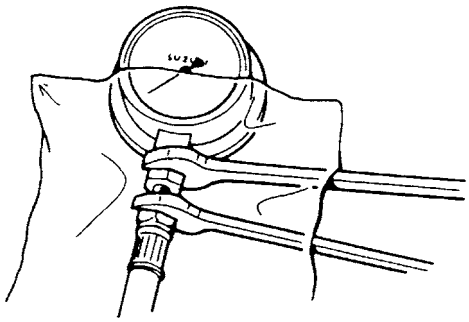
      Fuel pressure specification
      With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes): Over 250 kPa (2.5 kg/cm^2, 35.6 psi)

6) After checking fuel pressure, remove fuel pressure gauge.

WARNING:

As fuel feed line is still under high fuel pressure, make sure to release fuel pressure according to the following procedures.

- **Place fuel container under joint.**
- **Cover joint with rag and loosen joint nut slowly in order to release fuel pressure gradually.**



I2RH01170032-

7) Remove special tools from fuel delivery pipe and fuel feed hose.
8) Connect fuel feed hose to fuel delivery pipe and clamp it securely.
9) With engine OFF and ignition switch ON, check for fuel leaks.

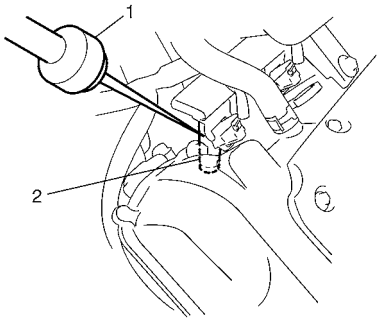
Fuel Cut Operation Inspection

S4RS0A1704002

NOTE:

Before inspection, make sure that gear shift lever is in neutral position (shift select lever is "P" range for A/T vehicle), A/C is OFF and parking brake lever is pulled all the way up.

1) Warm engine up to normal operating temperature.
2) While listening to sound of injector (2) by using sound scope (1) or such, increase engine speed to higher than 3,000 r/min.



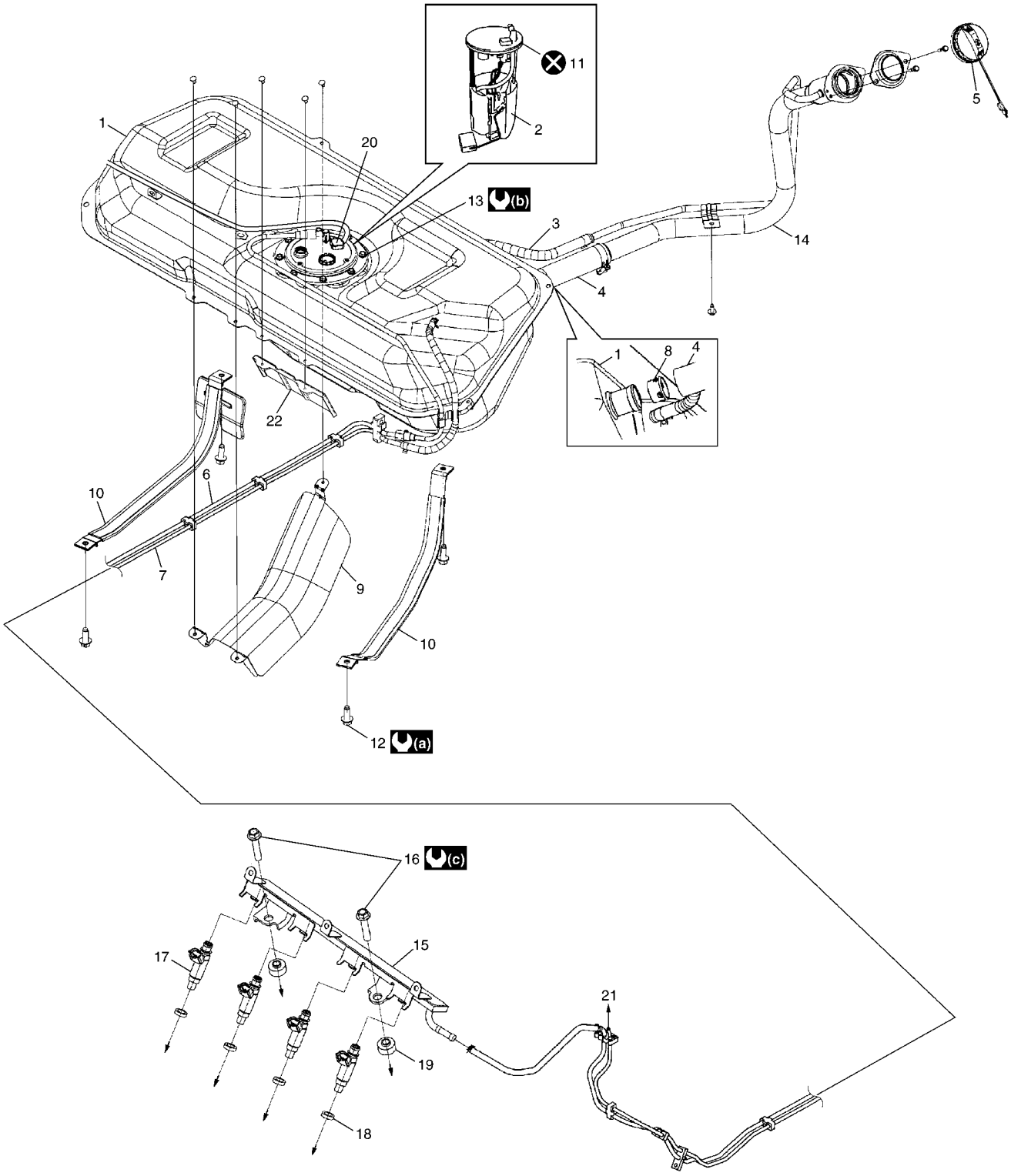
I2RH0B170004-

3) Check to make sure that injector operation sound is stop when throttle valve is closed instantly and it is heard again when engine speed is reduced to approx. 2,000 r/min or less.

Repair Instructions

Fuel System Components

S4RS0A1706001



I4RS0A170003-

1. Fuel tank	10. Fuel tank belt	19. Fuel delivery pipe insulator
2. Fuel pump assembly	11. Fuel pump gasket	20. Wire harness for fuel pump
3. Breather hose	12. Fuel tank bolt	21. To canister
4. Fuel tank filler hose	13. Fuel pump bolt	22. Fuel tank cover
5. Fuel filler cap	14. Fuel filler neck	: Do not reuse.
6. Fuel feed line	15. Fuel delivery pipe	(a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)

7. Fuel vapor line	16. Fuel delivery pipe bolt	(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
8. Fuel tank inlet valve	17. Fuel injector	(c) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
9. Fuel tank protector	18. Injector cushion	

Fuel Hose Disconnecting and Reconnecting

S4RS0A1706023

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

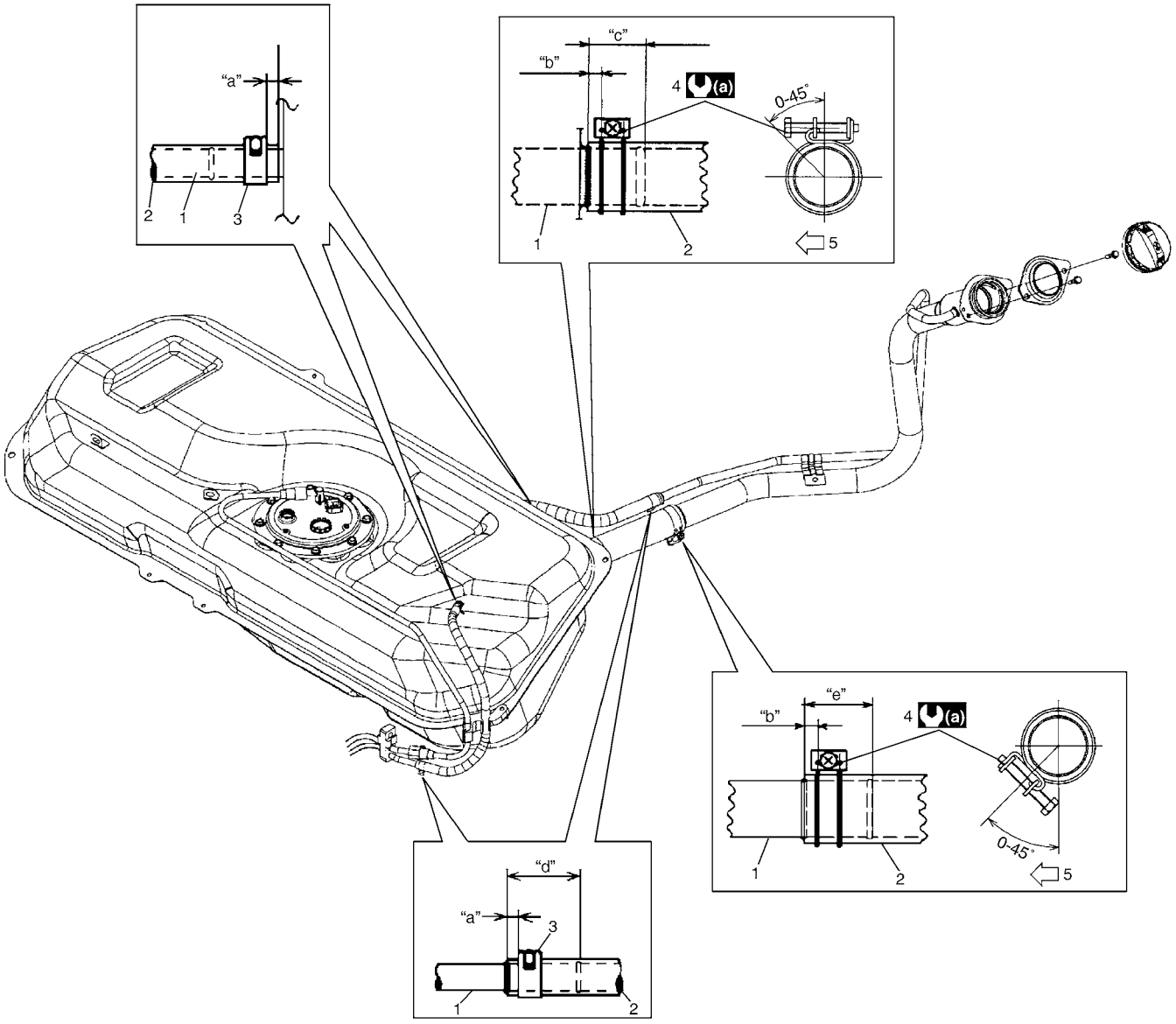
Be sure to connect and clamp each hose correctly as shown in figure.

For Normal Clamp

Fuel tank system

NOTE:

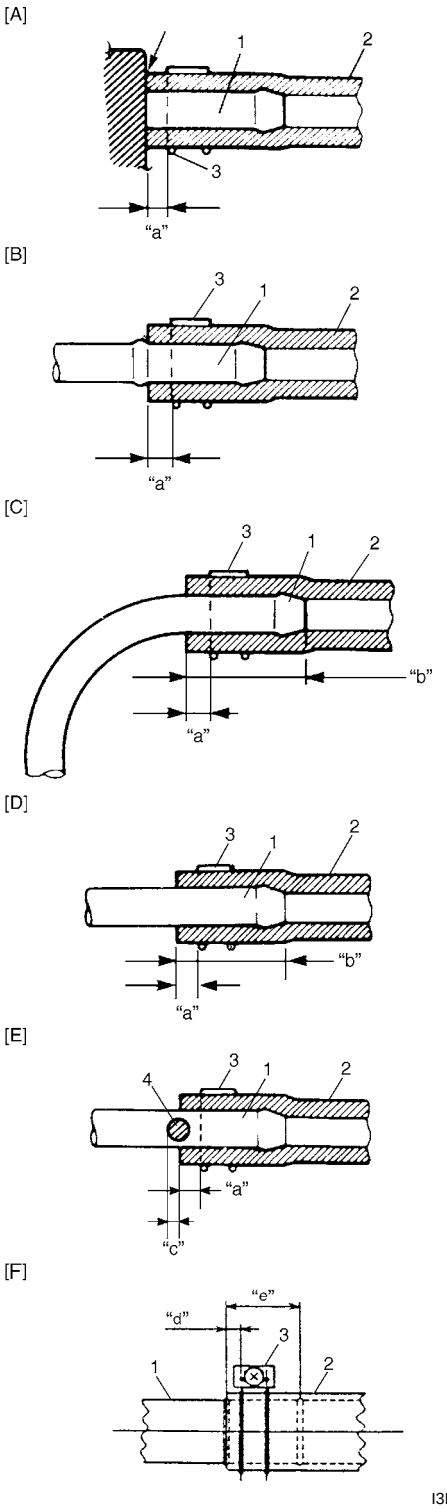
Be sure to install hose to spool of pipe surely.



I4RS0A170018-

1. Pipe	5. Vehicle leftward	"d" 30 mm (1.18 in.)
2. Hose	"a" 3 – 7 mm (0.12 – 0.28 in.)	"e" 38 mm (1.50 in.)
3. Clamp	"b" 5 – 12 mm (0.20 – 0.48 in.)	(a) : 2 N·m (0.2 kg-m, 1.5 lb-ft)
4. Fuel filler hose clamp screw	"c" 33 mm (1.30 in.)	

The other than fuel tank system



I3RM0A170001-

[A]:	With short pipe, fit hose as far as it reaches pipe joint as shown.
[B]:	With the following type pipe, fit hose as far as its peripheral projection as shown.
[C]:	With bent pipe, fit hose as its bent part as shown or till depth "b".
[D]:	With straight pipe, fit hose till depth "b".
[E]:	With red marked pipe, fit hose end reaches red mark on pipe.
[F]:	For fuel tank filler hose, insert it to spool or welding-bead.
"a":	Clamp securely at a position 3 – 7 mm (0.12 – 0.27 in.) from hose end.
"b":	20 – 30 mm (0.79 – 1.18 in.)
"c":	0 – 5 mm (0 – 0.19 in.)
"d":	5 – 12 mm (0.2 – 0.47 in.)
"e":	40 mm (1.57 in.)
4.	Red mark

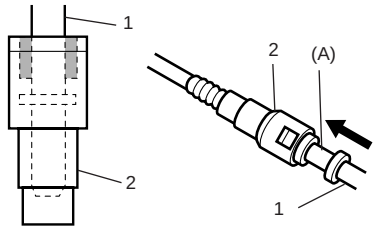
For Quick Joint

Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (2) by blowing compressed air.
2) Unlock joint lock by inserting special tool between pipe and quick joint.

   Special tool
   (A): 09919–47020

3) Disconnect quick joint from pipe.



I4RS0A170019-

Reconnecting

Insert quick joint to fuel pipe until they lock securely (a click is heard), and confirm that quick joint is not disconnected by hand.

Fuel Pressure Relief Procedure

S4RS0A1706002

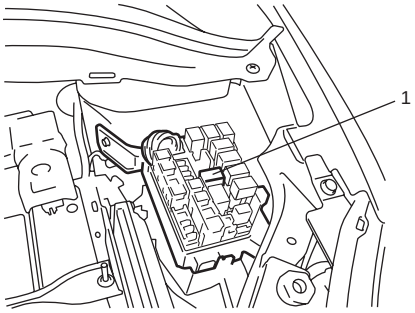
CAUTION:

This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

NOTE:

If ECM detects DTC(s) after servicing, clear DTC(s) referring to "DTC Clearance: in Section 1A".

1) Make sure that engine is cold.
2) Shift transaxle gear shift lever in "Neutral" (shift select lever in "P" range for A/T model), set parking brake and block drive wheels.
3) Remove relay / fuse box cover.
4) Disconnect fuel pump relay (1) from relay / fuse box (2).
5) Remove fuel filter cap in order to release fuel vapor pressure in fuel tank, and then reinstall it.
6) Start engine and run it until engine stops for lack of fuel. Repeat cranking engine 2 – 3 times for about 3 seconds each time in order to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
7) After servicing, connect fuel pump relay (1) to relay / fuse box and install relay / fuse box cover.



I4RS0A170004-

Fuel Leakage Check Procedure

S4RS0A1706003

After performing any service on fuel system, check to make sure that there are no fuel leakages as follows.

1) Turn ON ignition switch for 3 seconds (to operate fuel pump) and then turn it OFF.
   Repeat this (ON and OFF) 3 or 4 times and apply fuel pressure to fuel line until fuel pressure is felt by hand placed on fuel feed hose.
2) In this state, check to see that there are no fuel leakages from any part of fuel system.

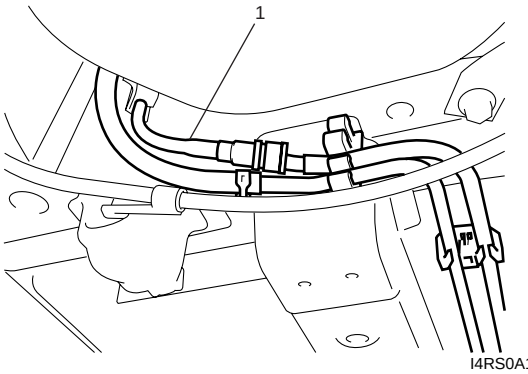
Fuel Lines On-Vehicle Inspection

S4RS0A1706004

CAUTION:

Due to the fact that fuel feed line (1) is under high pressure, use special care when servicing it.

Visually inspect fuel lines for evidence of fuel leakage, hose crack and deterioration or damage.
Make sure all clamps are secure.
Replace parts as needed.



I4RS0A170005-

Fuel Pipe Removal and Installation

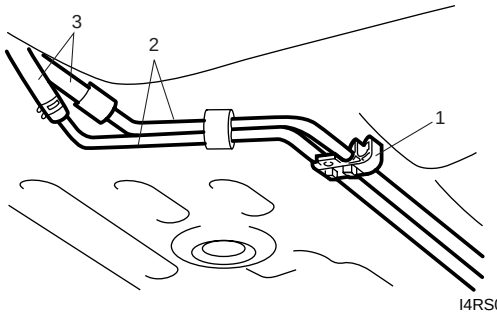
S4RS0A1706005

WARNING:

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk or fire and personal injury.

Removal

1) Relieve fuel pressure in fuel feed line according to "Fuel Pressure Relief Procedure: ".
2) Disconnect negative cable at battery.
3) Disconnect fuel pipe joint and fuel hose (3) from fuel pipe (2) at the front and rear of each fuel pipe referring to "Fuel Hose Disconnecting and Reconnecting: ".
4) Mark the location of clamps (1) on fuel pipes (2), so that the clamps can be reinstalled to where they were.
5) Remove pipes (2) with clamp (1) from vehicle.
6) Remove clamp (1) from pipes (2).



I4RS0A170020-

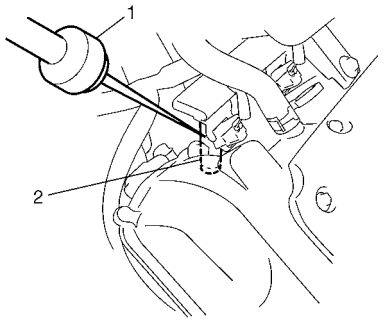
Installation

1) Install clamps to marked location on pipes. If clamp is deformed, its claw is bent or broken, replace it with new one.
2) Install pipes with pipe clamps to vehicle.
3) Connect fuel hoses and pipes to each pipe referring to “Fuel Hose Disconnecting and Reconnecting: ”.
4) Connect negative cable at battery.
5) With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Injector On-Vehicle Inspection

S4RS0A1706006

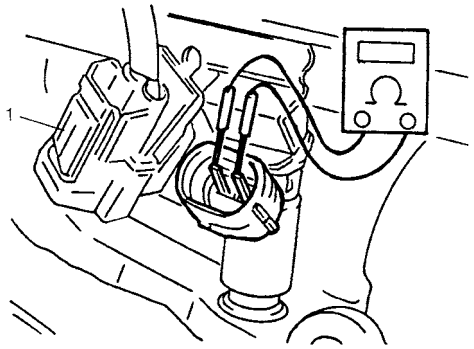
1) Using sound scope (1) or such, check operating sound of injector (2) when engine is running or cranking.
   Cycle of operating sound should vary according to engine speed.
   If no sound or an unusual sound is heard, check injector circuit (wire or coupler) or injector.



I2RH0B170007-

2) Disconnect connector (1) from injector, connect ohmmeter between terminals of injector and check resistance.
   If resistance is out of specification, replace.

   Resistance of fuel injector
   11.3 – 13.8 Ω at 20 °C, 68 °F



I2RH0B170008-

3) Connect connector to injector securely.

Fuel Injector Removal and Installation

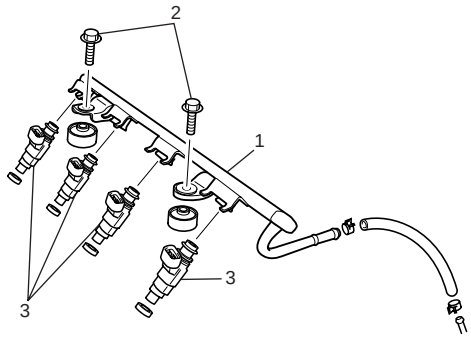
S4RS0A1706007

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

Removal

1) Relieve fuel pressure according to “Fuel Pressure Relief Procedure: ”.
2) Disconnect negative cable at battery.
3) Disconnect MAF sensor connector, and detach EVAP canister purge valve.
4) Remove air cleaner assembly with air intake pipe.
5) Disconnect fuel injector couplers.
6) Disconnect fuel feed hose from fuel delivery pipe (1).
7) Remove fuel delivery pipe bolts (2).
8) Remove fuel injector(s) (3).



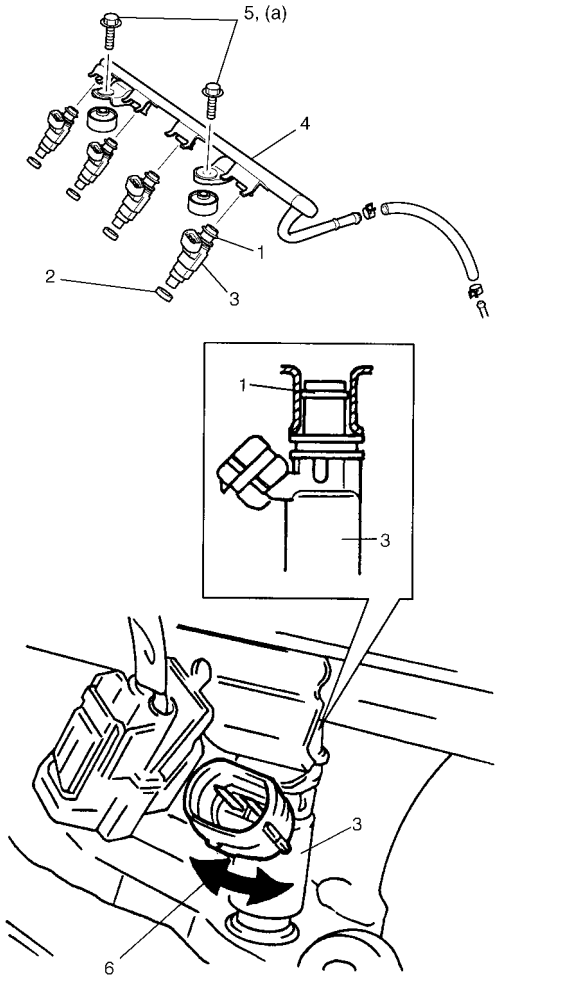
I3RM0A170010-

Installation

Reverse removal procedure for installation noting the following.

- Replace injector O-ring (1) with new one using care not to damage it.
- Check if cushion (2) is scored or damaged. If it is, replace with new one.
- Apply thin coat of fuel to O-rings (1) and then install injectors (3) into delivery pipe (4) and cylinder head. Make sure that injectors rotate smoothly (6). If not, probable cause is incorrect installation of O-ring. Replace O-ring with new one.
- Tighten delivery pipe bolts (5) to specified torque and make sure that injectors rotate smoothly.

Tightening torque
Fuel delivery pipe bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I3RM0A170011-

- After installation, with engine OFF and ignition switch ON, check for fuel leaks around fuel line connection.

Fuel Injector Inspection

S4RS0A1706008

WARNING:

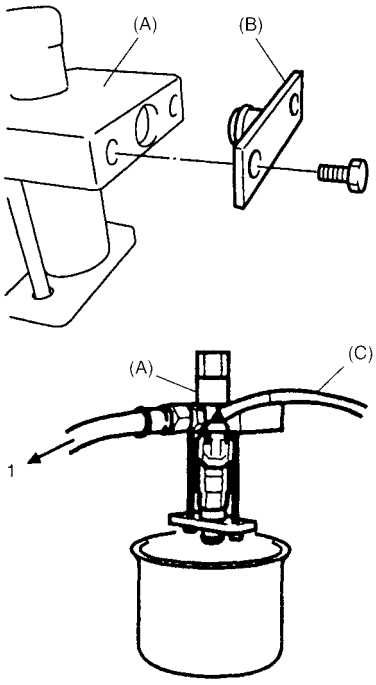
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk or fire and personal injury.

1) Install injector to special tool (injector checking tool).

Special tool
(A): 09912–58421
(B): 09912–57610

2) Connect special tools (hose and attachment) to fuel feed pipe (1) of vehicle.
3) Connect special tool (test lead) to injector.

Special tool
(C): 09930–88530

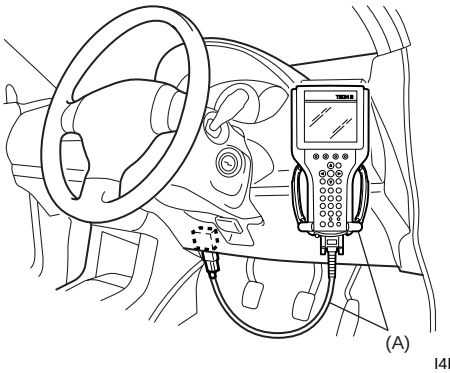


I3RM0A170012-

4) Install suitable vinyl tube onto injector nozzle to prevent fuel from splashing out when injecting.
5) Put graduated cylinder under injector.

6) Operate fuel pump and apply fuel pressure to injector as follows:
   a) When using scan tool:
      i) Connect scan tool to DLC with ignition switch OFF.
      ii) Turn ignition switch ON, clear DTC and select “MISC TEST” mode on scan tool.
      iii) Turn fuel pump ON by using scan tool.

      Special tool
      (A): SUZUKI scan tool



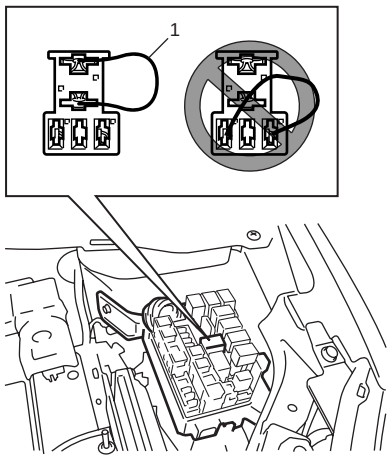
I4RS0A170021-

   b) When not using scan tool:
      i) Remove fuel pump relay from connector.
      ii) Connect two terminals of relay connector using service wire (1) as shown in the figure.

CAUTION:

Check to make sure that connection is made between correct terminals. Wrong connection can cause damage to ECM, wire harness, etc.

      iii) Turn ignition switch ON.



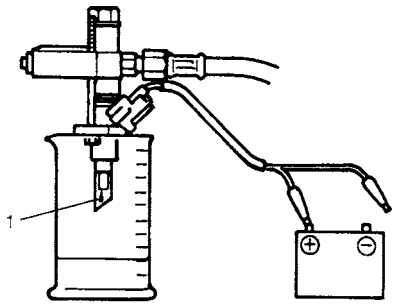
I4RS0A170006-

7) Apply battery voltage to injector (1) for 15 seconds and measure injected fuel volume with graduated cylinder. Test each injector two or three times. If not within specification, replace injector.

Injected fuel volume
43 – 47 cc/15 sec. (1.45/1.51 – 1.58/1.65 US/Imp oz/15 sec.)

8) Check fuel leakage from injector nozzle. Do not operate injector for this check (but fuel pump should be at work). If fuel leaks (1) more than the following specifications, replace.

Fuel leakage
Less than 1 drop/min.



I2RH0B170013-

Fuel Filler Cap Inspection

S4RS0A1706011

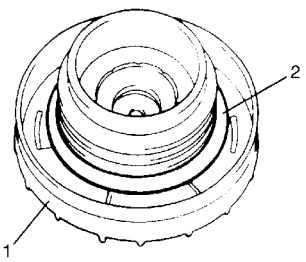
WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

Remove cap (1), and check gasket for even filler neck imprint, and deterioration or any damage. If gasket (2) is in malcondition, replace cap.

NOTE:

If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in fire and personal injury.



I2RH01170008-

Fuel Tank Inlet Valve Removal and Installation

S4RS0A1706015

WARNING:

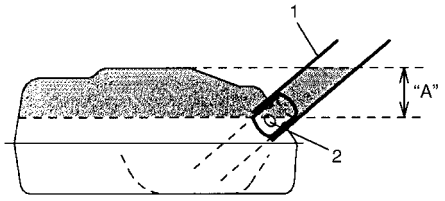
Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

Removal

1) Remove fuel filler cap.
2) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space “A” as shown in figure.

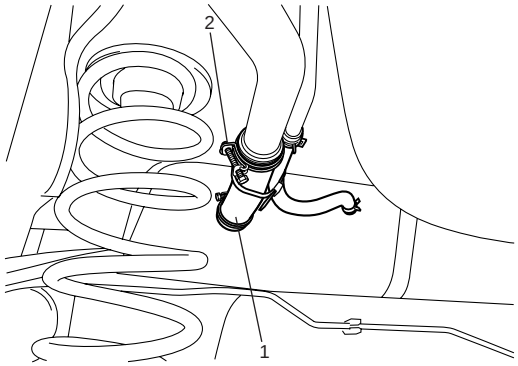
CAUTION:

Do not force pump hose into fuel tank, or pump hose may damage to fuel tank inlet valve (2).



IYSQ01170010-

3) Hoist vehicle, and remove clamp (2) and fuel filler hose (1) from fuel tank.

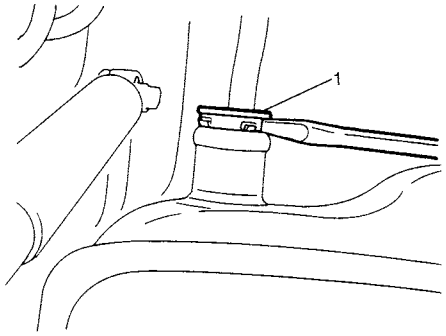


I4RS0A170007-

4) Remove fuel tank inlet valve (1) using flat head rod (2) or the like.

CAUTION:

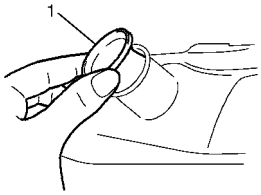
Be careful not to damage fuel tank inlet valve (1) with flat head rod (2) or the like.



I2RH0B170017-

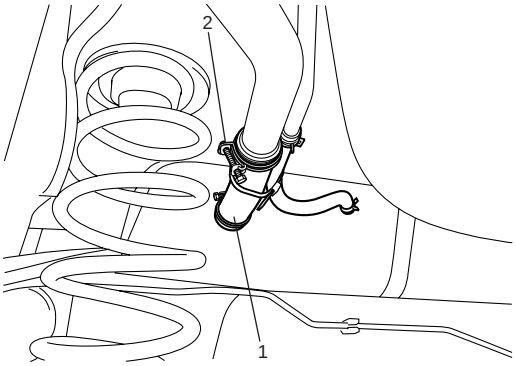
Installation

1) Install fuel tank inlet valve (1) to fuel tank.



I2RH0B170018-

2) Install fuel filler hose (1) to fuel tank and secure it with clamp (2).
For proper installation, refer to “Fuel Hose Disconnecting and Reconnecting: ”.



I4RS0A170007-

3) Lower vehicle and install fuel filler cap.

Fuel Tank Inlet Valve Inspection

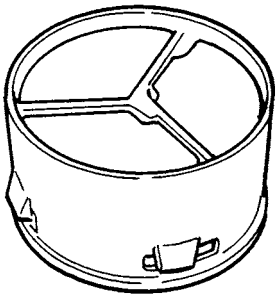
S4RS0A1706016

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

Check fuel tank inlet valve for the following.
If any damage or malfunction is found, replace.

- Damage
- Smooth opening and closing



I2RH0B170019-

Fuel Tank Removal and Installation

S4RS0A1706012

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

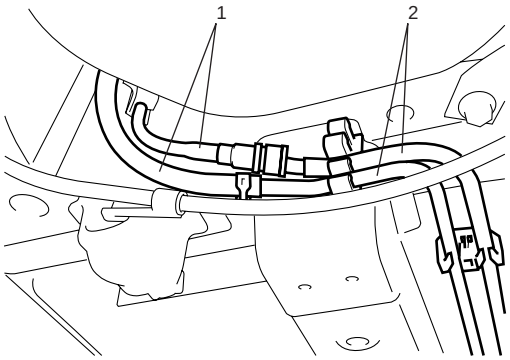
Removal

1) Relieve fuel pressure in fuel feed line according to “Fuel Pressure Relief Procedure: ”.
2) Disconnect negative cable at battery.
3) Hoist vehicle.
4) Remove exhaust center pipe.
5) Disconnect fuel filler hose and breather hose from filler neck referring to “Fuel Tank Inlet Valve Removal and Installation: ”.
6) Due to absence of fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler. Use hand operated pump device to drain fuel tank.

CAUTION:

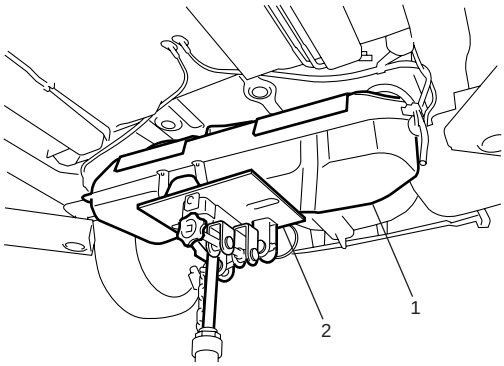
- **Do not force pump hose into fuel tank, or pump hose may damage fuel tank inlet valve.**
- **Never store fuel in an open container due to possibility of fire or explosion.**

7) Disconnect fuel pipe joint and fuel hoses (1) from fuel pipes (2) referring to “Fuel Hose Disconnecting and Reconnecting: ”.



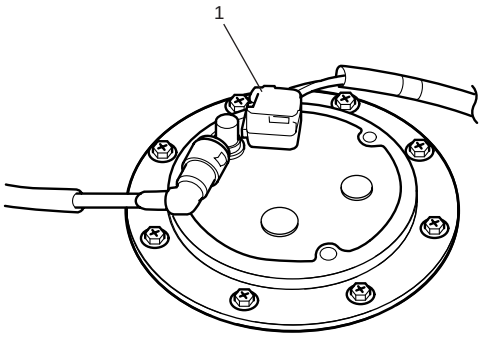
I4RS0A170008-

8) Support fuel tank (1) with jack (2) and remove its mounting bolts.



I4RS0A170009-

9) Lower fuel tank a little as to disconnect wire harness at connector (1), then remove fuel tank.



I4RS0A170010-

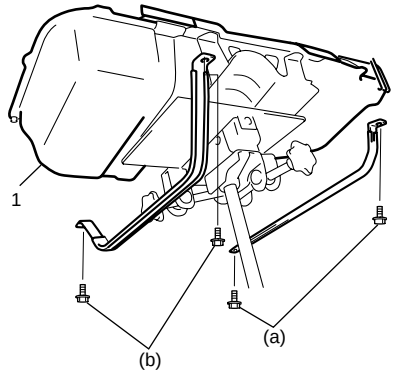
Installation

CAUTION:

- **When connecting joint, clean outside surfaces of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.**
- **Never let the fuel hoses touch the ABS sensor harness (if equipped).**

1) If parts have been removed from fuel tank, install them before installing fuel tank to vehicle.
2) Raise fuel tank (1) with jack and connect fuel pump connector and gauge and clamp wire harness.
3) Install fuel tank to vehicle.

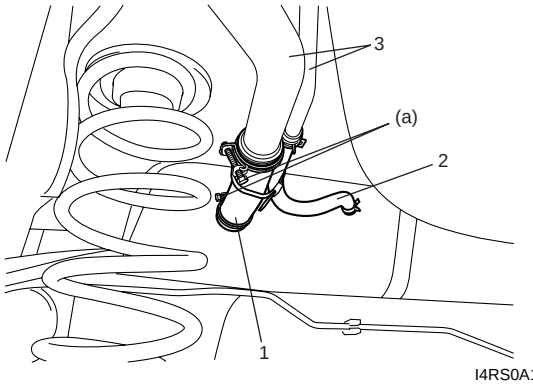
Tightening torque
Fuel tank bolt (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)



I4RS0A170011-

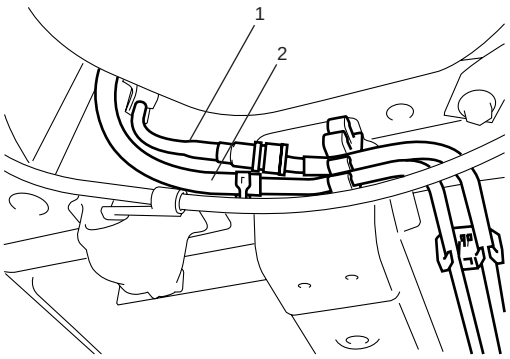
4) Connect fuel filler hose (1) and breather hose (2) to filler neck (3) as shown in figure, and clamp them securely.

Tightening torque
Fuel filler hose clamp (a): 2 N·m (0.2 kg-m, 1.5 lb-ft)



I4RS0A170012-

5) Connect fuel feed hose (1) and vapor hose (2) to each pipe as shown in figure, and clamp them securely.
6) Install exhaust center pipe referring to “Exhaust Pipe and Muffler Removal and Installation: in Section 1K”.



I4RS0A170013-

7) Connect negative cable at battery.
8) With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Tank Inspection

S4RS0A1706013

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump assembly gaskets for leaks, visually inspect fuel tank for leaks and damage.
Replace any damaged or malconditioned parts.

Fuel Tank Purging Procedure

S4RS0A1706014

WARNING:

- **Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.**
- **This purging procedure will not remove all fuel vapor.**
  Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.

CAUTION:

Never remain water in fuel tank after washing, or fuel tank inside will get corrosion.

The following procedure are used for purging fuel tank.

1) After removing fuel tank, remove all hoses, pipes and fuel pump assembly from fuel tank.
2) Drain all remaining fuel from tank.
3) Place fuel tank to flushing area.
4) Fill tank with warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean. Replace tank if its inside is rusty.
5) Completely flush out remaining water after washing.

Fuel Pump On-Vehicle Inspection

S4RS0A1706017

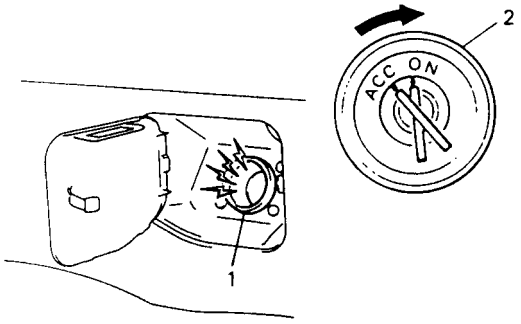
WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

NOTE:

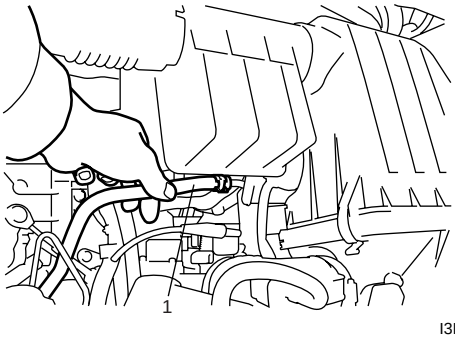
The fuel pressure regulator is incorporated with the fuel pump assembly so individual inspection of it is impossible.

1) Remove filler cap and turn ON ignition switch (2). Then fuel pump operating sound should be heard from fuel filler (1) for about 2 seconds and stop. Be sure to reinstall fuel filler cap after checking.
If the check result is not satisfactory, go to “Fuel Pump and Its Circuit Check: in Section 1A”.



IVSY01170013-

2) Turn OFF ignition switch and leave over 10 minutes as it is.
3) Fuel pressure should be felt at fuel feed hose (1) for about 2 seconds after ignition switch ON.
If fuel pressure is not felt, go to “Fuel Pressure Check: in Section 1A”.



I3RM0A170019-

Fuel Pump Assembly Removal and Installation

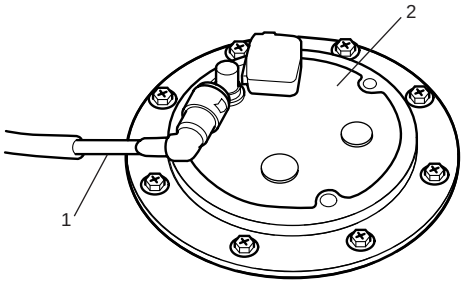
S4RS0A1706019

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

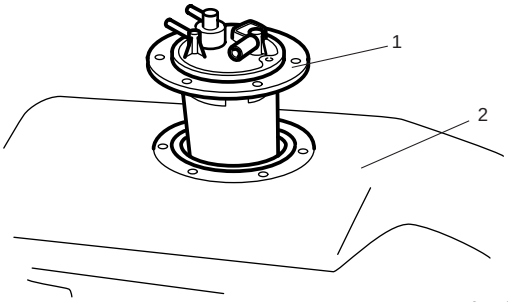
Removal

1) Remove fuel tank from vehicle. Refer to “Fuel Tank Removal and Installation: ”.
2) Disconnect fuel feed pipe (1) from fuel pump assembly (2) referring to “Fuel Hose Disconnecting and Reconnecting: ”.



I4RS0A170014-

3) Remove fuel pump assembly (1) from fuel tank (2).



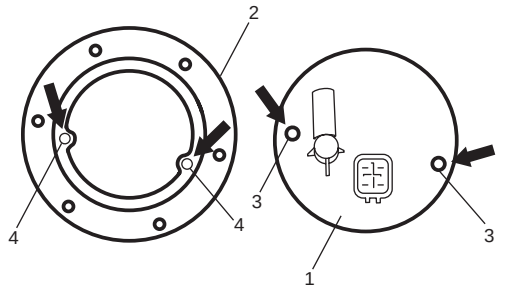
I3RM0A170021-

Installation

CAUTION:

When connecting joint, clean outside surface of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.

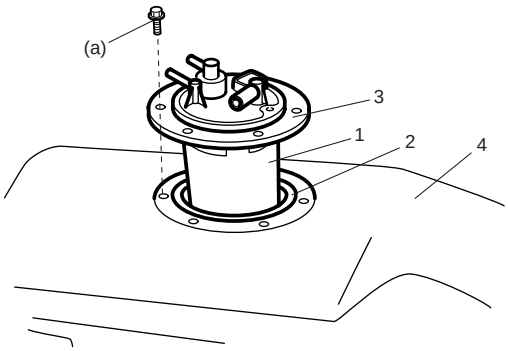
1) Clean mating surfaces of fuel pump assembly (1) and fuel tank.
2) Put plate (2) on fuel pump assembly (1) by matching the protrusion of fuel pump assembly (3) to plate hole (4) as shown.



I4RS0A170015-

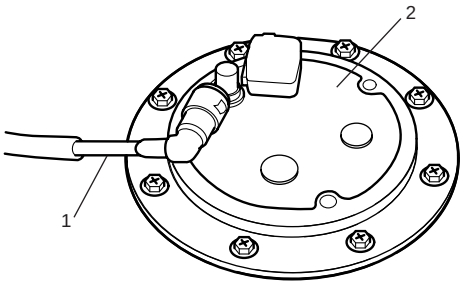
3) Install new gasket (2) and fuel pump assembly (1) with plate (3) to fuel tank (4).

Tightening torque
Fuel pump assembly bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I3RM0A170023-

4) Connect fuel feed line (1) (pipe joint) to fuel pump assembly (2).



I4RS0A170014-

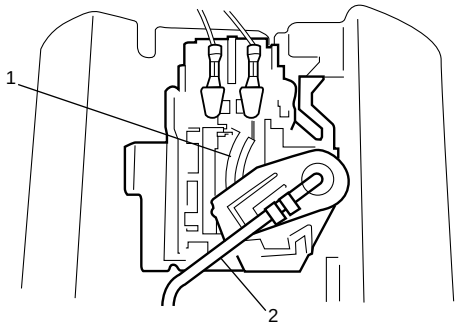
5) Install fuel tank to vehicle. Refer to “Fuel Tank Removal and Installation: ”.

Fuel Level Sensor Removal and Installation

S4RS0A1706022

CAUTION:

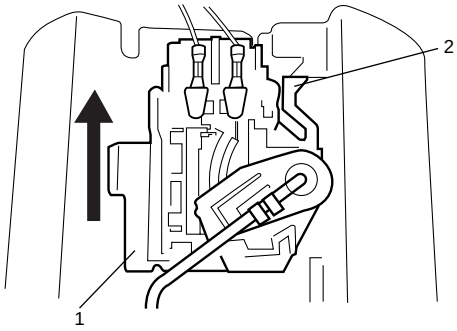
- **Do not touch resister plate (1) and deform arm (2). It may cause fuel level sensor to fail.**
- **Be very careful not to cause damage to fuel tube installed section (sealed section in bore). If it be damaged, replace it with new one, or fuel will leak from the part.**



I4RS0A170016-

Removal

1) Remove fuel pump assembly from fuel tank referring to “Fuel Pump Assembly Removal and Installation: ”.
2) Disconnect fuel level sensor connector.
3) With pressing snap-fit part (2), remove fuel level sensor (1) by sliding it in the arrow direction as shown in figure.



I4RS0A170017-

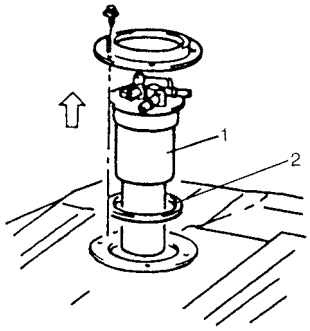
Installation

Reverse removal procedure for installation.

Fuel Pump Inspection

S4RS0A1706021

- Check fuel pump assembly for damage.
- Check fuel suction filter (1) for evidence of dirt and contamination.
  If present, replace or clean and check for presence of dirt in fuel tank.
- For electrical circuit, refer to “Fuel Pressure Check: in Section 1A”.
- For inspection of fuel level gauge (2), refer to “Fuel Level Sensor Inspection: in Section 9C”.



I3RM0A170024-

Specifications

Tightening Torque Specifications

S4RS0A1707001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Fuel delivery pipe bolt	25	2.5	18.0	☞
Fuel tank bolt	50	5.0	36.5	☞
Fuel filler hose clamp	2	0.2	1.5	☞
Fuel pump assembly bolt	11	1.1	8.0	☞

NOTE:

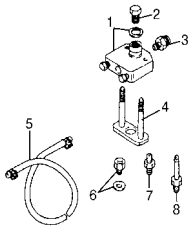
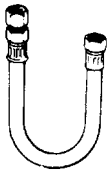
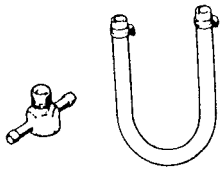
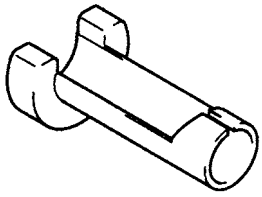
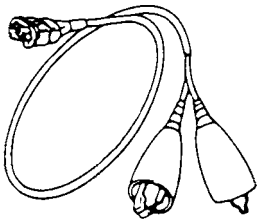
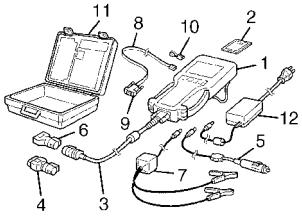
The specified tightening torque is also described in the following.
“Fuel System Components: ”
“Fuel Hose Disconnecting and Reconnecting: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A1708001

09912–57610 Injector checking tool plate ☞ 	09912–58421 Checking tool set This kit includes the following items. 1. Tool body and washer, 2. Body plug, 3. Body attachment-1, 4. Holder, 5. Return hose and clamp, 6. Body attachment-2 and washer, 7. Hose attachment-1, 8. Hose attachment-2 ☞ 
09912–58432 Fuel pressure gauge hose This tool included in fuel pressure gauge set (09912-58413). ☞ 	09912–58442 Fuel pressure gauge This tool included in fuel pressure gauge set (09912-58413). ☞
09912–58490 3-way joint & hose ☞ 	09919–47020 Quick joint remover ☞ 
09930–88530 Injector test lead ☞ 	SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ 

Ignition System

General Description

Ignition System Construction

S4RS0A1801001

The ignition system is an electronic (distributorless) ignition system. It consists of the parts as described below.

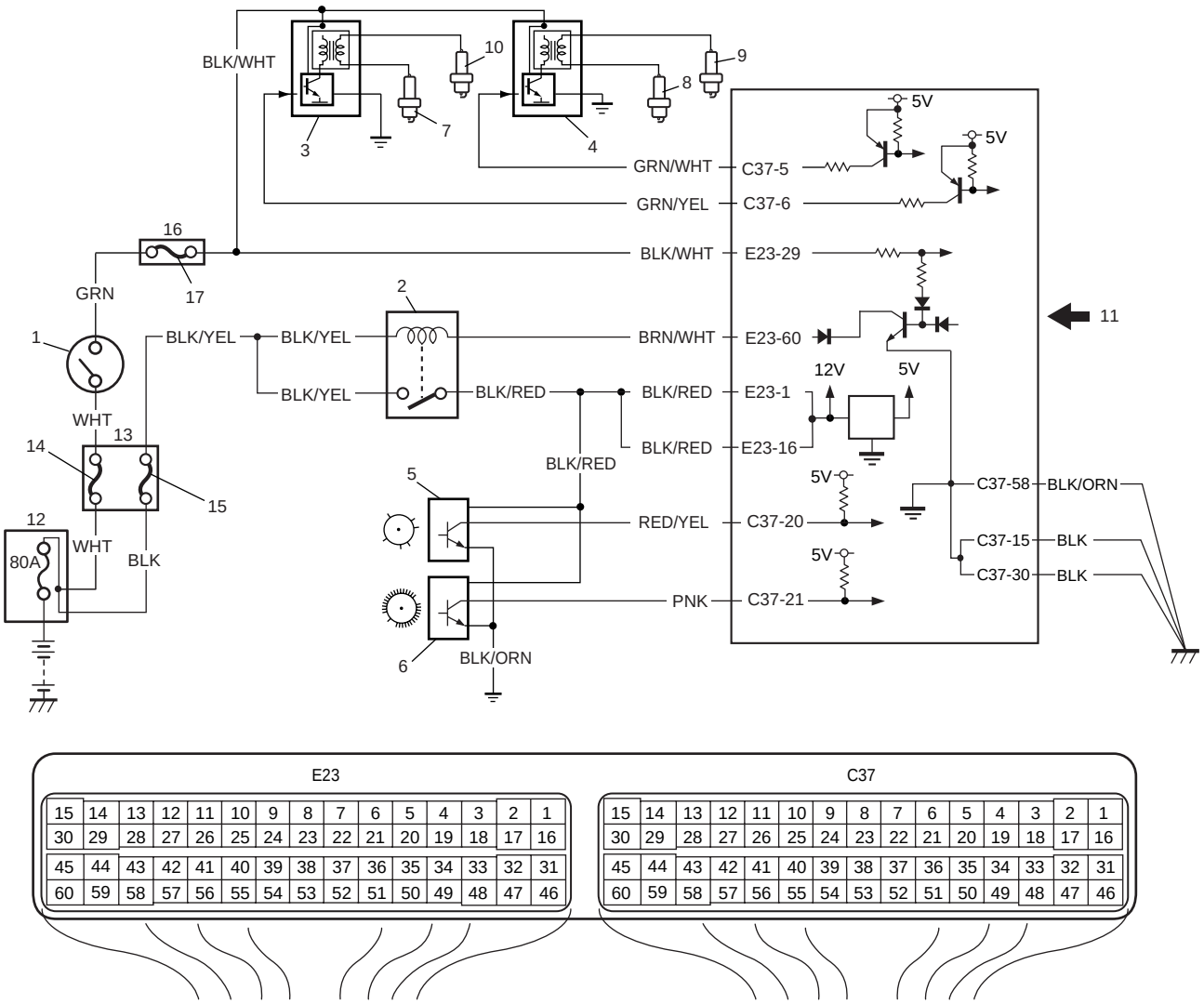
- **ECM**
  It detects the engine and vehicle conditions through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the ignitor (power unit) in the ignition coil assembly.
- **Ignition coil assembly (including an ignitor)**
  The ignition coil assembly has a built-in ignitor which turns ON and OFF the current flow to the primary coil according to the signal from ECM. When the current flow to the primary coil is turned OFF, a high voltage is induced in the secondary coil.
- **High-tension cords and spark plugs**
- **CMP sensor (Camshaft position sensor) and CKP sensor (Crankshaft position sensor)**
  Using signals from these sensors, ECM identifies the specific cylinder whose piston is in the compression stroke, detects the crank angle and adjusts initial ignition timing automatically.
- **TP sensor, ECT sensor, MAP sensor, MAF sensor, IAT sensor, knock sensor and other sensors / switches**

Although this ignition system does not have a distributor, it has two ignition coil assemblies (one is for No.1 and No.4 spark plugs and the other is for No.2 and No.3 spark plugs). When an ignition signal is sent from ECM to the ignitor in the ignition coil assembly for No.1 and No.4 spark plugs, a high voltage is induced in the secondary coil and that passes through the high-tension cords and causes No.1 and No.4 spark plugs to spark simultaneously. Likewise, when an ignition signal is sent to the ignitor in the other ignition coil assembly, No.2 and No.3 spark plugs spark simultaneously.

Schematic and Routing Diagram

Ignition System Wiring Circuit Diagram

S4RS0A1802001



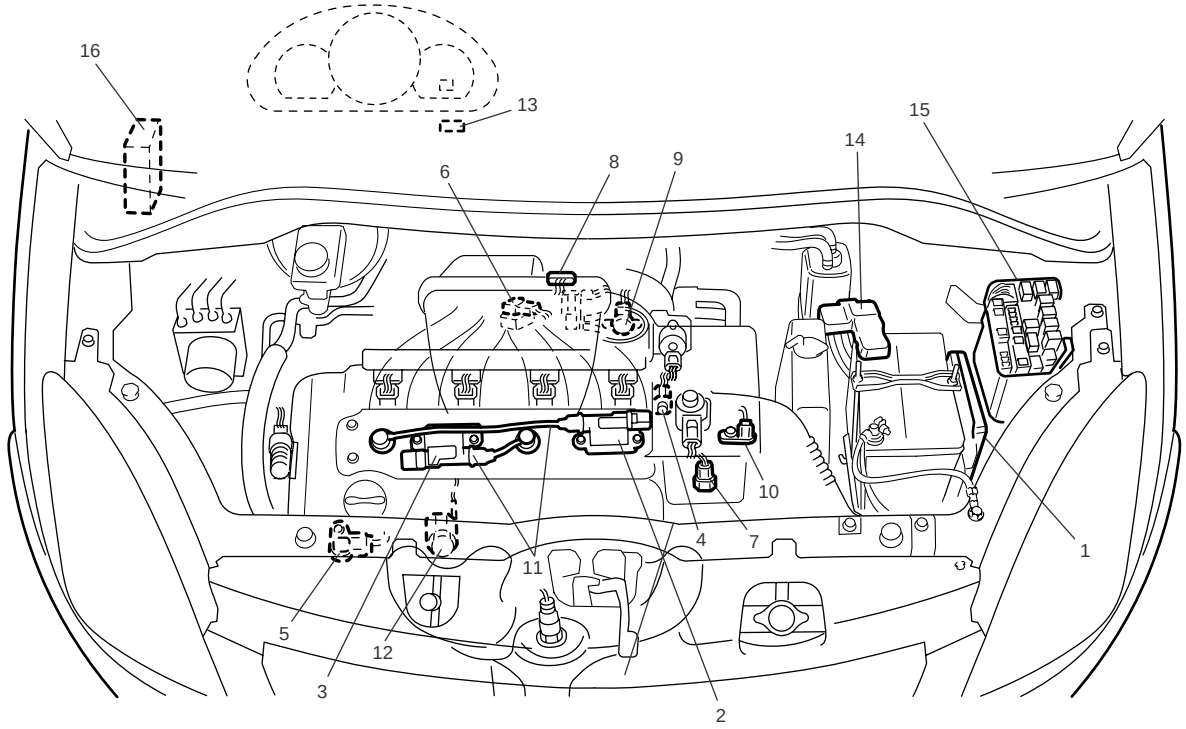
I4RS0A180001-

1. Ignition switch	7. No.1 spark plug	13. Relay box
2. Main relay	8. No.2 spark plug	14. “IG ACC” fuse
3. Ignition coil assembly for No.1 and No.4 spark plugs	9. No.3 spark plug	15. “FI” fuse
4. Ignition coil assembly for No.2 and No.3 spark plugs	10. No.4 spark plug	16. Junction block assembly
5. CMP sensor	11. Sensed information (MAP sensor, ECT sensor, MAF and IAT sensor, TP sensor, Knock sensor, VSS, Electric load signal, Engine start signal)	17. “IG COIL” fuse
6. CKP sensor	12. Main relay box	

Component Location

Ignition System Components Location

S4RS0A1803001



I4RS0A180002-

1. ECM	7. ECT sensor	13. Data link connector
2. Ignition coil assembly for No.1 and No.4 spark plugs	8. MAF and IAT sensor	14. Main relay box
3. Ignition coil assembly for No.2 and No.3 spark plugs	9. TP sensor	15. Relay box
4. CMP sensor	10. VSS	16. Junction block assembly
5. CKP sensor	11. High-tension cords	
6. MAP sensor	12. Knock sensor	

Diagnostic Information and Procedures

Ignition System Symptom Diagnosis

S4RS0A1804001

Condition	Possible cause	Correction / Reference Item
Engine cranks, but will not start or hard to start (No spark)	Blown fuse for ignition coil	*Replace.*
	Loose connection or disconnection of lead wire or high-tension cord(s)	*Connect securely.*
	Faulty high-tension cord(s)	*Replace.*
	Faulty spark plug(s)	*Replace.*
	Faulty ignition coil	*Replace ignition coil assembly.*
	Faulty CKP sensor or CKP sensor plate	*Clean, tighten or replace.*
	Faulty CMP sensor or sensor rotor tooth of camshaft	*Clean, tighten or replace.*
	Faulty ECM	*Replace.*
Poor fuel economy or engine performance	Incorrect ignition timing	*Check related sensors and CKP sensor plate.*
	Faulty spark plug(s) or high-tension cord(s)	*Adjust, clean or replace.*
	Faulty ignition coil assembly	*Replace.*
	Faulty CKP sensor or CKP sensor plate	*Clean, tighten or replace.*
	Faulty CMP sensor or sensor rotor tooth of camshaft	*Clean, tighten or replace.*
	Faulty knock sensor	*Replace.*
	Faulty ECM	*Replace.*

Reference Waveform of Ignition System

S4RS0A1804002

1) Remove ECM from its bracket with ECM connectors connected referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.
2) Oscilloscope waveform of CMP sensor and No.1/ No.4 ignition trigger signal are as shown in the figure when connecting oscilloscope between terminal “C37-20” of ECM connector and ground, and between terminal “C37-6” and ground.

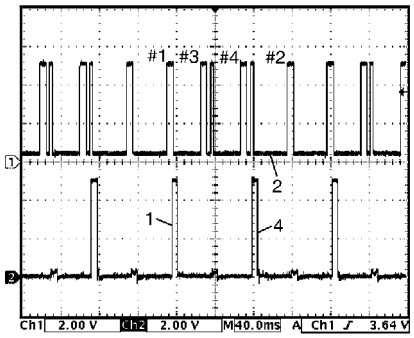
Measurement condition for waveform [A]

Measurement terminal	**CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58”**
Oscilloscope setting	**CH1: 2 V/DIV, CH2: 2 V/DIV Time: 40 ms/DIV**
Measurement condition	**After warmed up engine to normal operating temperature Engine at specified idle speed**

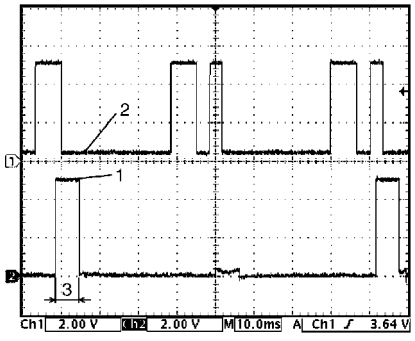
Measurement condition for waveform [B]

Measurement terminal	**CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58”**
Oscilloscope setting	**CH1: 2 V/DIV, CH2: 2 V/DIV Time: 10 ms/DIV**
Measurement condition	**After warmed up engine to normal operating temperature Engine at specified idle speed**

[A]



[B]



I3RB0A180003-

[A]:	Oscilloscope waveforms at specified idle speed
[B]:	Detail waveforms at specified idle speed
1.	No.1 ignition trigger signal
2.	CMP sensor signal
3.	Primary coil current flow time
4.	No.4 ignition trigger signal

Ignition System Check

S4RS0A1804003

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: in Section 1A".
2	**Ignition spark test** 1) Check all spark plugs for condition and type referring to "Spark Plug Inspection: ". 2) If OK, perform ignition spark test referring to "Ignition Spark Test: ". *Is spark emitted from all spark plugs?*	Go to Step 11.	Go to Step 3.
3	**DTC check** 1) Perform DTC check referring to "DTC Check: in Section 1A". *Is DTC stored in ECM?*	Go to applicable DTC diag. flow.	Go to Step 4.
4	**Electrical connection check** 1) Check ignition coil assemblies and high-tension cords for electrical connection. *Are they connected securely?*	Go to Step 5.	Connect securely.
5	**High-tension cords check** 1) Check high-tension cord for resistance referring to "High-Tension Cord Inspection: ". *Is check result satisfactory?*	Go to Step 6.	Replace high-tension cord(s).
6	**Ignition coil assembly power supply and ground circuit check** 1) Check ignition coil assembly power supply and ground circuits for open and short. *Are circuits in good condition?*	Go to Step 7.	Repair or replace.
7	**Ignition coil assembly check** 1) Check ignition coil for resistance referring to "Ignition Coil Assembly (Including ignitor) Inspection: ". *Is check result satisfactory?*	Go to Step 8.	Replace ignition coil assembly.
8	**CKP sensor check** 1) Check CKP sensor referring to "Crankshaft Position (CKP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	Go to Step 9.	Tighten CKP sensor bolt, replace CKP sensor or CKP sensor plate.
9	**CMP sensor check** 1) Check CMP sensor referring to "Camshaft Position (CMP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	Go to Step 10.	Tighten CMP sensor bolt, replace CMP sensor or intake camshaft.
10	**Ignition trigger signal circuit check** 1) Check ignition trigger signal wire for open, short and poor connection. *Is circuit in good condition?*	Go to Step 11.	Repair or replace.
11	**A known-good ignition coil assembly substitution** 1) Substitute a known-good ignition coil assembly and then repeat Step 2. *Is check result of Step 2 satisfactory?*	Go to Step 12.	Substitute a known-good ECM and then repeat Step 2.

Step	Action	Yes	No
12	**Knock sensor check** 1) Confirm that knock sensor circuit is in good condition referring to “DTC P0327 / P0328: Knock Sensor Circuit Low / High: in Section 1A” 2) Check oscilloscope waveform of knock sensor signal referring to “Reference waveform No.20” and “Reference waveform No.21” under “Inspection of ECM and Its Circuits: in Section 1A” *Is check result satisfactory?*	Go to Step 13.	Substitute a known-good knock sensor and recheck.
13	**Ignition timing check** 1) Check initial ignition timing and ignition timing advance referring to “Ignition Timing Inspection: ”. *Is check result satisfactory?*	System is in good condition.	Check CMP sensor, CMP sensor rotor tooth of camshaft, CKP sensor, CKP sensor plate and/or input signals related to this system.

Ignition Spark Test

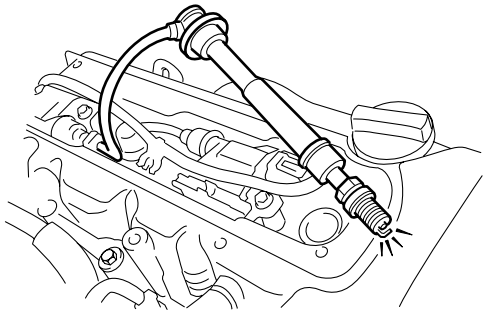
S4RS0A1804004

1) Remove air cleaner assembly with air intake pipe.
2) Disconnect all injector couplers from injectors.

WARNING:

Without disconnection of injector couplers, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.

3) Remove spark plug and check it for condition and type referring to “Spark Plug Inspection: ”.
4) If OK, connect ignition coil coupler to ignition coil assembly and connect spark plug to ignition coil assembly or high-tension cord. Ground spark plug.
5) Crank engine and check if each spark plug sparks.



I4RS0A180006-

6) If no spark is emitted, inspect the related parts as described in “Ignition System Symptom Diagnosis: ”.

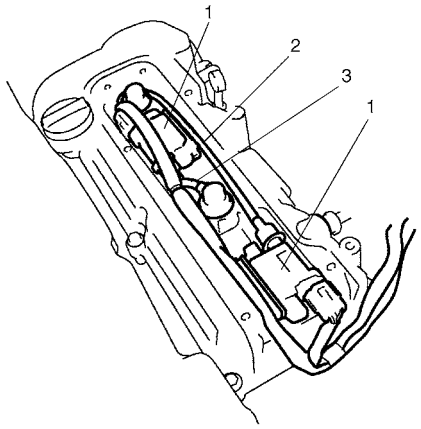
Repair Instructions

High-Tension Cord Removal and Installation

S4RS0A1806001

Removal

1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
2) Disconnect No.1 cylinder (2) and No.3 cylinder (3) high-tension cords from ignition coil assemblies (1) while gripping each cap.



I4RS0A180003-

3) Pull out high-tension cords from spark plugs while gripping each cap.

CAUTION:

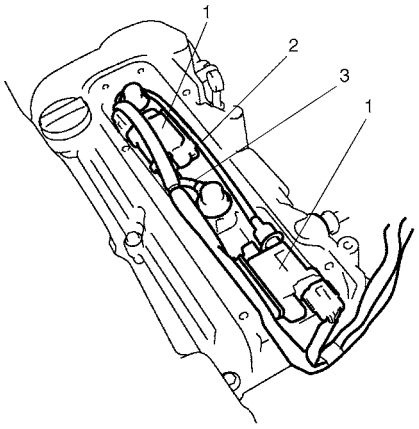
- **Removal of high-tension cords together with clamps will be recommended so as not to damage their inside wire (resistive conductor).**
- **For the same reason, pull out each connection by gripping cap portion.**

Installation

1) Install No.1 cylinder (2) and No.3 cylinder (3) high-tension cords to spark plugs and ignition coil assemblies (1) while gripping each cap.

CAUTION:

- **Never attempt to use metal conductor high-tension cords as replacing parts.**
- **Insert each cap portion fully when installing high-tension cords.**



I4RS0A180004-

High-Tension Cord Inspection

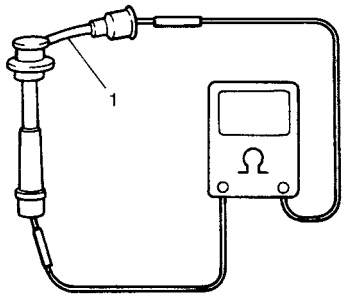
S4RS0A1806002

Measure resistance of high-tension cord (1) by using ohmmeter.
If resistance exceeds specification, replace high-tension cord(s).

High-tension cord resistance

No.1 cylinder high-tension cord resistance: 1.4 – 4.0 kΩ

No.3 cylinder high-tension cord resistance: 0.6 – 2.0 kΩ



I2RH0B180005-

Spark Plug Removal and Installation

S4RS0A1806003

Removal

1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
2) Pull out high-tension cords by gripping their caps and then remove ignition coil assemblies referring to “Ignition Coil Assembly (Including ignitor) Removal and Installation: ”.
3) Remove spark plugs.

Installation

1) Install spark plugs and tighten them to specified torque.

   Tightening torque
   Spark plug: 25 N·m (2.5 kg-m, 18.0 lb-ft)

2) Install ignition coil assemblies referring to “Ignition Coil Assembly (Including ignitor) Removal and Installation: ”.
3) Install high-tension cords securely by gripping their caps.
4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.

Spark Plug Inspection

S4RS0A1806004

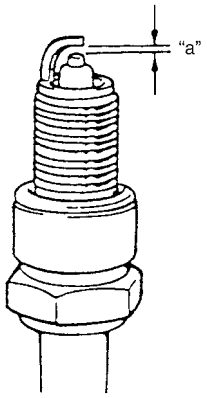
Inspect spark plug for:

- Electrode wear
- Carbon deposits
- Insulator damage

If any abnormality is found, adjust air gap, clean with spark plug cleaner or replace them with new plugs.

Spark plug air gap
“a”: 1.0 – 1.1 mm (0.040 – 0.043 in.)

Spark plug type
NGK: BKR6E-11
DENSO: K20PR-U11



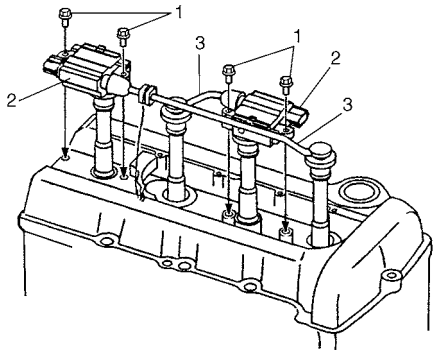
IYSQ01181012-

Ignition Coil Assembly (Including ignitor) Removal and Installation

S4RS0A1806005

Removal

1) Disconnect negative cable at battery.
2) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
3) Disconnect ignition coil coupler.
4) Disconnect high-tension cord (3) from ignition coil assembly (2).
5) Remove ignition coil bolts (1) and then pull out ignition coil assembly.



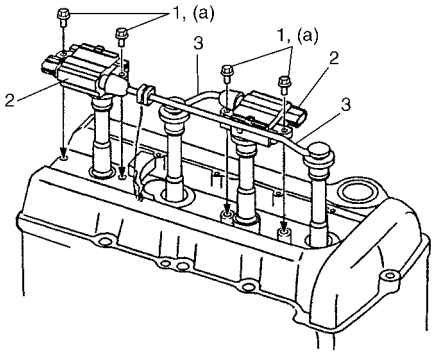
I2RH0B180006-

Installation

1) Install ignition coil assembly (2).
2) Tighten ignition coil bolts (1) to specified torque, and then connect ignition coil coupler.

   Tightening torque
   Ignition coil bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

3) Install high-tension cord (3) to ignition coil assembly while gripping its cap.



I3RM0A180004-

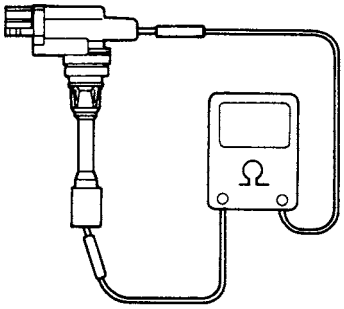
4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.
5) Connect negative cable to battery.

Ignition Coil Assembly (Including ignitor) Inspection

S4RS0A1806006

Measure secondary coil for resistance.
If resistance is out of specification, replace ignition coil assembly.

Secondary coil resistance
7.6 – 10.2 kΩ at 20 °C, 68 °F



I2RH0B180007-

Ignition Timing Inspection

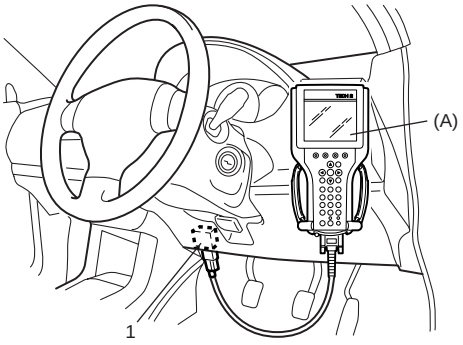
S4RS0A1806007

NOTE:

- **Ignition timing is not adjustable. If ignition timing is out of specification, check system related parts.**
- **Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake.**

1) Connect scan tool to DLC (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



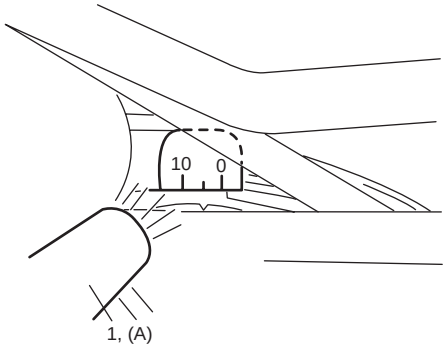
I4RS0A180005-

2) Start engine and warm it up to normal operating temperature.
3) Make sure that all of electrical loads except ignition are switched off.
4) Check to be sure that idle speed is within specification referring to "Idle Speed / Idle Air Control (IAC) Duty Inspection: in Section 1A".
5) Fix ignition timing by using "Fixed Spark" of "Misc Test" mode on scan tool.
6) Set timing light (1) to high-tension cord for No.1 cylinder and check that ignition timing is within specification.

Initial ignition timing (fixed with SUZUKI scan tool)
5 ± 3° BTDC (at specified idle speed)

Ignition order
1 – 3 – 4 – 2

Special tool
(A): 09930–76420



I3RB0A180004-

7) If ignition timing is out of specification, check the followings.
   - CKP sensor
   - CKP sensor plate
   - TP sensor
   - CMP sensor
   - CMP sensor rotor tooth of camshaft
   - VSS
   - Timing chain cover installation
8) After checking initial ignition timing, release ignition timing fixation by using scan tool.
9) With engine idling (throttle opening at closed position and vehicle stopped), check that ignition timing is about 3° – 13° BTDC. (Constant variation within a few degrees from 3° – 13° indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
   If the check results are not satisfactory, check CKP sensor and ECM.

Specifications

Tightening Torque Specifications

S4RS0A1807001

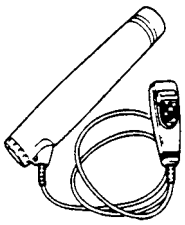
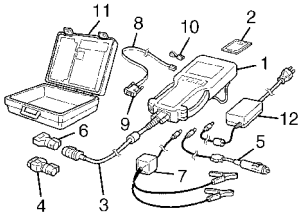
Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Spark plug	25	2.5	18.0	☞
Ignition coil bolt	10	1.0	7.5	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A1808001

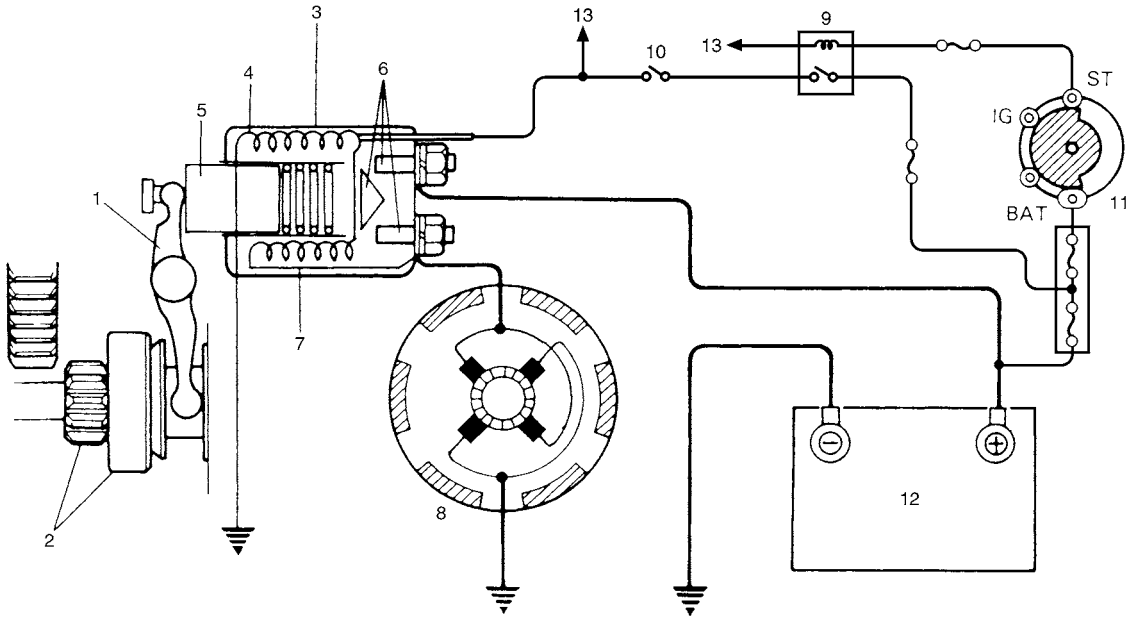
09930–76420 Timing-light (dry cell type) ☞		SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞	

Starting System

Schematic and Routing Diagram

Cranking System Circuit Diagram

S4RS0A1902001



I4RS0A190001-

1. Pinion drive lever	6. Magnetic switch contacts	11. Ignition & Starter switch
2. Pinion & Over-running clutch	7. Pull-in coil	12. Battery
3. Magnetic switch	8. Starting motor	13. To ECM
4. Hold-in coil	9. Starting motor control relay	
5. Plunger	10. A/T: Transmission range switch (shift lever switch)	

Diagnostic Information and Procedures

Cranking System Symptom Diagnosis

S4RS0A1904001

Possible symptoms due to starting system trouble would be as follows:

- Starting motor does not run (or runs slowly)
- Starting motor runs but fails to crank engine
- Abnormal noise is heard

Proper diagnosis must be made to determine exactly where the cause of each trouble lies in battery, wiring harness, (including starting motor switch), starting motor or engine.
Do not remove motor just because starting motor does not run. Check the following items and narrow down scope of possible causes.

1) Condition of trouble
2) Tightness of battery terminals (including ground cable connection on engine side) and starting motor terminals
3) Discharge of battery
4) Mounting of starting motor

Condition	Possible cause	Correction / Reference Item
Motor not running (No operating sound of magnetic switch)	Shift lever switch is not in P or N, or not adjusted (A/T)	*Shift in P or N, or adjust switch. (A/T)*
	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Poor contact in battery terminal connection	*Retighten or replace.*
	Loose grounding cable connection	*Retighten.*
	Fuse set loose or blown off	*Tighten or replace.*
	Poor contacting action of ignition switch and magnetic switch	*Replace.*
	Lead wire coupler loose in place	*Retighten.*
	Open-circuit between ignition switch and magnetic switch	*Repair.*
	Open-circuit in pull-in coil	*Replace magnetic switch.*
	Brushes are seating poorly or worn down	*Repair or replace.*
	Poor sliding of plunger and/or pinion	*Repair.*
	Faulty starting motor control relay	*"Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: in Section 1C".*
	Faulty ECM and its circuit	*"Inspection of ECM and Its Circuits: in Section 1A".*
Motor not running (Operating sound of magnetic switch heard)	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Loose battery cable connections	*Retighten.*
	Burnt main contact point, or poor contacting action of magnetic switch	*Replace magnetic switch.*
	Brushes are seating poorly or worn down	*Repair or replace.*
	Weakened brush spring	*Replace.*
	Burnt commutator	*Replace armature.*
	Layer short-circuit of armature	*Replace.*
	Crankshaft rotation obstructed	*Repair.*
Starting motor running but too slow (small torque) (If battery and wiring are satisfactory, inspect starting motor)	Insufficient contact of magnetic switch main contacts	*Replace magnetic switch.*
	Layer short-circuit of armature	*Replace.*
	Disconnected, burnt or worn commutator	*Repair commutator or replace armature.*
	Worn brushes	*Replace brush.*
	Weakened brush springs	*Replace spring.*
	Burnt or abnormally worn end bush	*Replace bush.*
Starting motor running, but not cranking engine	Worn pinion tip	*Replace over-running clutch.*
	Poor sliding of over-running clutch	*Repair.*
	Over-running clutch slipping	*Replace over-running clutch.*
	Worn teeth of ring gear	*Replace flywheel (M/T) or drive plate (A/T).*
Noise	Abnormally worn bush	*Replace bush.*
	Worn pinion or worn teeth of ring gear	*Replace over-running clutch, flywheel (M/T) or drive plate (A/T).*
	Poor sliding of pinion (failure in return movement)	*Repair or replace.*
	Worn internal or planetary gear teeth	*Replace.*
	Lack of oil in each part	*Lubricate.*

Condition	Possible cause	Correction / Reference Item
Starting motor does not stop running	Fused contact points of magnetic switch	*Replace magnetic switch.*
	Short-circuit between turns of magnetic switch coil (layer short-circuit)	*Replace magnetic switch.*
	Failure of returning action in ignition switch	*Replace.*

Cranking System Test

S4RS0A1904002

CAUTION:

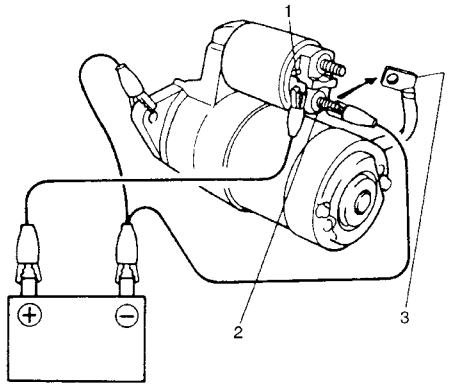
Each test must be performed within 3 – 5 seconds to avoid coil from burning.

Pull-In Test

Connect battery to the magnetic switch as shown.
Check that plunger and pinion move outward.
If plunger and pinion don't move, replace the magnetic switch.

NOTE:

Before testing, disconnect lead wire from terminal "M" (2).

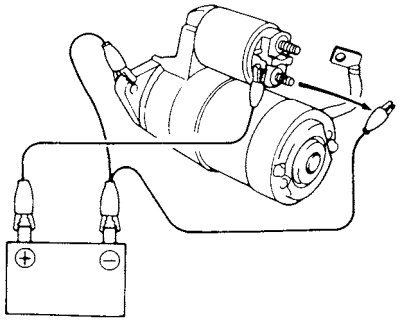


I2RH01190002-

1.	Terminal "S"
3.	Lead wire (switch to motor)

Hold-In Test

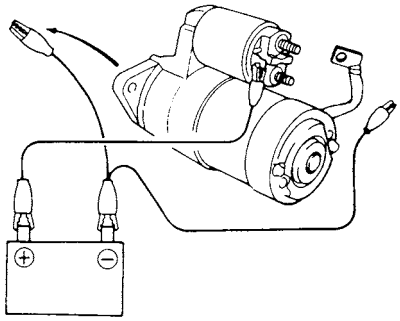
While connected as the figure with plunger out, disconnect negative lead from terminal "M".
Check that plunger and pinion remain out.
If plunger and pinion return inward, replace the magnetic switch.



I2RH01190003-

Plunger and Pinion Return Test

Disconnect negative lead from starting motor body.
Check that plunger and pinion return inward.
If plunger and pinion don't return, replace the magnetic switch.

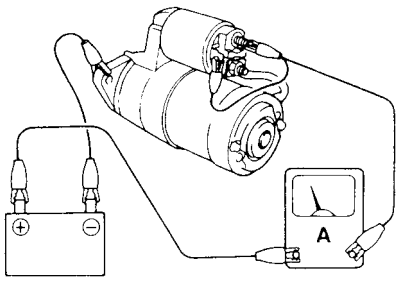


I2RH01190004-

No-Load Performance Test

Connect battery and ammeter to starter as shown.
Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter indicates specified current.

Specified current (No-load performance test)
90 A MAX. at 11 V

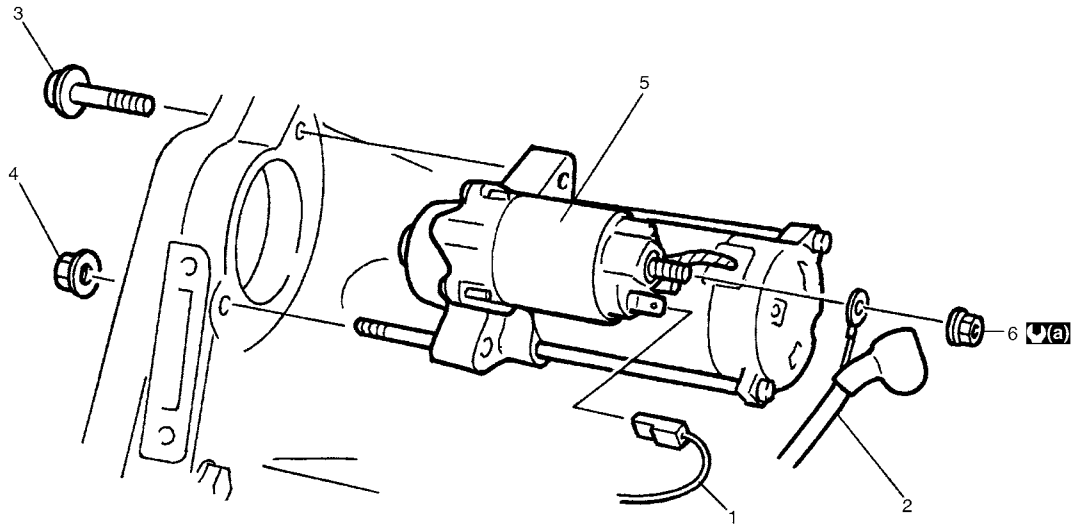


I2RH01190005-

Repair Instructions

Starting Motor Dismounting and Remounting

S4RS0A1906001



I4RS0A190002-

(a) : 9.8 N·m (0.98 kg-m, 7.0 lb-ft)

Dismounting

1) Disconnect negative (–) battery lead at battery.
2) Disconnect magnetic switch lead wire (1) and battery cable (2) from starting motor terminals.
3) Detach shift & select control cable bracket from transaxle. (M/T model only)
4) Remove starting motor mount bolt (3) and nut (4).
5) Remove starting motor (5).

Remounting

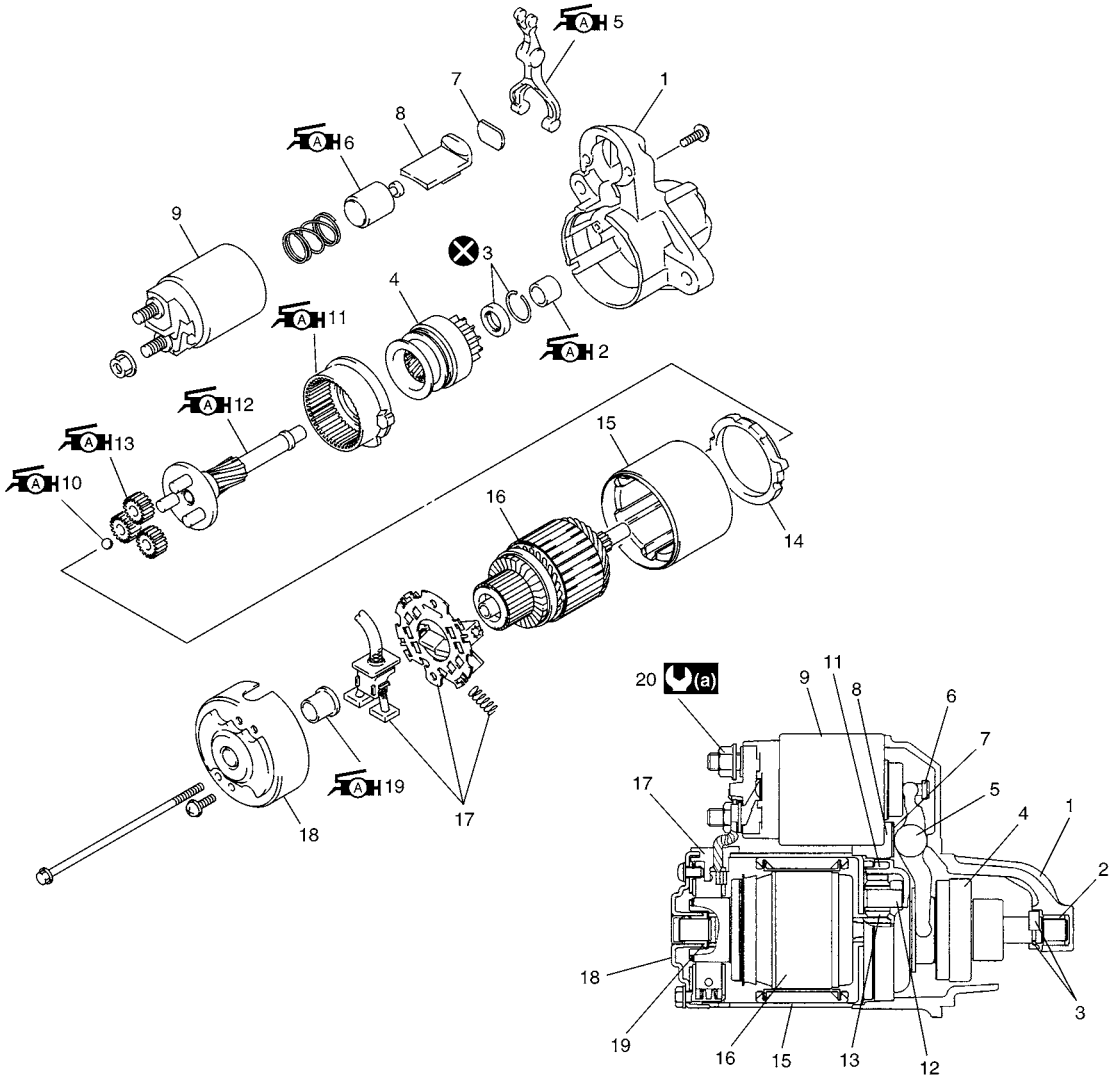
Reverse the dismounting procedure noting the following.

- Tighten battery cable nut (6) to specified torque.

Tightening torque
Starting motor battery cable nut (a): 9.8 N·m (0.98 kg-m, 7.0 lb-ft)

Starting Motor Components

S4RS0A1906002



I4RS0A190003-

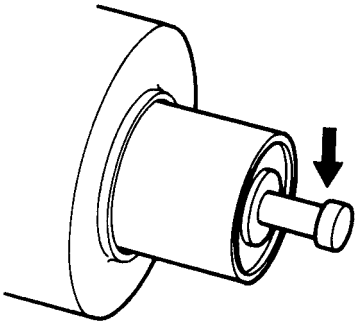
1. Front housing	8. Seal rubber	15. Yoke	⊗ : Do not reuse.
2. Bush	9. Magnetic switch	16. Armature	A H : Apply grease 99000-25010 to sliding surface of each part.
3. Pinion stop ring	10. Ball	17. Brush assembly	
4. Over-running clutch	11. Internal gear	18. Rear bracket	
5. Lever	12. Planetary carrier shaft	19. Rear bush	
6. Plunger	13. Planetary gear	20. Starting motor battery cable nut	
7. Plate	14. Packing	(a) : 9.8 N·m (0.98 kg-m, 7.0 lb-ft)	

Starting Motor Inspection

S4RS0A1906003

Plunger

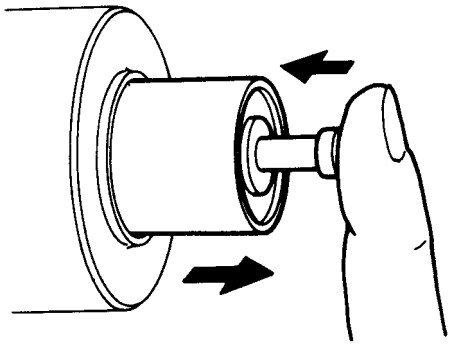
Inspect plunger for wear. Replace if necessary.



I2RH01190008-

Magnetic Switch

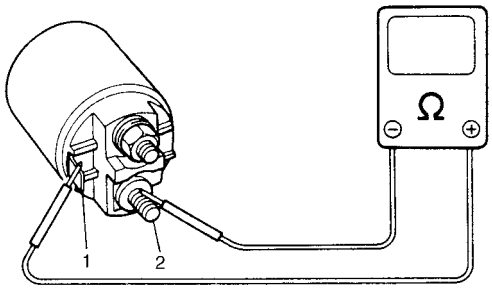
Push in plunger and release it. The plunger should return quickly to its original position. Replace if necessary.



I2RH01190009-

Pull-in coil open circuit test

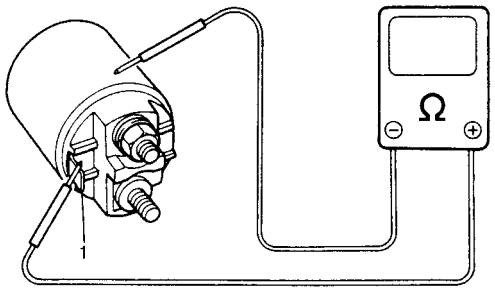
Check for continuity across magnetic switch “S” terminal (1) and “M” terminal (2). If no continuity, coil is open and should be replaced.



I2RH01190010-

Hold-in coil open circuit test

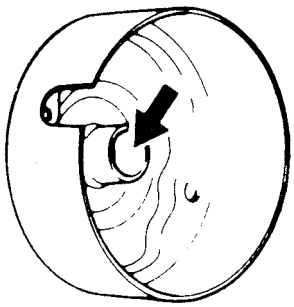
Check for continuity across magnetic switch “S” terminal (1) and coil case. If no continuity, coil is open and should be replaced.



I2RH01190011-

Rear Bracket Bush

Inspect bush for wear or damage. Replace if necessary.

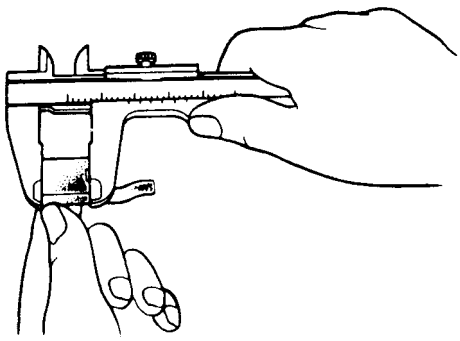


I2RH01190012-

Brush

- Check brushes for wear.
  Measure length of brushes and if below the limit, replace the brush.

  Brush length
  Standard: 12.3 mm (0.48 in.)
  Limit: 7.0 mm (0.28 in.)



I2RH01190013-

- Install brushes to each brush holder and check for smooth movement.

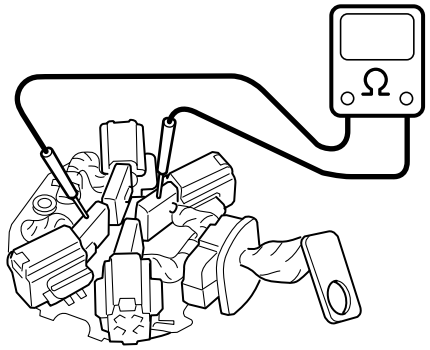
Spring

Inspect brush springs for wear, damage or other abnormal conditions. Replace if necessary.

Brush spring tension
Standard: 2.2 kg (4.85 lb)
Limit: 0.6 kg (1.33 lb)

Brush Holder

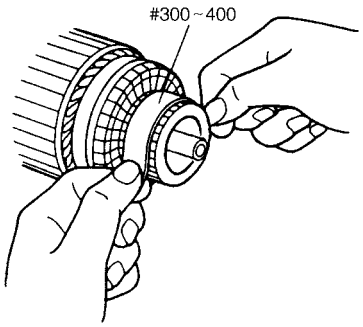
- Check movement of brush in brush holder. If brush movement within brush holder is sluggish, check brush holder for distortion and sliding faces for contamination.
  Clean or correct as necessary.
- Check for continuity across insulated brush (positive side) and grounded brush (negative side).
  If continuity exists, brush holder is grounded due to defective insulation and should be replaced.



I4RS0A190004-

Armature

- Inspect commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.



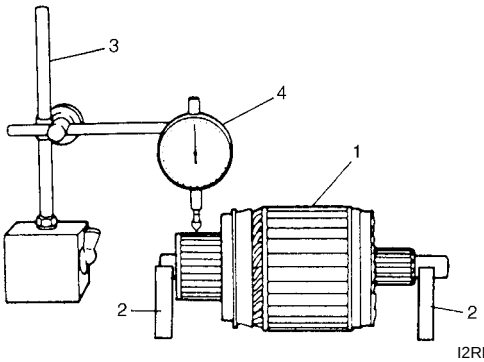
I2RH01190015-

- Check commutator for uneven wear with armature (1) supported on V-blocks (2). If deflection of dial gauge (4) pointer exceeds limit, repair or replace.

NOTE:

The following specification presupposes that the armature is free from bend. Bent armature must be replaced.

Commutator out of round
Standard: 0.05 mm (0.002 in.) or less
Limit: 0.4 mm (0.016 in.)

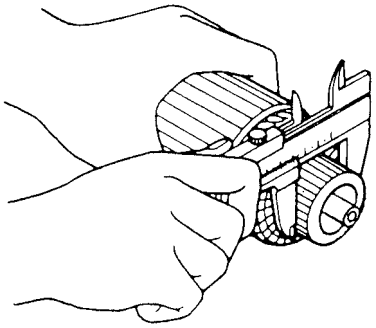


I2RH01190016-

3. Magnetic stand

- Inspect the commutator for wear. If diameter is below limit, replace the armature.

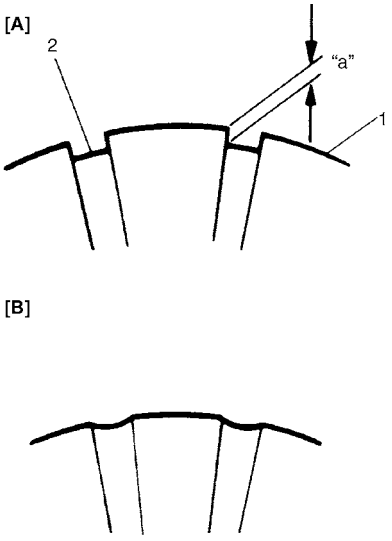
Commutator outside diameter
Standard: 29.4 mm (1.16 in.)
Limit: 28.8 mm (1.14 in.)



I2RH01190017-

- Inspect the commutator (1) for insulator (2) depth. Correct or replace if below limit.

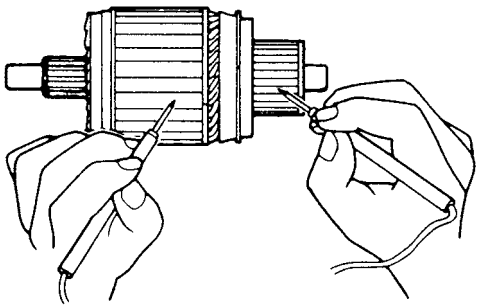
Commutator insulator depth “a”
Standard: 0.4 – 0.6 mm (0.016 – 0.023 in.)
Limit: 0.2 mm (0.008 in.)



I3RH0A190005-

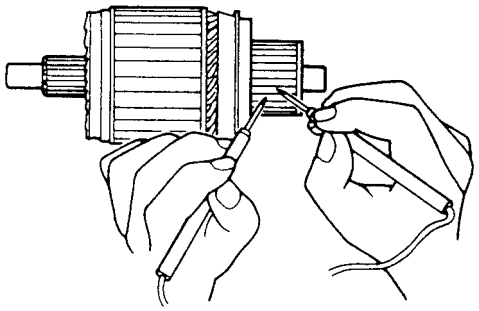
[A]: Correct
[B]: Incorrect

- Check the commutator and armature core. If there is continuity, the armature is grounded and must be replaced.



I2RH01190019-

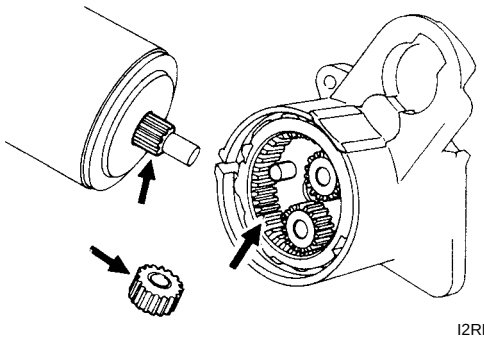
- Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and the armature must be replaced.



I2RH01190020-

Gears

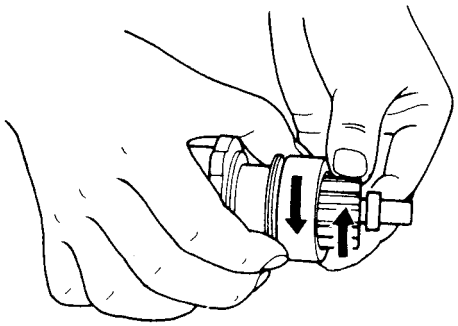
Inspect the internal gear and the planetary gears for wear, damage or other abnormal conditions. Replace if necessary.



I2RH01190021-

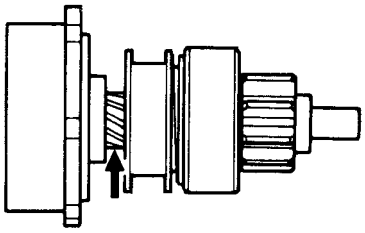
Pinion and Over-Running Clutch

- Inspect the pinion for wear, damage or other abnormal conditions.
  Check that clutch locks up when turned in direction of drive and rotates smoothly in reverse direction.
  Replace if necessary.



I2RH01190022-

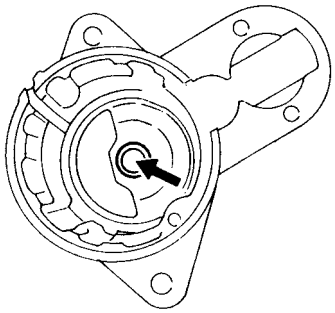
- Inspect the spline teeth for wear or damage. Replace if necessary.
  Inspect the pinion for smooth movement.



I2RH01190023-

Front Housing Bush

Inspect the bush for wear or damage. Replace if necessary.



I2RH01190024-

Specifications

Cranking System Specifications

S4RS0A1907002

Voltage			12 volts	
Output			1.2 kW	
Rating			30 seconds	
Direction of rotation			Clockwise as viewed from pinion side	
Brush length			Standard: 12.3 mm (0.48 in.)	Limit: 7.0 mm (0.28 in.)
Number of pinion teeth			8	
Performance		Condition	Guarantee	
Around at 20 °C (68 °F)	No load characteristic	11.0 V	90 A maximum 2370 r/min minimum	
	Load characteristic	7.5 V 300 A	10.65 N·m (1.065 kg-m, 7.70 lb-ft) minimum 840 r/min minimum	
	Locked characteristic	4.0 V	780 A maximum 20 N·m (2.0 kg-m, 14.5 lb-ft) minimum	
	Magnetic switch operating voltage		8 volts maximum	

Tightening Torque Specifications

S4RS0A1907001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Starting motor battery cable nut	9.8	0.98	7.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Starting Motor Dismounting and Remounting: ”
“Starting Motor Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”

Special Tools and Equipment

Recommended Service Material

S4RS0A1908001

NOTE:

Required service material is also described in the following.
“Starting Motor Components: ”

Charging System

General Description

Battery Description

S4RS0A1A01001

The battery has three major functions in the electrical system.

- It is a source of electrical energy for cranking the engine.
- It acts as a voltage stabilizer for the electrical system.
- It can, for a limited time, provide energy when the electrical load exceeds the output of the generator.

Carrier and Hold-Down

The battery carrier should be in good condition so that it will support the battery securely and keep it level. Before installing the battery, the battery carrier and hold-down clamp should be clean and free from corrosion and make certain there are no parts in carrier.
To prevent the battery from shaking in its carrier, the hold-down bolts should be tight enough but not over-tightened.

Electrolyte Freezing

The freezing point of electrolyte depends on its specific gravity. Since freezing may ruin a battery, it should be protected against freezing by keeping it in a fully charged condition. If a battery is frozen accidentally, it should not be charged until it is warmed.

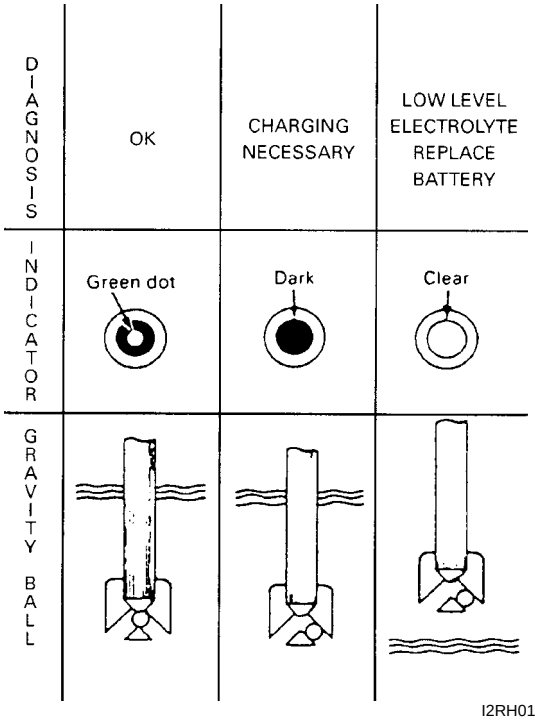
Sulfation

If the battery is allowed to stand for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. “Sulfation” means the result as well as the process of that reaction. Such a battery can be revived by very slow charging and may be restored to usable condition but its capacity is lower than before.

Built-In Indicator (If Equipped)

The battery has a built-in temperature compensated indicator in the top of the battery. This indicator is to be used with the following diagnostic procedure. When checking the indicator, make sure that the battery has a clean top. A light may be needed in some poorly-lit areas.
Three types of indication available under normal operation are as follows.

- **Green dot**
  Battery is sufficiently charged for testing.
- **Dark**
  Battery must be charged before testing. If there is a cranking complaint, battery should be tested as described in “Battery Inspection: ”. Charging and electrical systems should also be checked at this time.
- **Clear or light yellow**
  This means that fluid level is below the bottom of hydrometer. Its possible cause is excessive or prolonged charging, a broken case, excessive tipping or normal battery deterioration. When the battery is found in such condition, it is possible that high charging voltage is caused by the faulty charging system and therefore, charging and electrical systems need to be checked. If there is a trouble in cranking and its cause lies in the battery, it should be replaced.



I2RH011A0001-

Care of battery

WARNING:

- **Never expose battery to open flame or electric spark because of battery generate gas which is flammable and explosive.**
- **Do not allow battery fluid to contact eyes, skin, fabrics, or painted surfaces as fluid is a corrosive acid. Flush any contacted area with water immediately and thoroughly.**
- **Batteries should always be kept out of reach of children.**

1) The battery is a very reliable component, but needs periodical attentions.
   - Keep the battery carrier clean.
   - Prevent rust formation on the terminal posts.
   - Keep the electrolyte up to the upper level uniformly in all cells.

- When keeping battery on vehicle over a long period of time, follow instructions given below.
  - Weekly, start the engine and run it until it reaches normal operating temperature with engine speed of 2000 to 3000 rpm. Make sure all electric switches are off before storing the vehicle.
  - Recharge the battery twice a month to prevent it from discharging excessively. This is especially important when ambient temperature is low.
    The battery discharges even when it is not used, while vehicles are being stored. Battery electrolyte can freeze and battery case can crack at cold ambient condition if battery is not properly charged.

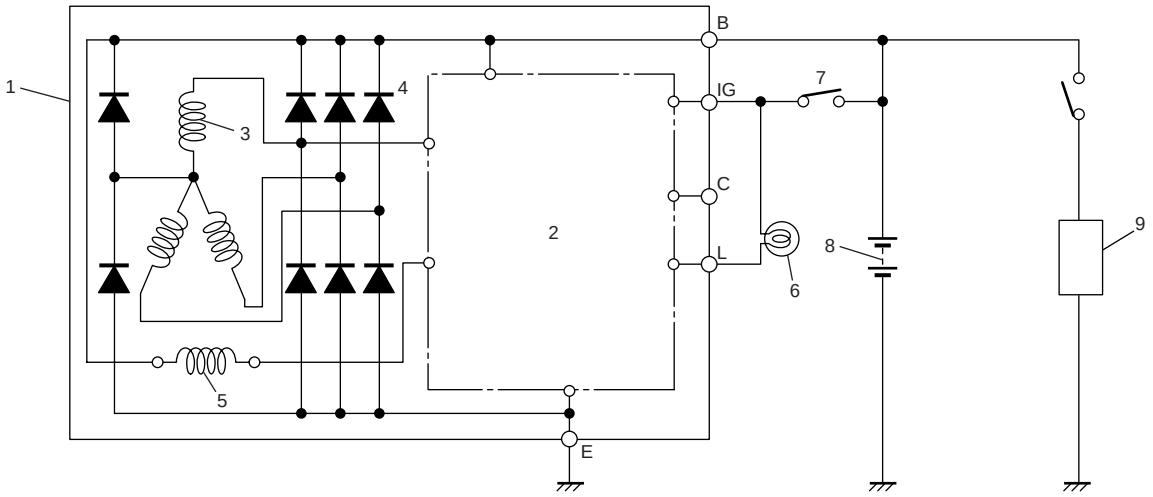
2) Keep the battery cable connections clean.
   The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current.
   Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.
3) Be always in the know as to the state of charge of the battery. The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an instrument for measuring the specific gravity (S.G.) of the battery electrolyte. The S.G. of the electrolyte is indicative of the state of charge. Refer to “Battery Inspection: ”.

Generator Description

S4RS0A1A01002

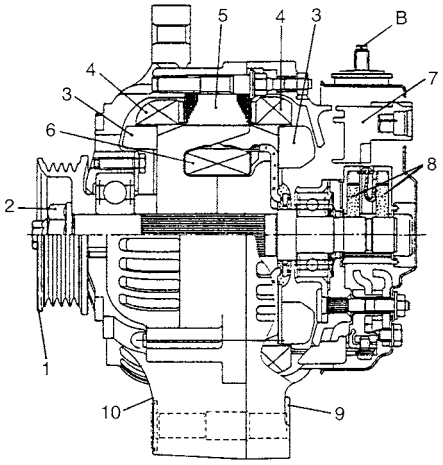
The generator is a small and high performance type with an IC regulator incorporated. The internal components are connected electrically as shown in the following figure.
The generator features are as follows:

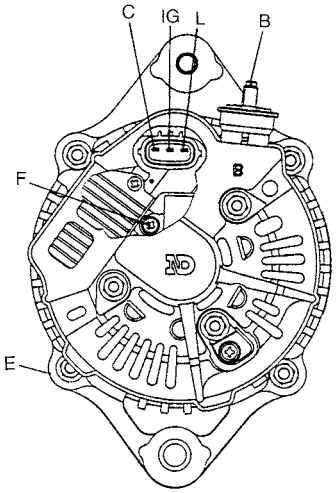
- Solid state regulator is mounted inside the generator.
- All regulator components are enclosed into a solid mold.
- This unit along with the brush holder assembly is attached to the rear housing.
- The IC regulator uses integrated circuits and controls the voltage produced by the generator, and the voltage setting cannot be adjusted.
- The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long period of attention-free service.
- The stator windings are assembled on the inside of a laminated core that forms part of the generator frame.



I4RS0A1A0001-

1. Generator with regulator assembly	3. Stator coil	5. Field coil (rotor coil)	7. Main switch	9. Load
2. I.C. regulator	4. Diode	6. Charge indicator light	8. Battery	





I2RH0B1A0002-

1. Pulley	5. Stator core	9. Rear end frame	E: Ground
2. Pulley nut	6. Field coil	10. Drive end frame	F: Field coil terminal
3. Rotor fan	7. Regulator	B: Generator output (Battery terminal)	IG: Ignition terminal
4. Stator coil	8. Brush	C: C terminal	L: Lamp terminal

Diagnostic Information and Procedures

Battery Inspection

S4RS0A1A04001

Visual Inspection

Check for obvious damage, such as cracked or broken case or cover, that could permit loss of electrolyte. If obvious damage is noted, replace battery. Determine cause of damage and correct as needed.

Generator Symptom Diagnosis

S4RS0A1A04002

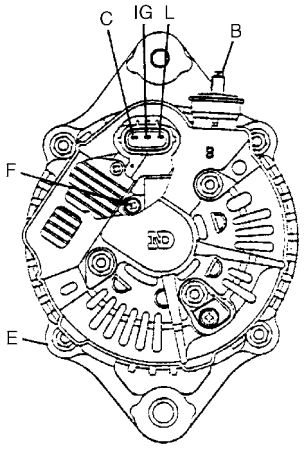
CAUTION:

- **Do not mistake polarities of "IG" terminal and "L" terminal.**
- **Do not create short circuit between "IG" and "L" terminals. Always connect these terminals through a lamp.**
- **Do not connect any load between "L" and "E" terminals.**
- **When connecting charger or booster battery to vehicle battery, refer to "Jump Starting in Case of Emergency: ".**

Trouble in charging system will show up as one or more of the following conditions:

1) Faulty indicator lamp operation.
2) An undercharged battery as evidenced by slow cranking or indicator dark.
3) An overcharged battery as evidenced by excessive spewing of electrolyte from vents.

Noise from generator may be caused by loose drive pulley, loose mounting bolts, worn or dirty bearings, defective diode, or defective stator.



I2RH0B1A0004-

B: Generator output (Battery terminal)	F: Field coil terminal
C: C terminal	IG: Ignition terminal
E: Ground	L: Lamp terminal

Charging Indicator Lamp Operation

Condition	Possible cause	Correction / Reference Item
Charge light does not light with ignition ON and engine off	Fuse blown	*Check fuse.*
	Indicator lamp (LED) faulty	*Replace combination meter.*
	Wiring connection loose	*Tighten loose connection.*
	IC regulator or field coil faulty	*Check generator.*
	Poor contact between brush and slip ring	*Repair or replace.*
Charge light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	*Adjust or replace drive belt.*
	IC regulator or generator faulty	*Check charging system.*
	Wiring faulty	*Repair wiring.*

Generator Test (Undercharged Battery Check)

S4RS0A1A04003

This condition, as evidenced by slow cranking or low specific gravity can be caused by one or more of the following conditions even though indicator lamp may be operating normal. The following procedure also applies to cars with voltmeter and ammeter.

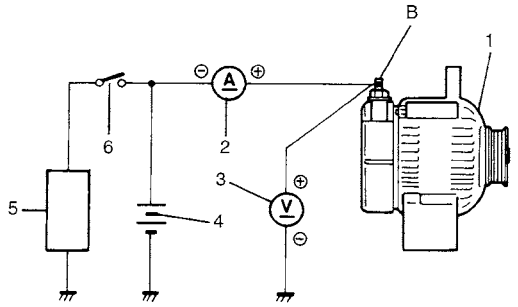
- Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
- Check drive belt for proper tension.
- If battery defect is suspected, refer to “Battery Description: ”.
- Inspect wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starting motor and ignition ground cable.

No-Load Check

1) Connect voltmeter and ammeter as shown in the figure.

NOTE:

Use fully charged battery.



I2RH011A0006-

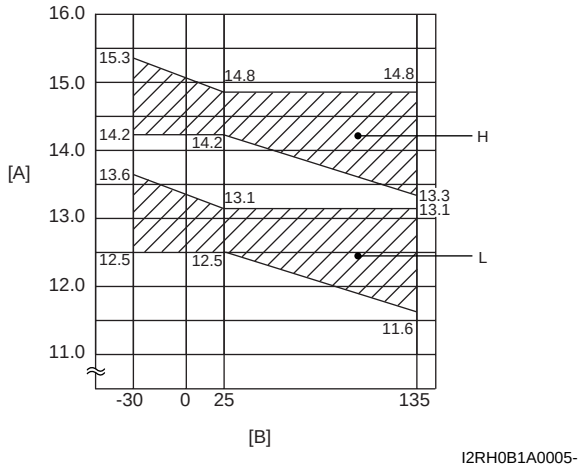
1.	Generator
2.	Ammeter (between generator “B” terminal and battery (+) terminal)
3.	Voltmeter (between generator “B” terminal and ground)
4.	Battery
5.	Load
6.	Switch

2) Run engine from idling up to 2,000 rpm with all accessories turned off and read meters.
If voltage is higher than standard value, check ground of brushes.
If brushes are not grounded, replace IC regulator.
If voltage is lower than standard value, proceed to the following check.

Specification for undercharged battery (No-load check)
Current: 10 A
Voltage: 14.2 – 14.8 V at Hi (H) (at 25 °C, 77 °F)
Voltage: 12.5 – 13.1 V at Lo (L) (at 25 °C, 77 °F)

NOTE:

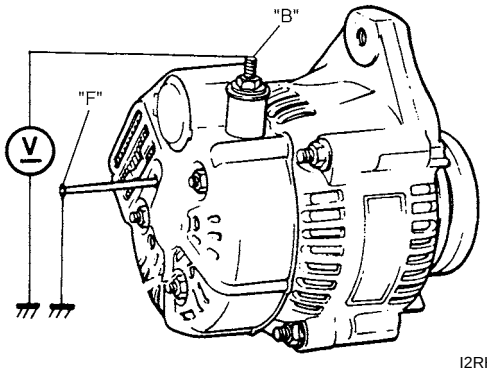
Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in the figure.



I2RH0B1A0005-

[A]:	Regulated voltage (V)
[B]:	Heatsink temperature (°C)

3) Ground “F” terminal and start engine, then measure voltage at “B” terminal as shown in the figure.
   - Voltage is higher than standard value. It is considered that generator itself is good but IC regulator has been damaged, replace IC regulator.
   - Voltage is lower than standard value. It is considered that generator itself has problem, check the generator.



I2RH011A0008-

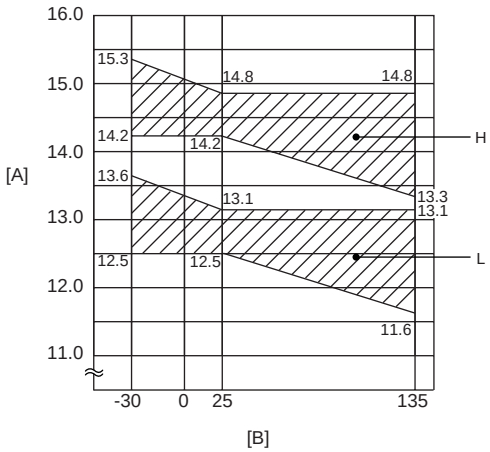
Load Check

1) Run engine at 2,000 rpm and turn on head light and heater motor.
2) Measure current and if it is less than 20 A, repair or replace generator.

Generator Test (Overcharged Battery Check)

S4RS0A1A04004

1) To determine battery condition, refer to “Battery Description: ”.
2) If obvious overcharged condition exists as evidenced by excessive spewing of electrolyte, measure generator “B” terminal voltage at engine 2000 rpm.
3) If measured voltage is higher than upper limit value, disassemble generator.
4) Check ground of brushes. If brushes are not grounded, replace IC regulator. Then check field coil for grounds and shorts.



I2RH0B1A0005-

[A]:	Regulated voltage (V)
[B]:	Heatsink temperature (°C)

Repair Instructions

Jump Starting in Case of Emergency

S4RS0A1A06001

With Auxiliary (Booster) Battery

CAUTION:

If vehicle is manual transaxle model and has a catalytic converter, do not push or tow it to start. Damage to its emission system and/or to other parts may result.

Both booster and discharged battery should be treated carefully when using jumper cables. Follow the procedure outlined as follows, being careful not to cause sparks.

WARNING:

- **Departure from these conditions or procedure described as follows could result in:**
  - **Serious personal injury (particularly to eyes) or property damage from such causes as battery explosion, battery acid, or electrical burns.**
  - **Damage to electronic components of either vehicle.**
- **Remove rings, watches, and other jewelry. Wear approved eye protection.**
- **Be careful so that metal tools or jumper cables do not contact positive battery terminal (or metal in contact with it) and any other metal on vehicle, because a short circuit could occur.**
- **Do not connect negative cable directly to negative terminal of dead battery.**

1) Set parking brake and place automatic transaxle in PARK (NEUTRAL on manual transaxle). Turn off ignition, turn off lights and all other electrical loads.
2) Check electrolyte level. If it is below low level line, add distilled water.
3) Attach end of one jumper cable to positive terminal of booster battery and the other end of the same cable to positive terminal of discharged battery. (Use 12-volt battery only to jump start engine).
4) Attach one end of the remaining negative cable to negative terminal of booster battery, and the other end to a solid engine ground (such as exhaust manifold) at least 45 cm (18 in.) away from battery of vehicle being started.
5) Start engine of vehicle with booster battery and turn off electrical accessories. Then start engine of the vehicle with discharged battery.
6) Disconnect jumper cables in the exact reverse order.

With Charging Equipment

CAUTION:

When jump starting engine with charging equipment, be sure equipment used is 12-volt and negative ground. Do not use 24-volt charging equipment. Using such equipment can cause serious damage to electrical system or electronic parts.

Battery Dismounting and Remounting

S4RS0A1A06002

Dismounting

1) Disconnect negative cable (1).
2) Disconnect positive cable (2).
3) Remove retainer (3).
4) Remove battery (4).

Handling

When handling battery, the following safety precautions should be followed:

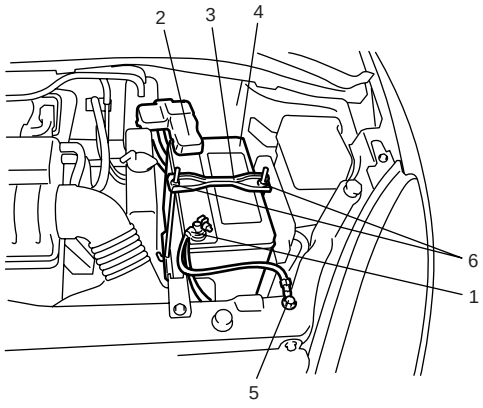
- Hydrogen gas is produced by battery. A flame or spark near battery may cause the gas to ignite.
- Battery fluid is highly acidic. Avoid spilling on clothing or other fabric. Any spilled electrolyte should be flushed with large quantity of water and cleaned immediately.

Remounting

1) Reverse removal procedure.
2) Tighten battery cables securely.

NOTE:

Check to be sure that ground cable has enough clearance to hood panel by terminal.



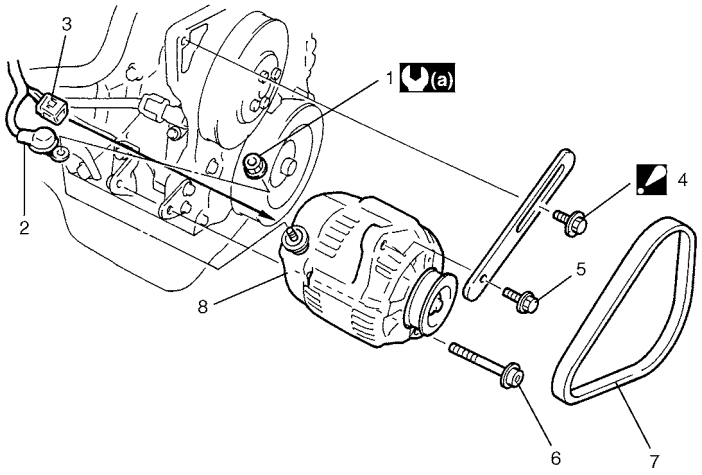
I4RS0A1A0005-

5.	Body ground bolt
6.	Nut

Generator Dismounting and Remounting

S4RS0A1A06003

1) Disconnect negative cable at battery.
2) Remove right side drive shaft referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”
3) Dismount in numerical order as shown in the figure.
4) Reverse dismounting procedure for remounting.

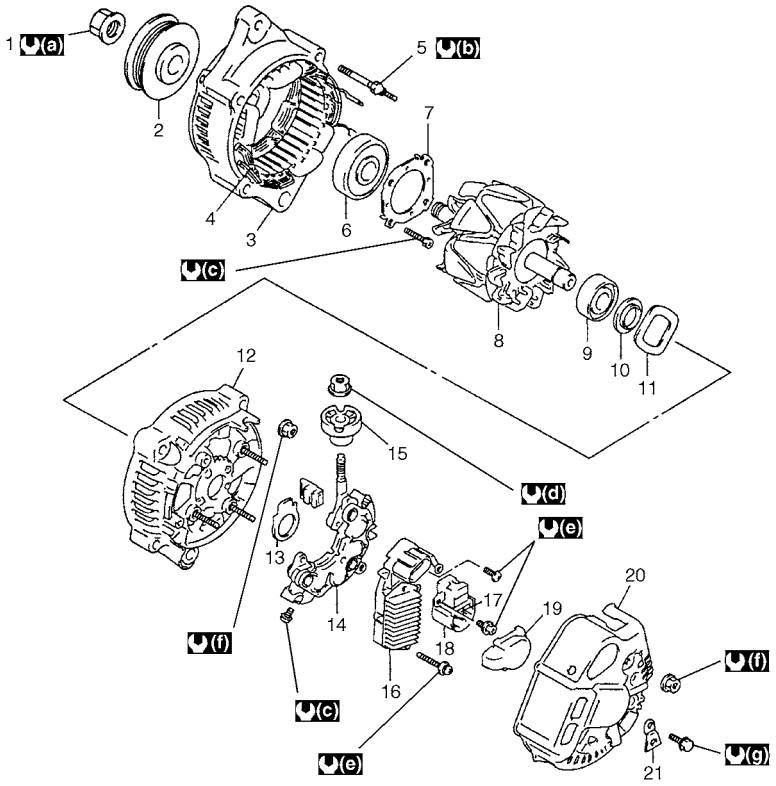


I4RS0A1A0003-

1. “B” terminal nut	4. Generator adjusting bolt : Only loosen this bolt.	7. Generator belt
2. “B” terminal wire	5. Generator adjusting arm bolt	8. Generator
3. Connector	6. Generator pivot bolt	(a) : 8.0 N·m (0.8 kg·m, 6.0 lb-ft)

Generator Components

S4RS0A1A06004



I4RS0A1A0004-

1. Pulley nut	7. Bearing retainer	13. Seal plate	19. Brush holder cover	(d) : 3.6 N·m (0.36 kg-m, 3.0 lb-ft)
2. Pulley	8. Rotor	14. Rectifier	20. Rear end cover	(e) : 2.0 N·m (0.2 kg-m, 1.5 lb-ft)
3. Drive end frame	9. End housing bearing	15. Insulator	21. Terminal plate	(f) : 4.5 N·m (0.45 kg-m, 3.5 lb-ft)
4. Stator	10. Bearing cover	16. Regulator	(a) : 111 N·m (11.1 kg-m, 80.5 lb-ft)	(g) : 3.8 N·m (0.38 kg-m, 3.0 lb-ft)
5. Stud bolt	11. Wave washer	17. Brush	(b) : 9.8 N·m (0.98 kg-m, 7.0 lb-ft)	
6. Drive end bearing	12. Rear end frame	18. Brush holder	(c) : 3.0 N·m (0.3 kg-m, 2.5 lb-ft)	

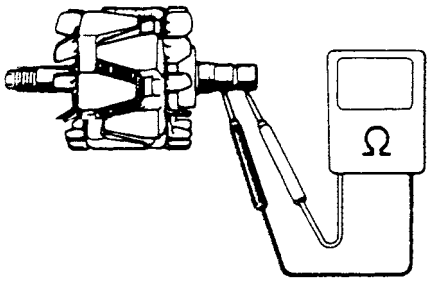
Generator Inspection

S4RS0A1A06005

Rotor

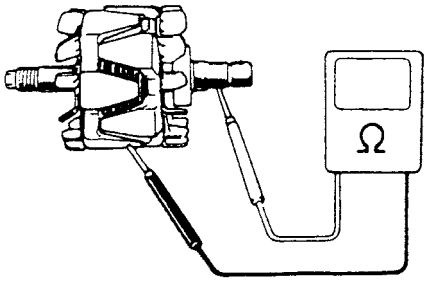
1) Using an ohmmeter, check for continuity between slip rings of rotor. If there is no continuity, replace the rotor.

Standard resistance between slip rings of rotor
2.7 – 3.1 Ω at 20 °C (68 °F)



IYSQ011A0042-

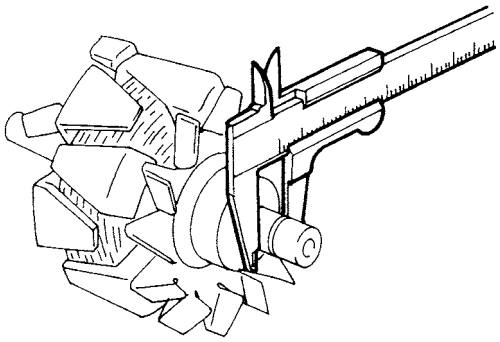
2) Using an ohmmeter, check that there is no continuity between slip ring and rotor. If there is continuity, replace the rotor.



IYSQ011A0043-

3) Check slip rings for roughness or scoring. If rough or scored, replace the rotor.
Using a vernier caliper, measure the slip ring diameter. If the diameter is less than minimum, replace the rotor.

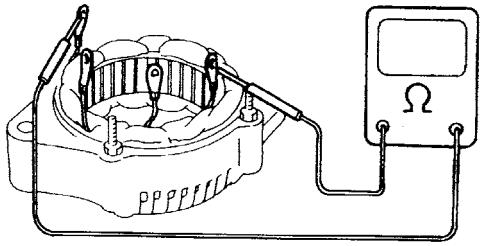
Slip ring diameter
Standard: 14.2 – 14.4 mm (0.560 – 0.566 in.)
Limit: 12.8 mm (0.503 in.)



IYSQ011A0044-

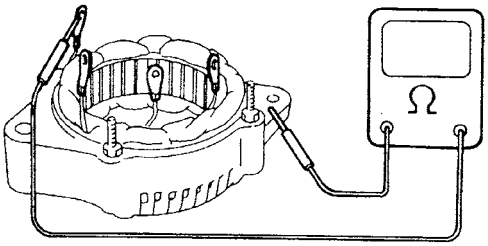
Stator

1) Using an ohmmeter, check all leads for continuity. If there is no continuity, replace the stator.



I2RH011A0014-

2) Using an ohmmeter, check that there is no continuity between coil leads and stator core. If there is continuity, replace the stator.

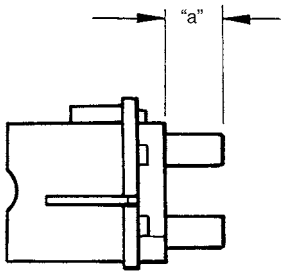


I2RH011A0015-

Brush and Brush Holder

Check each brush for wear by measuring its length as shown. If the brush is found worn down to service limit, replace the brush.

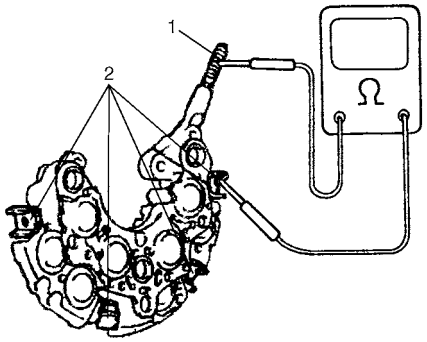
Exposed brush length “a”
Standard: 10.5 mm (0.41 in.)
Limit: 1.5 mm (0.05 in.)



IYSQ011A0047-

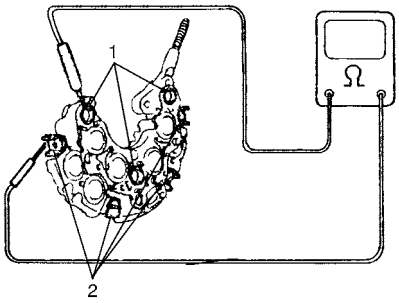
Rectifier

1) Using an ohmmeter, connect one tester probe to the “B” terminal (1) and the other to each rectifier terminal (2).



I1JA011A0002-

2) Reverse the polarity of the tester probes and repeat Step 1).
3) Check that one shows continuity and the other shows no continuity.
   If there is continuity, replace the rectifier.
4) Using an ohmmeter, connect one tester probe to each negative terminal (1) and the other to each rectifier terminal (2).



I2RH011A0017-

5) Reverse the polarity of the tester probes and repeat Step 4).
6) Check that one shows continuity and the other shows no continuity.
   If there is continuity, replace the rectifier.

Specifications

Charging System Specifications

S4RS0A1A07002

Battery

Battery type		46B24R
Rated capacity	AH/5HR, 12 Volts	36
Electrolyte	L (US / lmp pt.)	3.2 (6.76 / 5.63)

Generator

Type	70 A type
Rated voltage	12 V
Nominal output	70 A
Permissible max. speed	18,000 r/min.
No-load speed	1020 r/min. (rpm)
Regulated voltage	14.2 – 14.8 V (Hi), 12.5 – 13.1 V (Lo)
Exposed brush length	Standard: 10.5 mm (0.41 in.) Limit: 1.5 mm (0.05 in.)
Permissible ambient temperature	–30 to 90 °C (–22 to 194 °F)
Polarity	Negative ground
Rotation	Clockwise viewed from pulley side

Tightening Torque Specifications

S4RS0A1A07001

NOTE:

The specified tightening torque is also described in the following.
“Generator Dismounting and Remounting: ”
“Generator Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”

Exhaust System

General Description

Exhaust System Description

S4RS0A1B01001

The exhaust system consists of an exhaust manifold, three-way catalytic converter (TWC) in catalyst case, exhaust pipes, a muffler and seals, gasket and etc.
The three-way catalytic converter is an emission control device added to the exhaust system to lower the levels of Hydrocarbon (HC), Carbon Monoxide (CO), and Oxides of Nitrogen (NOx) pollutants in the exhaust gas.

Diagnostic Information and Procedures

Exhaust System Check

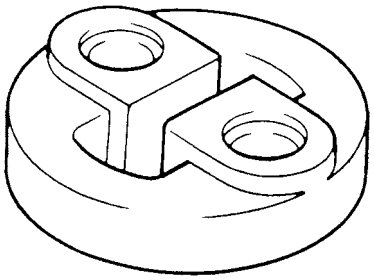
S4RS0A1B04001

WARNING:

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

At every interval of periodic maintenance service, and when vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.



IYSY011B0003-

- Check exhaust system for leakage, loose connection, dent and damage.
- If bolts or nuts are loosened, tighten them to specified torque referring to “Exhaust System Components: ”.
- Check nearby body areas damaged, missing, or mispositioned part, open seam, hole connection or any other defect which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

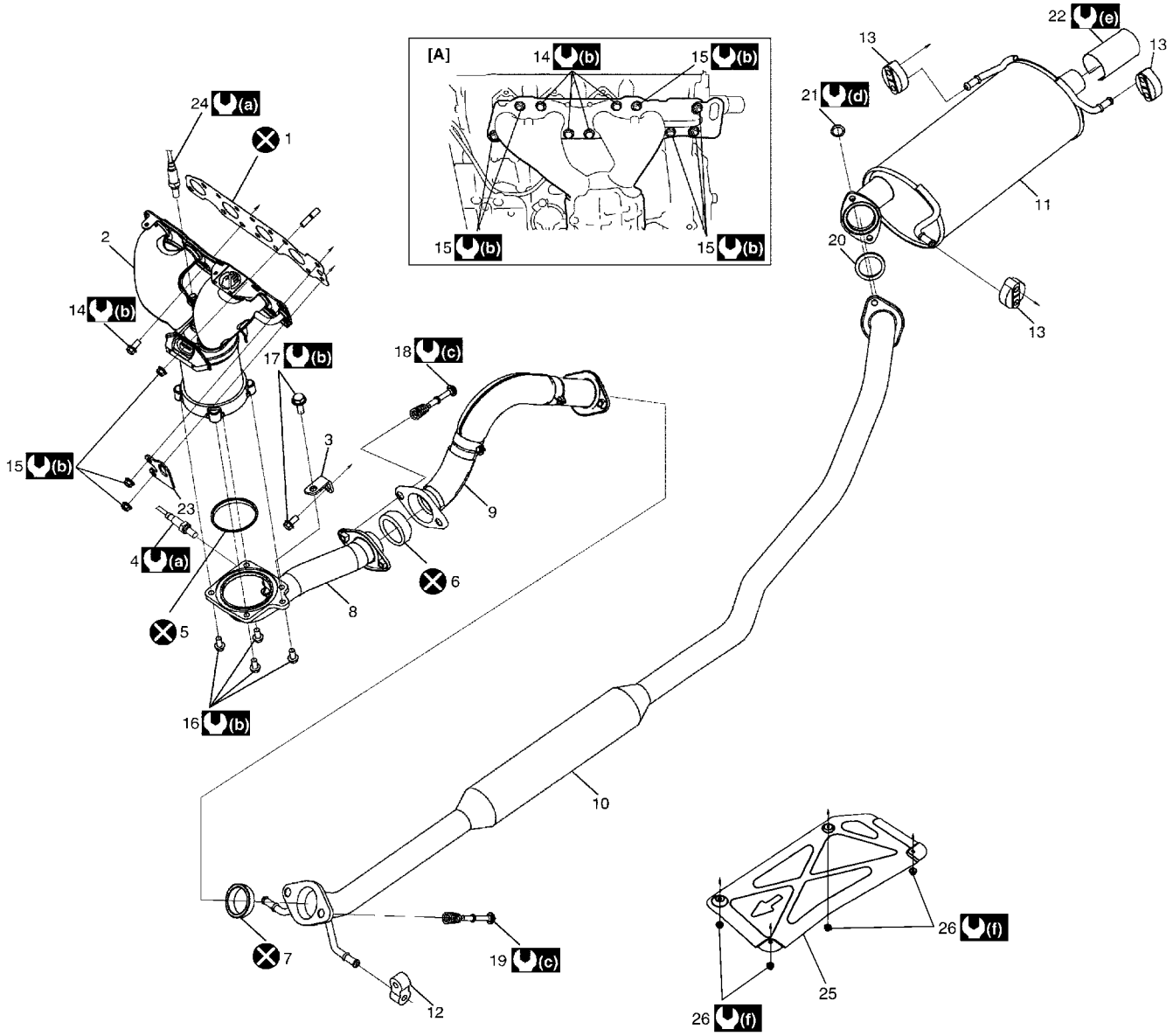
Repair Instructions

Exhaust System Components

S4RS0A1B06001

WARNING:

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.



I4RS0A1B0001-

[A]: Installing location of exhaust manifold bold and nut.	11. Muffler	22. Muffler tail pipe
1. Exhaust manifold gasket	12. Center pipe mounting	23. Engine hook
2. Exhaust manifold	13. Muffler mounting	24. Heated oxygen sensor No.2 (connector color: gray)
3. Exhaust manifold stiffener	14. Exhaust manifold bolt	25. Heat insulator
4. Heated oxygen sensor No.1 (connector color: green)	15. Exhaust manifold nut	(a) : 45 N·m (4.5 kg-m, 32.5 lb-ft)
5. Exhaust pipe No.1 gasket	16. Exhaust No.1 pipe bolt	(b) : 50 N·m (5.0 kg-m, 36.5 lb-ft)
6. No.1 seal ring	17. Exhaust manifold stiffener bolt	(c) : 43 N·m (4.3 kg-m, 31.0 lb-ft)
7. No.2 seal ring	18. Exhaust No.2 pipe bolt	(d) : 60 N·m (6.0 kg-m, 43.5 lb-ft)
8. Exhaust No.1 pipe	19. Exhaust center pipe bolt	(e) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
9. Exhaust No.2 pipe	20. Exhaust pipe No.2 gasket	(f) : 3 N·m (0.3 kg-m, 2.5 lb-ft)
10. Exhaust center pipe	21. Muffler nut	: Do not reuse.

Exhaust Manifold Removal and Installation

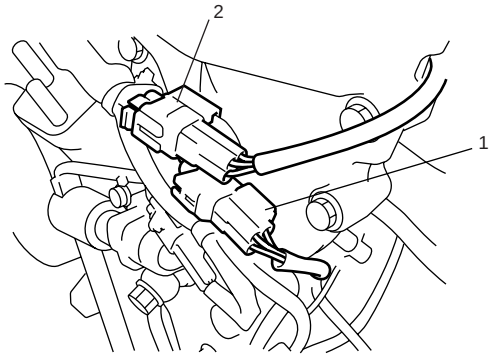
S4RS0A1B06003

Removal

WARNING:

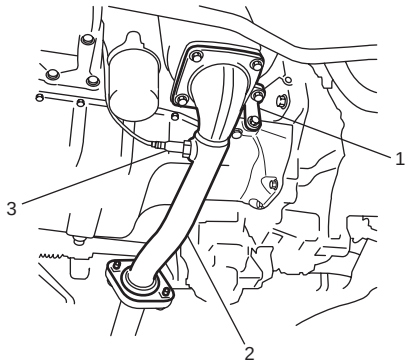
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

1) Disconnect negative cable at battery.
2) Remove front bumper with front grille referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Remove radiator referring to “Radiator Removal and Installation: in Section 1F” for equipped with A/C.
4) With hose connected, detach A/C condenser from vehicle body for equipped with A/C.
5) Disconnect heated oxygen sensor No.1 connector (1) (connector color: green) and heated oxygen sensor No.2 connector (2) (connector color: gray), and then detach it from its stay.



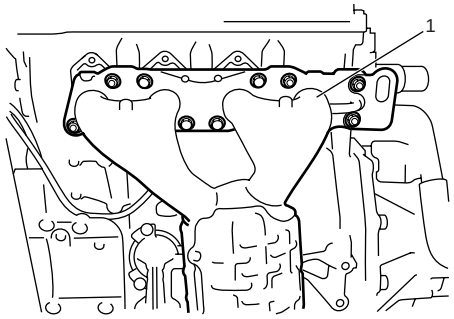
I4RS0A1B0006-

6) Remove exhaust manifold stiffener (1).
7) Remove heated oxygen sensors (3) from exhaust manifold and exhaust No.1 pipe, if necessary.
8) Disconnect exhaust No.1 pipe (2) from exhaust manifold.



I4RS0A1B0002-

9) Remove exhaust manifold (1) and its gasket from cylinder head.



I4RS0A1B0003-

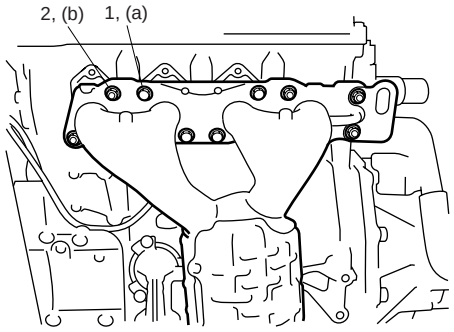
Installation

1) Install new gasket to cylinder head. Then install exhaust manifold.
   Tighten manifold bolts (1) and nuts (2) to specified torque.

   Tightening torque
   Exhaust manifold bolt (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)
   Exhaust manifold nut (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

   NOTE:

   Be sure to install exhaust manifold bolts and nuts to proper location referring to “Exhaust System Components: ”.



I4RS0A1B0004-

2) Install new seal ring and connect exhaust No.1 pipe (1) to exhaust manifold.
   Tighten pipe fasteners to specified torque.

   Tightening torque
   Exhaust No.1 pipe bolt (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)

3) Install exhaust manifold stiffener (2).
   Tighten exhaust manifold stiffener bolts to specified torque.

   Tightening torque
   Exhaust manifold stiffener bolt (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

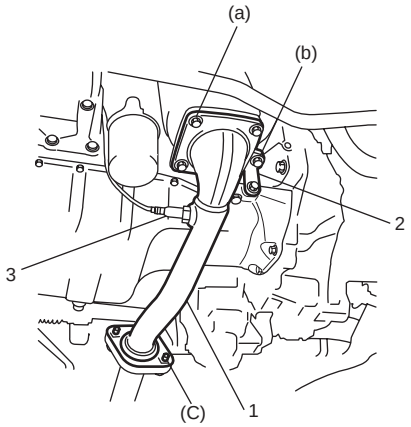
4) Install new seal ring and connect exhaust No.1 pipe (1) to exhaust No.2 pipe. Tighten pipe fasteners to specified torque.

Tightening torque
Exhaust No.2 pipe bolt (c): 43 N·m (4.3 kg-m, 31.0 lb-ft)

5) Install heated oxygen sensors (3) referring to “Exhaust System Components: ”, if removed.

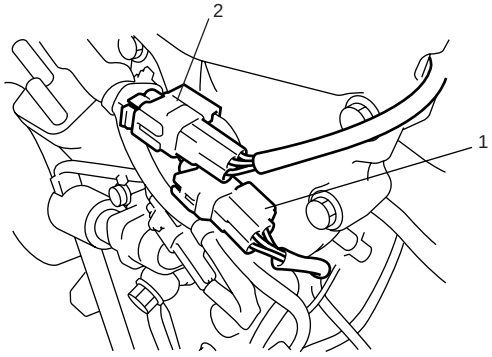
NOTE:

Be sure to identify heated oxygen sensor No.1 and No.2 by its connector color.



I4RS0A1B0005-

6) Connect heated oxygen sensor No.1 connector (1) (connector color: green) and heated oxygen sensor No.2 connector (2) (connector color: gray), and then fit coupler to bracket securely.



I4RS0A1B0006-

7) Install A/C condenser to vehicle body for equipped with A/C.
8) Install radiator referring to “Radiator Removal and Installation: in Section 1F” for equipped with A/C.
9) Install front bumper with front grille by referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
10) Connect negative cable at battery.
11) Check exhaust system for exhaust gas leakage.

Exhaust Pipe and Muffler Removal and Installation

S4RS0A1B06004

For replacement of exhaust pipe, be sure to hoist vehicle and observe WARNING under “Exhaust System Components: ” and the following.

CAUTION:

Exhaust manifold have three way catalytic converter in it, it should not be exposed to any impulse.
Be careful not to drop it or hit it against something.

- Tighten bolts and nuts to specified torque when reassembling. Refer to “Exhaust System Components: ”.
- After installation, start engine and check each joint of exhaust system for leakage.

Specifications

Tightening Torque Specifications

S4RS0A1B07001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Exhaust manifold bolt	50	5.0	36.5	☞
Exhaust manifold nut	50	5.0	36.5	☞
Exhaust No.1 pipe bolt	50	5.0	36.5	☞
Exhaust manifold stiffener bolt	50	5.0	36.5	☞
Exhaust No.2 pipe bolt	43	4.3	31.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Exhaust System Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Section 2

Suspension

CONTENTS

Precautions 2-1
Precautions 2-1
Precautions on Suspension 2-1

Suspension General Diagnosis 2A-1
Diagnostic Information and Procedures 2A-1
Suspension, Wheels and Tires Symptom Diagnosis 2A-1
Specifications 2A-3
Wheel Alignment Specifications 2A-3

Front Suspension 2B-1
General Description 2B-1
Front Suspension Construction 2B-1
Front Wheel Alignment Construction 2B-2
Repair Instructions 2B-2
Front Wheel Alignment Inspection and Adjustment 2B-2
Front Strut Assembly Components 2B-4
Front Strut Assembly Removal and Installation 2B-4
Front Strut Assembly Disassembly and Assembly 2B-6
Front Strut Assembly Check 2B-7
Front Wheel Hub and Steering Knuckle Components 2B-8
Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation 2B-8
Front Wheel Hub, Disc, Nut and Bearing Check 2B-12
Suspension Control Arm / Bushing Removal and Installation 2B-12
Suspension Control Arm / Bushing Disassembly and Assembly 2B-13
Suspension Control Arm / Steering Knuckle Check 2B-14
Suspension Control Arm Bushing Check 2B-14
Suspension Control Arm Joint Check 2B-14
Front Suspension Frame, Stabilizer Bar and/or Bushings Components 2B-15
Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation 2B-15
Front Suspension Frame Check 2B-18
Front Stabilizer Bar, Bushing and/or Joint Check 2B-19
Front Suspension Fasteners Check 2B-19
Specifications 2B-19
Tightening Torque Specifications 2B-19
Special Tools and Equipment 2B-20
Special Tool 2B-20

Rear Suspension 2C-1
General Description 2C-1
Rear Suspension Construction 2C-1
Component Location 2C-2
Rear Suspension Component Location 2C-2
Repair Instructions 2C-3
Rear Shock Absorber Removal and Installation 2C-3
Rear Shock Absorber Inspection 2C-4
Rear Shock Absorber Bush Removal and Installation 2C-4
Rear Shock Absorber Bush Inspection 2C-5
Coil Spring Removal and Installation 2C-5
Spring Upper Seat / Spring Lower Seat Inspection 2C-6
Spring Upper Seat and Lower Seat Removal and Installation 2C-6
Rear Axle Removal and Installation 2C-7
Trailing Arm, Rear Axle and Coil Spring Inspection 2C-10
Rear Axle Bush Inspection 2C-10
Wheel Bearing and Wheel Stud Bolt Removal and Installation 2C-11
Rear Wheel Disc, Nut and Bearing Inspection 2C-12
Spindle Removal and Installation 2C-12
Spindle Inspection 2C-13
Rear Suspension Fasteners Inspection 2C-13
Specifications 2C-14
Tightening Torque Specifications 2C-14
Special Tools and Equipment 2C-14
Special Tool 2C-14

Wheels and Tires 2D-1
General Description 2D-1
Tires Description 2D-1
Wheels Description 2D-2
Irregular and/or Premature Wear Description 2D-2
Wear Indicators Description 2D-3
Radial Tire Waddle Description 2D-3
Radial Tire Lead / Pull Description 2D-4
Balancing Wheels Description 2D-4
Repair Instructions 2D-5
General Balance Procedures 2D-5

Tire Rotation....2D-5
Wheel Removal and Installation....2D-6
Tire Mounting and Dismounting....2D-6
Tire Repair....2D-6
Specifications....2D-7
Wheels and Tires Specifications....2D-7
Tightening Torque Specifications....2D-7

Precautions

Precautions

Precautions on Suspension

S4RS0A2000001

Suspension Caution
Refer to “Suspension Caution: in Section 00”.

Wheels and Tires Caution
Refer to “Wheels and Tires Caution: in Section 00”.

General Precautions
Refer to “General Precautions: in Section 00”.

Vehicle Lifting Points
Refer to “Vehicle Lifting Points: in Section 0A”.

Fastener Caution
Refer to “Fastener Caution: in Section 00”.

Fastener Information
Refer to “Fasteners Information: in Section 0A”.

Brake Caution
Refer to “Brake Caution: in Section 00”.

Suspension General Diagnosis

Diagnostic Information and Procedures

Suspension, Wheels and Tires Symptom Diagnosis

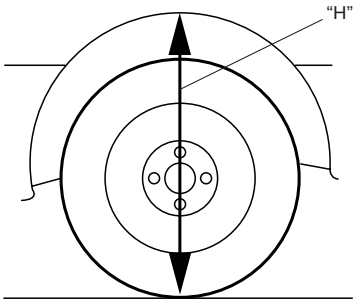
S4RS0A2104001

Condition	Possible cause	Correction / Reference Item
Vehicle pulls (Leads)	Mismatched or uneven tires	*Replace tire.*
	Tires not adequately inflated	*Adjust tire pressure.*
	Broken or sagging springs	*Replace spring.*
	Radial tire lateral force	*Replace tire.*
	Disturbed wheel alignment	*Check and adjust wheel alignment.*
	Brake dragging in one road wheel	*Repair brake.*
	Loose, bent or broken front or rear suspension parts	*Tighten or replace suspension parts.*
Abnormal or excessive tire wear	Sagging or broken spring	*Replace spring.*
	Tire out of balance	*Adjust balance or replace tire.*
	Disturbed wheel alignment	*Check and adjust wheel alignment.*
	Faulty strut (shock absorber)	*Replace strut.*
	Hard driving	*Replace tire.*
	Overloaded vehicle	*Replace tire.*
	Not rotating tire	*Replace or rotate tire.*
	Worn or loose wheel bearing	*Replace wheel bearing.*
	Wobbly wheel or tire	*Replace wheel or tire.*
	Tires not adequately inflated	*Adjust tire pressure.*
Wheel tramp	Blister or bump on tire	*Replace tire.*
	Improper strut (shock absorber) action	*Replace strut.*
Shimmy, shake or vibration	Tire or wheel out of balance	*Balance wheels or replace tire and/or wheel.*
	Loosen wheel bearings	*Replace wheel bearing.*
	Worn tie-rod ends	*Replace tie-rod end.*
	Worn lower ball joints	*Replace front suspension arm.*
	Excessive wheel runout	*Repair or replace wheel and/or tire.*
	Blister or bump on tire	*Replace tire.*
	Excessively loaded radial runout of tire / wheel assembly	*Replace tire or wheel.*
	Disturbed wheel alignment	*Check and adjust wheel alignment.*
	Loose or worn steering linkage	*Tighten or replace steering linkage.*
	Loose steering gear case bolts	*Tighten case bolts.*
Abnormal noise, front end	Worn, sticky or loose tie-rod ends, lower ball joints, tie-rod inside ball joints or drive shaft joints	*Replace tie-rod end, suspension arm, tie-rod or drive shaft joint.*
	Damaged struts or mountings	*Repair or replace.*
	Worn suspension arm bushings	*Replace.*
	Loose stabilizer bar	*Tighten bolts or nuts, replace bushes.*
	Loose wheel nuts	*Tighten wheel nuts.*
	Loose suspension bolts or nuts	*Tighten suspension bolts or nuts.*
	Broken or otherwise damaged wheel bearings	*Replace.*
	Broken suspension springs	*Replace.*
	Poorly lubricated or worn strut bearings	*Replace strut bearing.*
	Malfunction of Power Steering System	*Check and correct.*
Low or uneven trim height	Broken or sagging springs	*Replace.*
	Over loaded	*Check loading.*
NOTE:	Incorrect springs	*Replace.*
See NOTE *1.	Tires not adequately inflated	*Adjust tire pressure.*
Ride too soft	Faulty struts (shock absorber)	*Replace strut.*
Suspension bottoms	Overloaded	*Check loading.*
	Faulty struts (shock absorber)	*Replace strut.*
	Incorrect, broken or sagging springs	*Replace.*

Condition	Possible cause	Correction / Reference Item
Body leans or sways in corners	Loose stabilizer bar	*Tighten stabilizer bar bolts or nuts, or replace bushes.*
	Faulty struts (shock absorbers) or mountings	*Replace strut or tighten mounting.*
	Broken or sagging springs	*Replace.*
	Overloaded	*Check loading.*
Cupped tires	Front struts defective	*Replace.*
	Worn wheel bearings	*Replace.*
	Excessive tire or wheel run-out	*Replace tire or wheel disc.*
	Worn ball joints	*Replace front suspension arm.*
	Tire out of balance	*Adjust tire balance.*

NOTE:

***1: Right-to-left trim height (“H”) difference should be within 15 mm (0.6 in.) with curb weight. (same with rear side.)**



I2RH01210001-

Specifications

Wheel Alignment Specifications

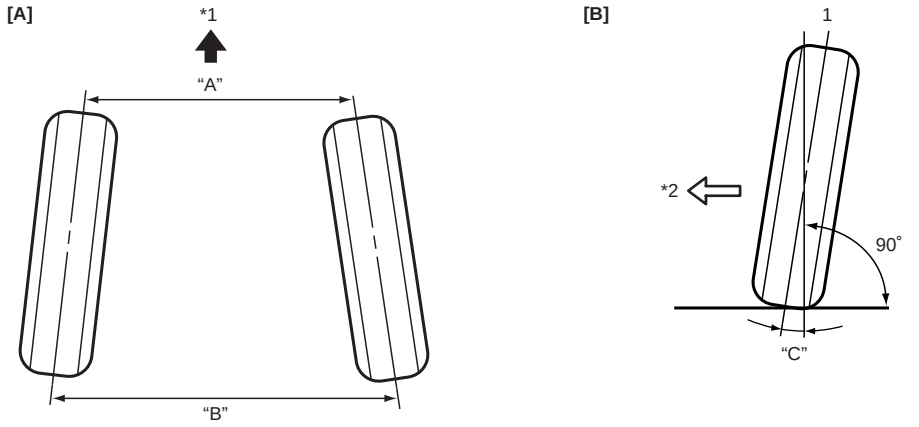
S4RS0A2107001

Wheel alignment specifications

Item		Front	Rear
Front toe (“B” – “A”) (total) Rear toe (Non adjustable, for reference only)		IN 0 + 1.0 / –0.5 mm (IN 0 + 0.0394 / –0.0197 in.)	IN 5.2 ± 5.2 mm (0.205 ± 0.205 in.)
Camber “C” (Non adjustable, for reference only)		0 ° 00’ ± 1 °	–1 ° 00’ ± 1°
Caster (Non adjustable, for reference only)		5 ° 12’ ± 2 °	—
Side Slip Limit mm/m (in./3.3 ft)		IN 0 to IN 3.0 (IN 0 to IN 0.118)	—
Steering angle (Turning angle)	Inside	39.1 ° ± 3 °	—
	Outside	33.3 ° ± 3 °	—

NOTE:

Toe value in the specifications table was measured by using a toe-in gauge.



I4RH01210001-

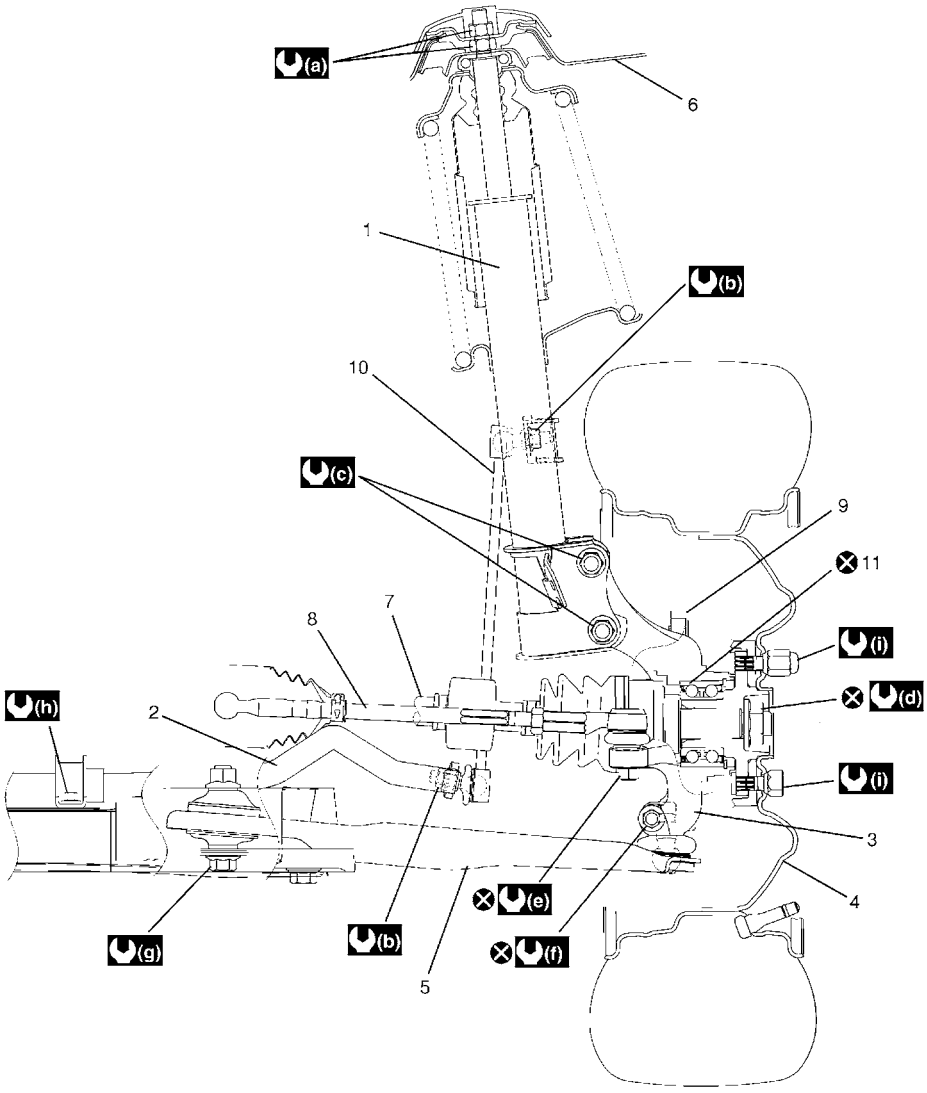
[A]: Toe-in (Top view)	1. Center line of wheel	*2. Body center
[B]: Camber (Front view)	*1. Forward	

Front Suspension

General Description

Front Suspension Construction

S4RS0A2201001



I4RS0A220001-

1. Strut assembly	7. Drive shaft	(b) : 50 N·m (5.0 kg-m, 36.5 lb-ft)	(h) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
2. Stabilizer bar	8. Tie-rod	(c) : 105 N·m (10.5 kg-m, 76.0 lb-ft)	(i) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
3. Steering knuckle	9. Brake disc	(d) : 175 N·m (17.5 kg-m, 126.5 lb-ft)	⊗ : Do not reuse.
4. Wheel	10. Stabilizer bar joint	(e) : 45 N·m (4.5 kg-m, 32.5 lb-ft)	
5. Suspension control arm	11. Wheel bearing	(f) : 60 N·m (6.0 kg-m, 43.5 lb-ft)	
6. Vehicle body	(a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)	(g) : 170 N·m (17.0 kg-m, 123.0 lb-ft)	

Front Wheel Alignment Construction

S4RS0A2201002

Among factors for front wheel alignment, only toe setting can be adjusted. Camber and caster can be adjusted. Therefore, should camber or caster be out of specification due to the damage caused by hazardous road conditions or collision, whether the damage is in body or in suspension should be determined and damaged body should be repaired or damaged suspension should be replaced.

Preliminary Checks Prior to Adjustment Front Wheel Alignment

Steering and vibration complaints are not always the result of improper alignment. An additional item to be checked is the possibility of tire lead due to worn or improperly manufactured tires. eadis the vehicle deviation from a straight path on a level road without hand pressure on the steering wheel. Refer to “Radial Tire Lead / Pull Description: in Section 2D” in order to determine if the vehicle has a tire lead problem. Before making any adjustment affecting wheel alignment, the following checks and inspections should be made to ensure correctness of alignment readings and alignment adjustments:

- Check all tires for proper inflation pressures and approximately the same tread wear.
- Check for loose of ball joints. Check tie-rod ends; if excessive looseness is noted, it must be corrected before adjusting.
- Check for run-out of wheels and tires.
- Check vehicle trim heights; if out of limits and a correction is to be made, it must be made before adjusting toe.
- Check for loose of suspension arms.
- Check for loose or missing stabilizer bar attachments.
- Consideration must be given to excess loads, such as tool boxes. If this excess load is normally carried in vehicle, it should remain in vehicle during alignment checks.
- Consider condition of equipment being used to check alignment and follow manufacturer instructions.
- Regardless of equipment used to check alignment, vehicle must be on a level surface both fore and aft and transversely.

NOTE:

To prevent possible incorrect reading of toe, camber or caster, vehicle front and rear end must be moved up and down a few times before inspection.

Repair Instructions

Front Wheel Alignment Inspection and Adjustment

S4RS0A2206001

Toe Inspection and Adjustment

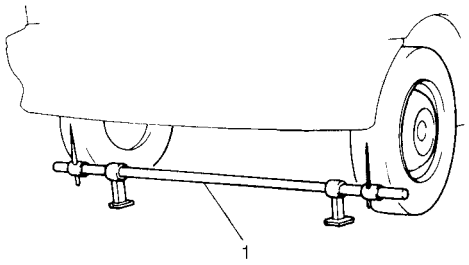
Preparation for toe inspection and adjustment.

- Place vehicle in non-loaded state on level floor.
- Set steering wheel in straight state.
- Check that inflation pressure of each tire is adjusted properly and disc wheel is free from deflection.
- Check that each suspension part is free from bend, dent, wear or damage in any other form.
- Check that ground clearance at the right and left is just about the same.

Inspection

Measure toe with toe-in gauge (1).
Toe should be within following specifications.
If toe is out of the value corresponding specification, adjust toe properly.

Toe
IN 0 +1.0 / –0.5 mm (0 + 0.0394 / –0.0197in.)



I2RH01220062-

Adjustment

1) Loosen right and left tie-rod end lock nuts (1) first.
2) Rotate right and left tie-rods (2) by the same amount to align toe to specification. In this adjustment, right and left tie-rods (2) should become equal in length

NOTE:

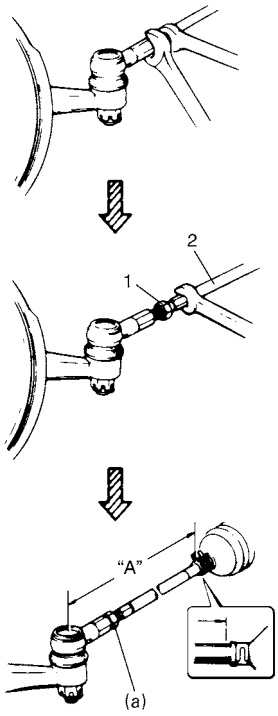
Before rotating tie-rods (2), apply grease between tie-rods and rack boots so that boots won be twisted.

3) After adjustment, tighten lock nuts (1) to specified torque.

Tightening torque
Tie-rod end lock nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

NOTE:

Make sure that rack boots are not twisted.



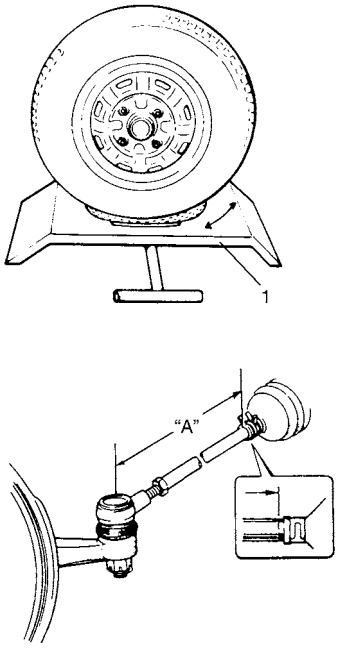
I3RH0A220002-

Steering Angle Check and Adjustment
When tie-rod or tie-rod end was replaced, check toe and then also steering angle with turning radius gauge (1). If steering angle is not correct, check if right and left tie-rods are equal in length

NOTE:

If tie-rod lengths were changed to adjust steering angle, reinspect toe-in.

Steering angle
Inside: 39.1 ° ± 3 °
Outside: 33.3 ° ± 3 °



I3RH0A220003-

Reference Information

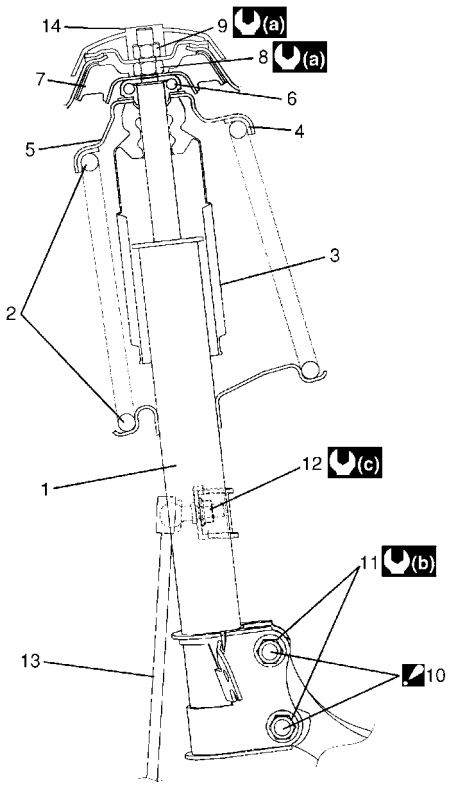
Side slip
When checked with side slip tester, side slip should satisfy following specification.

Side slip
0 to IN 3.0 mm/m (0 to IN 0.118 in/3.3 ft)

If side slip exceeds the limit, toe or front wheel alignment may not be correct.

Front Strut Assembly Components

S4RS0A2206005



I4RS0A220002-

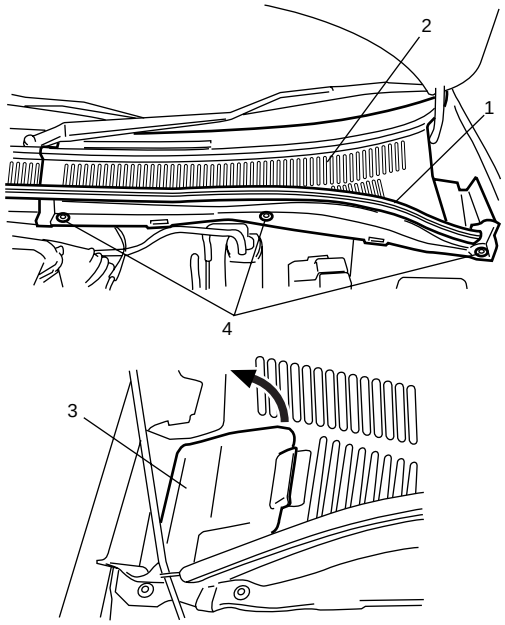
1. Strut assembly	6. Strut bearing	11. Strut bracket nut	(b) : 105 N·m (10.5 kg-m, 76.0 lb-ft)
2. Coil spring	7. Strut support	12. Stabilizer joint nut	(c) : 50 N·m (5.0 kg-m, 36.5 lb-ft)
3. Bump stopper	8. Strut support lower nut	13. Stabilizer joint	
4. Coil spring seat	9. Strut nut	14. Strut rod cap	
5. Coil spring upper seat	10. Strut bracket bolt : Insert from vehicle front side.	(a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)	

Front Strut Assembly Removal and Installation

S4RS0A2206006

Removal

1) Remove hood rear seal (1), and then remove left side cowl top garnish (2) and right side cover cap (3) from vehicle.



I4RS0A220003-

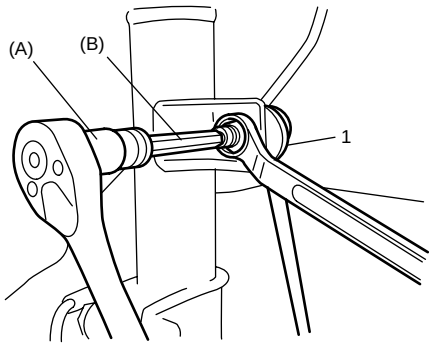
4. Clip

NOTE:

When servicing component parts of strut assembly, remove strut rod cap and then loosen strut nut a little before removing strut assembly. This will make service work easier. Note, however, nut must not be removed at this point.

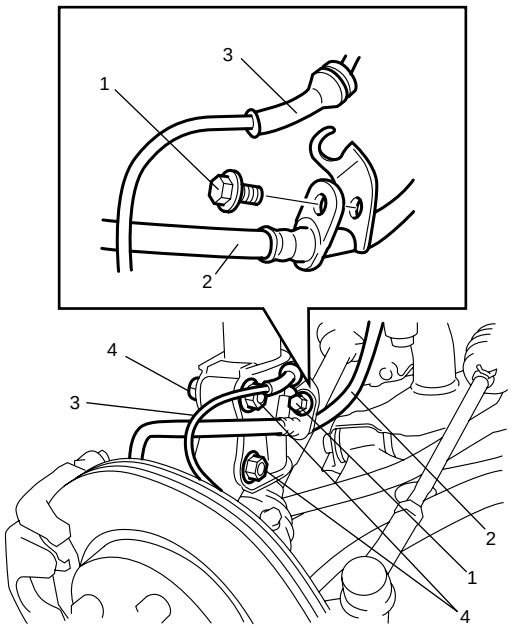
2) Hoist vehicle, allowing front suspension to hang free.
3) Remove wheel and disconnect stabilizer joint (1) from strut bracket.
When loosening joint nut, hold stud with special tools.

Special tool
(A): 09900–00411 (socket)
(B): 09900–00413 (5 mm)



I4RS0A220004-

4) Remove brake hose mounting bolt (1) and take off brake hose (2) and then ABS wheel speed sensor harness (3) (if equipped) from strut bracket as shown in figure.
5) Remove strut bracket bolts and nuts (4).

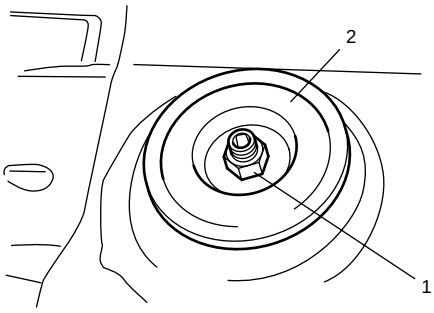


I4RS0A220005-

6) Remove strut rod cap.
7) Remove strut nut (1), and remove rebound stopper (2).

NOTE:

Hold strut by hand so that it will not fall off.



I4RS0A220006-

8) Remove strut assembly.

Installation
Install strut assembly by reversing removal procedure, noting the following instructions.

- Insert bolts in such direction as shown in figure.
- Tighten all fasteners to specified torque.

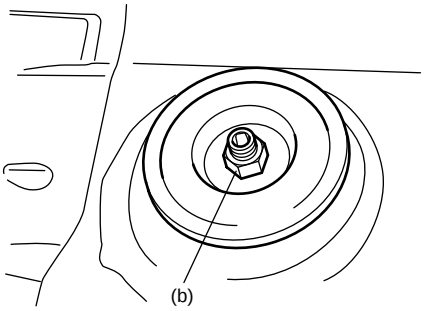
Tightening torque
Strut bracket nut (a): 105 N·m (10.5 kg-m, 76.0 lb-ft)
Brake hose mounting bolt (c): 25 N·m (2.5 kg-m, 18.0 lb-ft)
Stabilizer joint nut (d): 50 N·m (5.0 kg-m, 36.5 lb-ft)

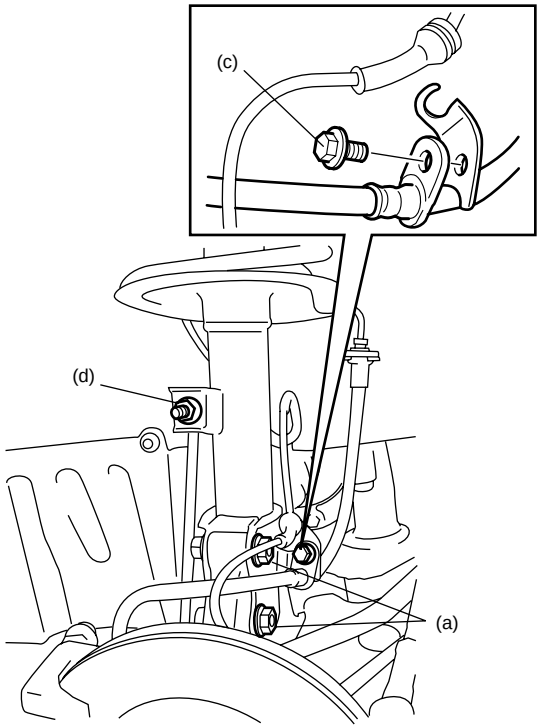
- Lower hoist and vehicle in non-loaded condition, tighten strut nut (b) to specified torque.

Tightening torque
Strut nut (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

CAUTION:

- **Don twist brake hose and ABS wheel speed sensor harness (if equipped) when installing it.**
- **Install ABS wheel speed sensor harness (if equipped) to strut bracket as shown in figure.**





I4RS0A220008-

- Tighten wheel nuts to specified torque.

  Tightening torque
  Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

- After installation, confirm front wheel alignment.

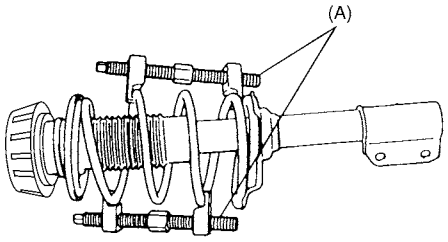
Front Strut Assembly Disassembly and Assembly

S4RS0A2206007

Disassembly

1) With special tool (A) placed to spring as shown, turn special tool bolts alternately until spring tension is released. Whether it is released or not can be known by whether strut turns lightly while strut spring is held stationary.

   Special tool
   (A): 09940-71431



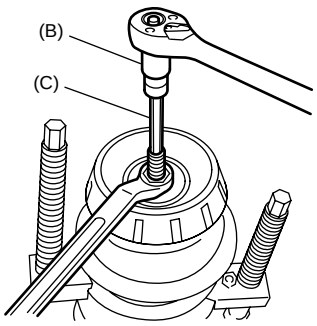
I4RS0A220009-

WARNING:

Use a commercially available spring compressor and follow the operation procedure described in the Instruction Manual supplied with that spring compressor.

2) While keeping spring compressed with special tool as shown, remove strut support lower nut.

   Special tool
   (B): 09900-00411 (socket)
   (C): 09900-00414 (6 mm)



I4RS0A220007-

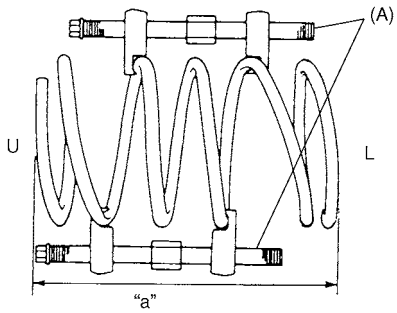
3) Disassemble strut assembly.

Assembly

For assembly, reverse disassembly procedure, noting the following instructions.

1) Compress spring with special tool (A) until total length becomes about 280 mm (11.0 in.) as shown.

   Length
   280 mm (11.0 in.)



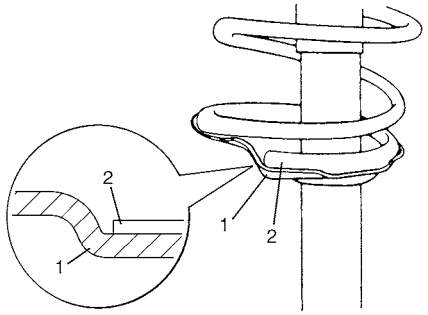
I4RS0A220010-

U:	Upper side (small dia.)
L:	Lower side (large dia.)

2) Install compressing coil spring, and mate spring end (2) with stepped part of spring lower seat (1) as shown.

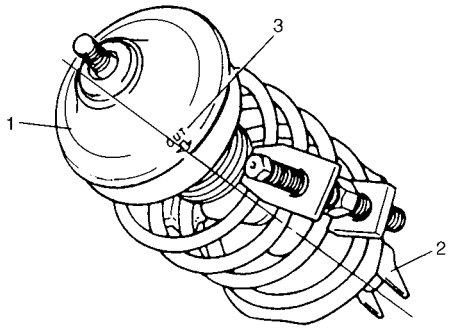
CAUTION:

End of coil spring must not interfere with step of spring lower seat.



I4RS0A220011-

3) Install bump stopper onto strut rod. For installing direction, refer to the figure in “Front Suspension Construction: ”.
4) Pull strut rod as far up as possible and use care not to allow it to retract into strut.
5) Install spring seat on coil spring and then spring upper seat (1) aligning UTmark (3) on spring upper seat and center of strut bracket (2).

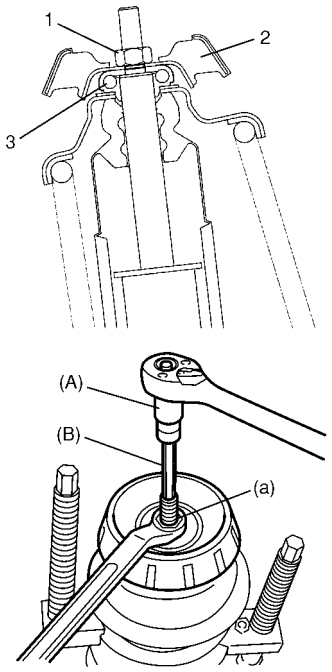


I4RS0A220012-

6) Install bearing (3), strut support (2) and strut support lower nut (1) in this sequence.
Tighten strut support lower nut (1) to specified torque.
When tightening strut support lower nut, hold stud with special tools.

Special tool
(A): 09900–00411 (socket)
(B): 09900–00414 (6 mm)

Tightening torque
Strut support lower nut (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)

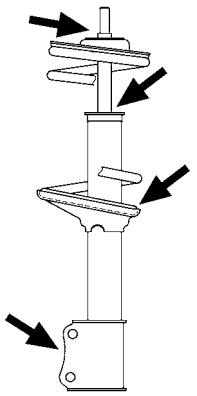


I4RS0A220013-

Front Strut Assembly Check

S4RS0A2206008

- Inspect strut for oil leakage, damage or deformation.
- If strut is found faulty, replace it as an assembly unit, because it can not be disassembled.



I4RS0A220014-

- Inspect strut function referring to the following procedures.

1) Check and adjust tire pressures as specified.
2) Bounce vehicle body 3 or 4 times continuously by pushing front end on the side with strut to be checked.
3) Apply the same amount of force at each push and note strut resistance both when pushed and rebounding.
4) Also, note how many times vehicle body rebounds before coming to stop after hands are off. Do the same for strut on the other side.

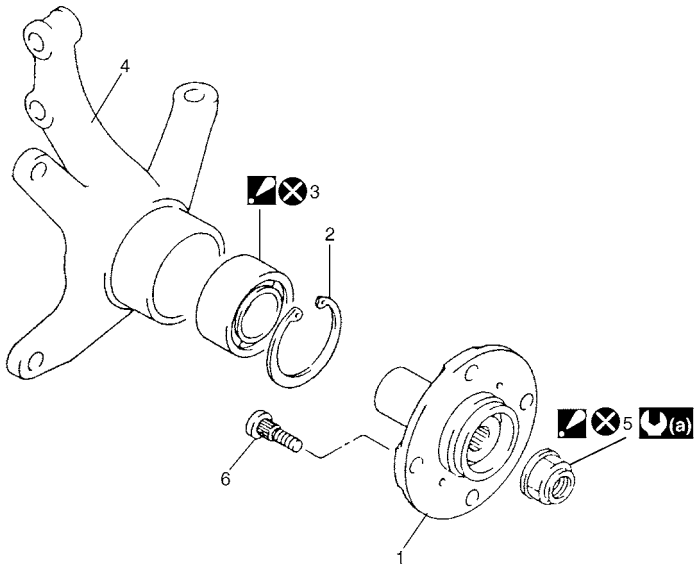
5) Compare strut resistance and number of rebalance on the right with those on the left. And they must be equal in both. With proper strut, vehicle body should come to stop the moments hands are off or after only one or two small rebalances.

If conditions of struts are in doubt, compare them with known-good vehicle or strut.

- Inspect bearing for wear, abnormal noise or gripping. If defective, replace.
- Inspect spring seat for cracks or deformation. If defective, replace.
- Inspect bump stopper for deterioration. If defective, replace.
- Inspect rebound stopper and strut mount for wear, cracks or deformation. If defective, replace.

Front Wheel Hub and Steering Knuckle Components

S4RS0A2206009



I4RS0A220015-

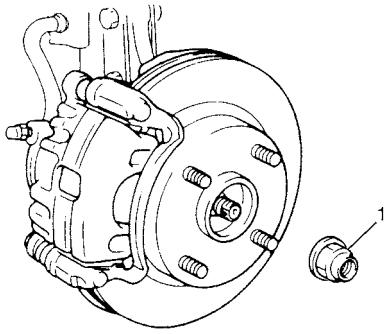
1. Front wheel hub	4. Steering knuckle	(a) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
2. Circlip	5. Drive shaft nut : Calk, after tightening.	⊗ : Do not reuse.
3. Wheel bearing : Face grooved rubber seal side to wheel hub.	6. Hub bolt	

Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation

S4RS0A2206010

Removal

1) Hoist vehicle and remove wheel.
2) Uncaulk drive shaft nut (1).
3) Depress foot brake pedal and hold it there. Remove drive shaft nut (1).
4) Remove caliper carrier bolts.



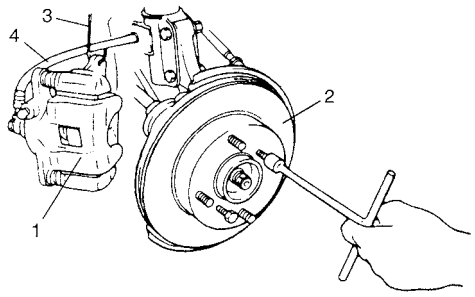
I4RS0A220016-

5) Remove caliper (1) with carrier.

NOTE:

Hang removed caliper with a wire hook or the like (3) so as to prevent brake hose (4) from bending and twisting excessively or being pulled.
Don operate brake pedal with pads removed.

6) Pull brake disc (2) off by using two 8 mm bolts.



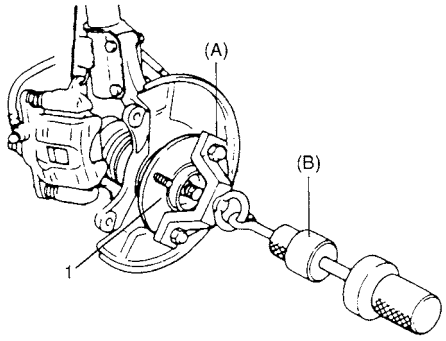
I2RH01220027-

7) Pull out wheel hub (1) with special tools.

Special tool
(A): 09943-17912
(B): 09942-15511

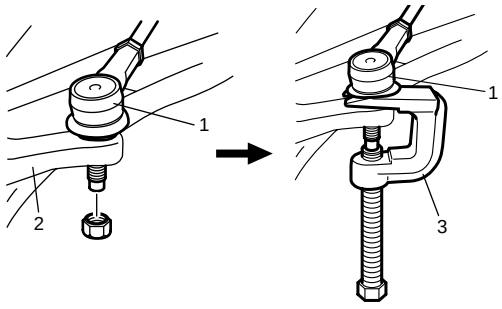
CAUTION:

When wheel hub is removed, replace wheel bearing with new one.



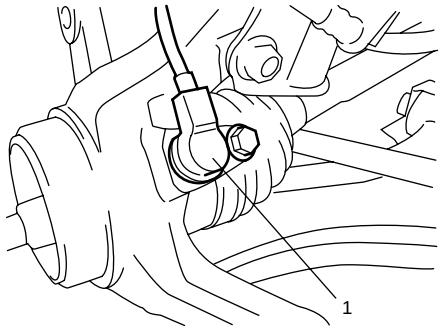
I2RH01220028-

8) Disconnect tie-rod end (1) from steering knuckle (2) with puller (3).



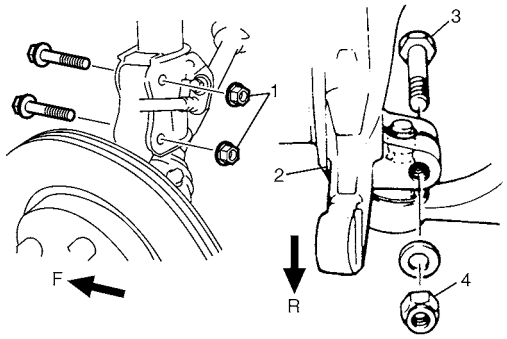
I4RS0A220017-

9) Remove wheel speed sensor (1) from knuckle (if equipped with ABS).



I4RS0A220018-

10) Loosen strut bracket nuts (1).
11) Remove ball joint bolt (3) and nut (4).
12) Remove strut bracket bolts from strut bracket and then steering knuckle (2).



I4RS0A220019-

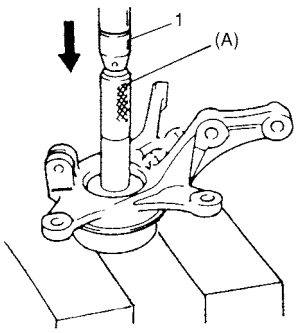
F:	Forward
R:	Rearward

13) Remove circlip from knuckle.
14) Using hydraulic press (1) and special tool, remove wheel bearing.

Special tool
(A): 09913-75520

CAUTION:

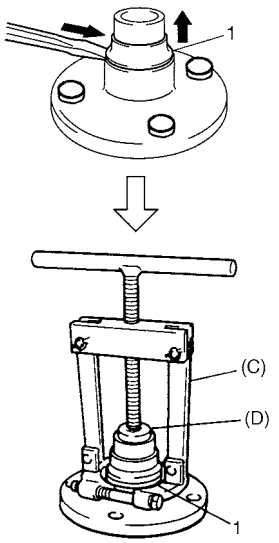
When installing wheel bearing, replace it with new one.



I2RH01220033-

15) Remove wheel bearing outside inner race (1).

Special tool
(C): 09913-65810
(D): 09913-85230

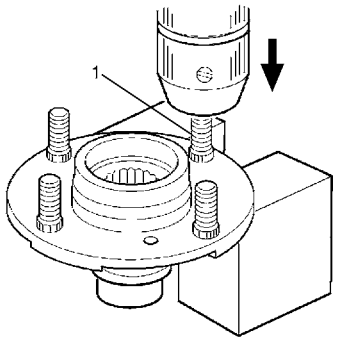


I3RH0A220006-

16) Remove hub bolts (1) with copper hammer or hydraulic press.

CAUTION:

Never remove bolt unless replacement is necessary.
Be sure to use a new bolt for replacement.



I4RS0A220020-

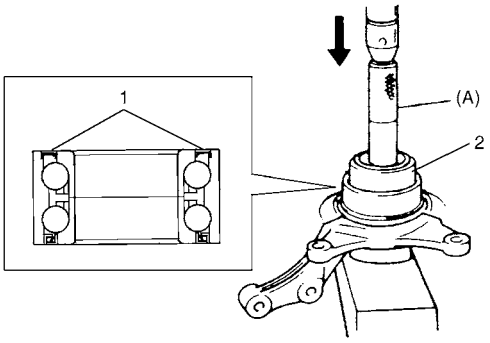
Installation
For installation, reverse removal procedure, noting the following instructions.

1) Face grooved rubber seal side (1) of new wheel bearing (2) upward as shown in figure and press-fit it into knuckle using special tool.

Special tool
(A): 09913-75510

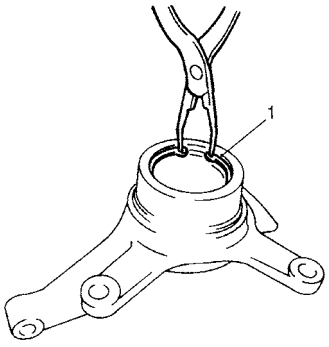
CAUTION:

When installing wheel bearing, replace it with new one.



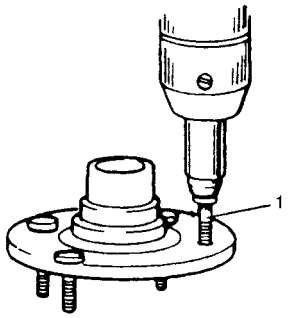
I4RS0A220021-

2) Install circlip (1).



I2RH01220037-

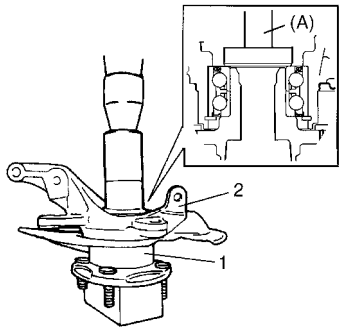
3) Insert new hub bolt (1) in hub hole. Rotate hub bolt slowly to assure that serrations are aligned with those made by original bolt.



I2RH01220040-

4) Using special tool, drive wheel hub (1) into steering knuckle (2) and then install steering knuckle (2) to strut and lower ball joint.

Special tool
(A): 09913-75520



I4RH01220012-

5) Install ball joint bolt (1) and nut (2) from the direction as shown in figure.
6) Tighten new suspension arm ball joint nut (2) to specified torque.

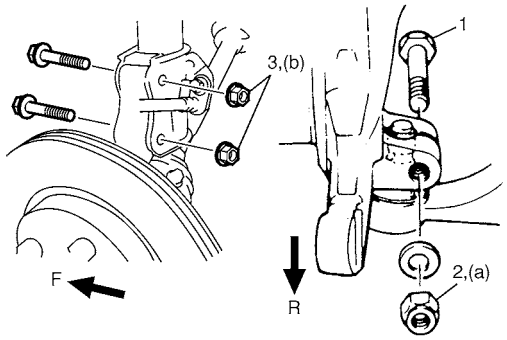
Tightening torque
Suspension arm ball joint nut (a): 60 N·m (6.0 kg-m, 43.5 lb-ft)

CAUTION:

Never reuse the removed suspension arm ball joint nut.

7) Tighten strut bracket nuts (3) to specified torque.

Tightening torque
Strut bracket nut (b): 105 N·m (10.5 kg-m, 76.0 lb-ft)

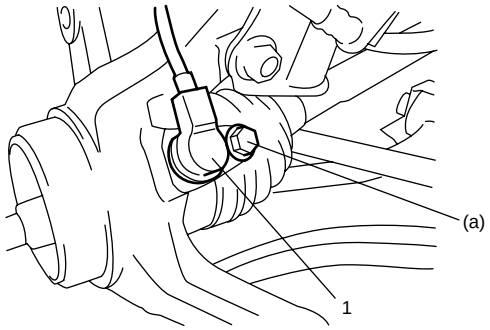


I4RS0A220022-

F:	Forward
R:	Rearward

8) Install ABS wheel speed sensor (1) (if equipped with ABS).

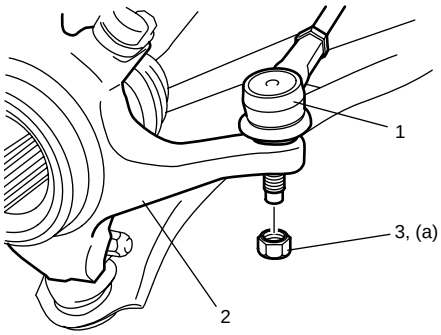
Tightening torque
ABS wheel speed sensor mounting bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I4RS0A220023-

9) Connect tie-rod end (1) to steering knuckle (2), tighten new nut (3) to specified torque.

Tightening torque
Tie-rod end nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)



I4RS0A220024-

10) Install brake disk (2) and brake caliper (3).
11) Tighten caliper carrier bolt to specified torque.

Tightening torque
Caliper carrier bolt: 85 N·m (8.5 kg-m, 61.5 lb-ft)

12) Depress foot brake pedal and hold it there.
Tighten new drive shaft nut (1) to specified torque.

Tightening torque
Drive shaft nut (a): 175 N·m (17.5 kg-m, 126.5 lb-ft)

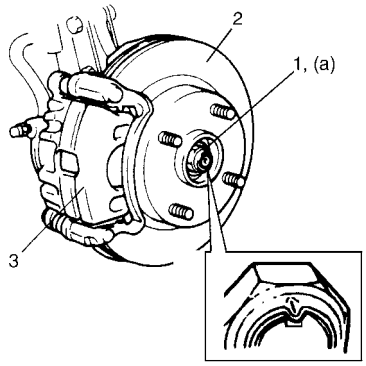
CAUTION:

Never reuse drive shaft nut (1).

13) Caulk drive shaft nut (1) as shown.

CAUTION:

Be careful while caulking nut so that no crack will occur in caulked part of nut. Cracked nut must be replaced with new one.



I4RS0A220025-

14) Tightening wheel nuts to specified torque.

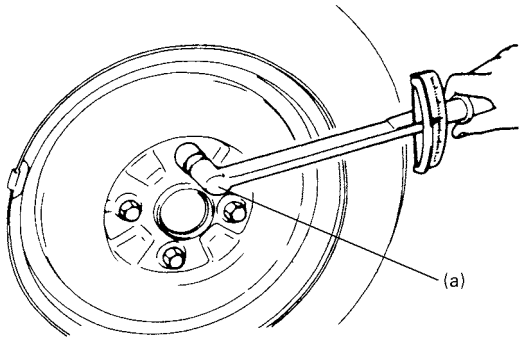
Tightening torque
Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

Front Wheel Hub, Disc, Nut and Bearing Check

S4RS0A2206012

- Inspect each wheel disc for dents, distortion and cracks.
  A disc in badly damaged condition must be replaced.
- Check installation face inside of wheel disc for rust.
  As rust affects adversely, remove it thoroughly.
- Check wheel nuts for tightness and, as necessary, retighten them to specification.
- Check wheel bolt press-fitted into wheel hub for wear, damage, poor thread condition, and looseness.
  Replace defective bolt with a new one.
  When bolt installation is found loose, replace both bolt and wheel hub with new ones.

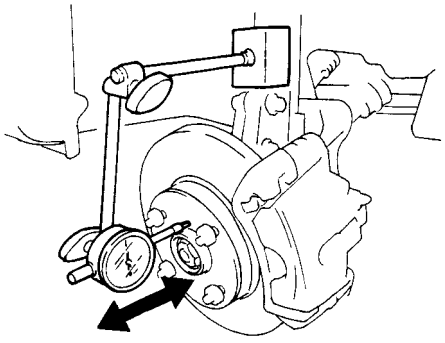
Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01220009-

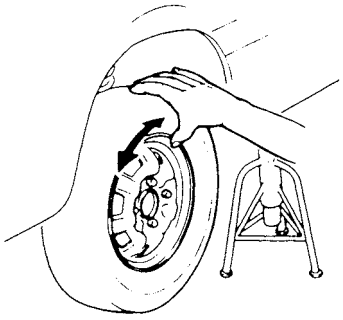
- Check wheel bearing for wear. When measuring thrust play, apply a dial gauge to wheel hub.

Thrust play limit
0.1 mm (0.004 in.)



I2RH01220010-

- By rotating wheel actually, check wheel bearing for noise and smooth rotation.
  If defective, replace bearing.



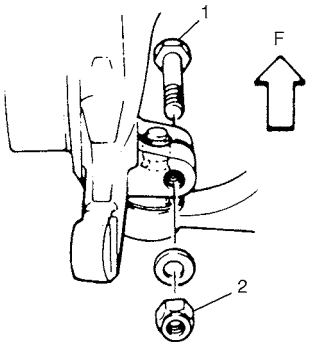
I2RH01220011-

Suspension Control Arm / Bushing Removal and Installation

S4RS0A2206013

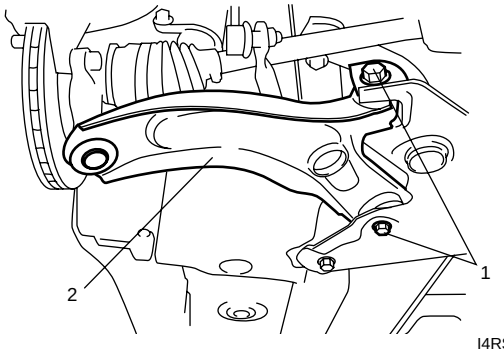
Removal

1) Remove suspension control arm ball joint bolt (1) and nut (2).



I2RH01220046-

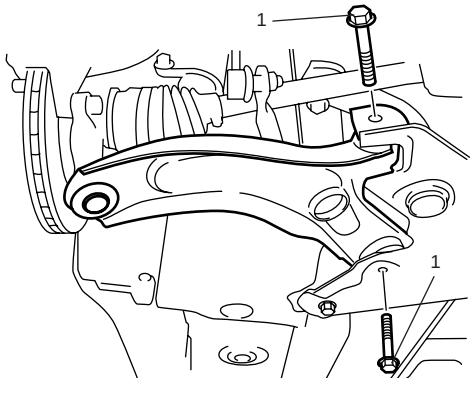
2) Remove suspension control arm bolts (1).
3) Remove suspension control arm (2).



I4RS0A220026-

Installation

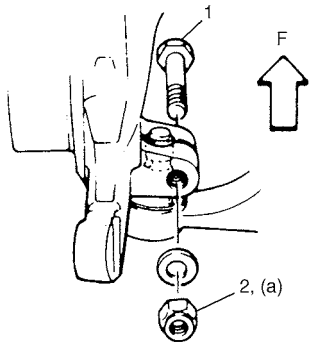
1) Install suspension control arm as shown but tighten new suspension control arm bolts (1) only temporarily.



I4RS0A220027-

2) Install suspension control arm ball joint to steering knuckle. Align ball stud groove with steering knuckle bolt hole. Then install ball joint bolt (1) from the direction as shown in figure. Tighten new suspension arm ball joint nut (2) to specified torque.

Tightening torque
Suspension arm ball joint nut (a): 60 N·m (6.0 kg-m, 43.5 lb-ft)

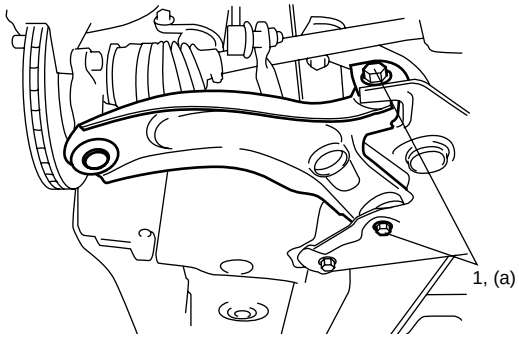


I2RH01220054-

F: Forward

3) Lower hoist and vehicle in non-loaded condition, tighten control arm mounting bolts (1) to specified torque.

Tightening torque
Control arm mounting bolt (a): 170 N·m (17.0 kg-m, 123.0 lb-ft)



I4RS0A220028-

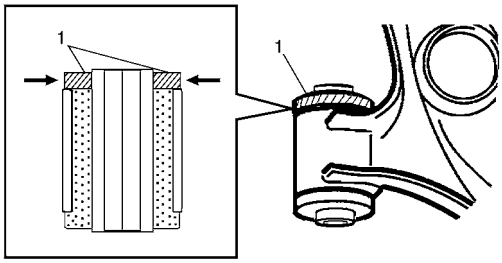
4) Confirm front wheel alignment referring to “Front Wheel Alignment Inspection and Adjustment: ”.

Suspension Control Arm / Bushing Disassembly and Assembly

S4RS0A2206014

Disassembly

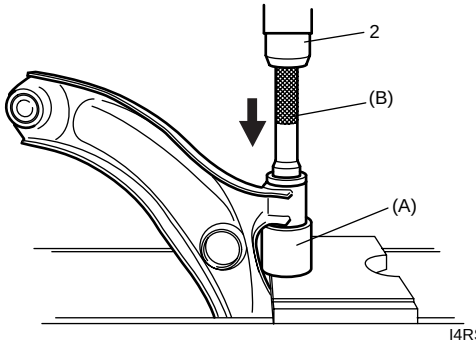
1) Cut off bushing flange (rubber) (1) with knife.



I4RS0A220029-

2) Push out bushing by using hydraulic press (2) and special tools.

Special tool
(A): 09943–76310
(B): 09913–75821



I4RS0A220030-

Assembly

1) Front bushing
Press-fit front bushing (1) by using special tools and press (2).

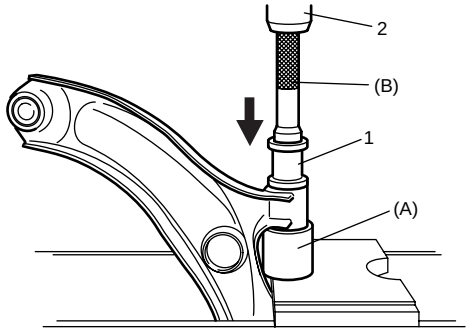
Special tool
(A): 09943–76310
(B): 09913–75821

CAUTION:

Be sure to use new bushing.

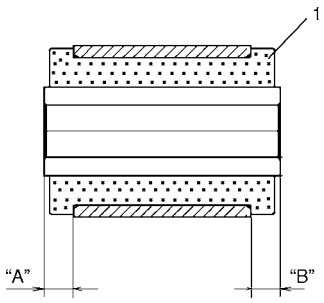
NOTE:

- **Before installing bushing, apply soap water on its circumference to facilitate installation.**



I4RS0A220032-

2) Press-fit bushing (1) so that dimensions and in figure become equal.

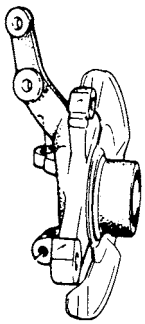


I4RS0A220033-

Suspension Control Arm / Steering Knuckle Check

S4RS0A2206015

Inspect for cracks, deformation or damage.
If defective, replace.

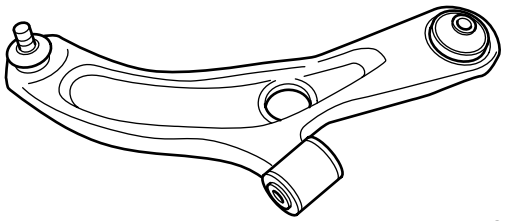


I2RH01220005-

Suspension Control Arm Bushing Check

S4RS0A2206016

Inspect for damage, wear or deterioration.
If defective, replace.



I4RS0A220035-

Suspension Control Arm Joint Check

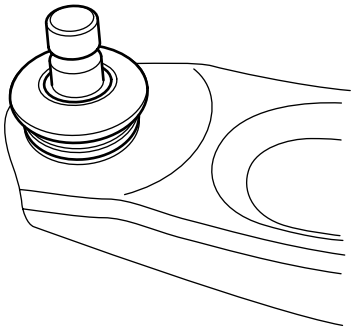
S4RS0A2206017

- Check for smooth rotation.
- Inspect ball stud for damage.
- Inspect dust cover for damage.

NOTE:

Suspension control arm and arm joint cannot be separated.

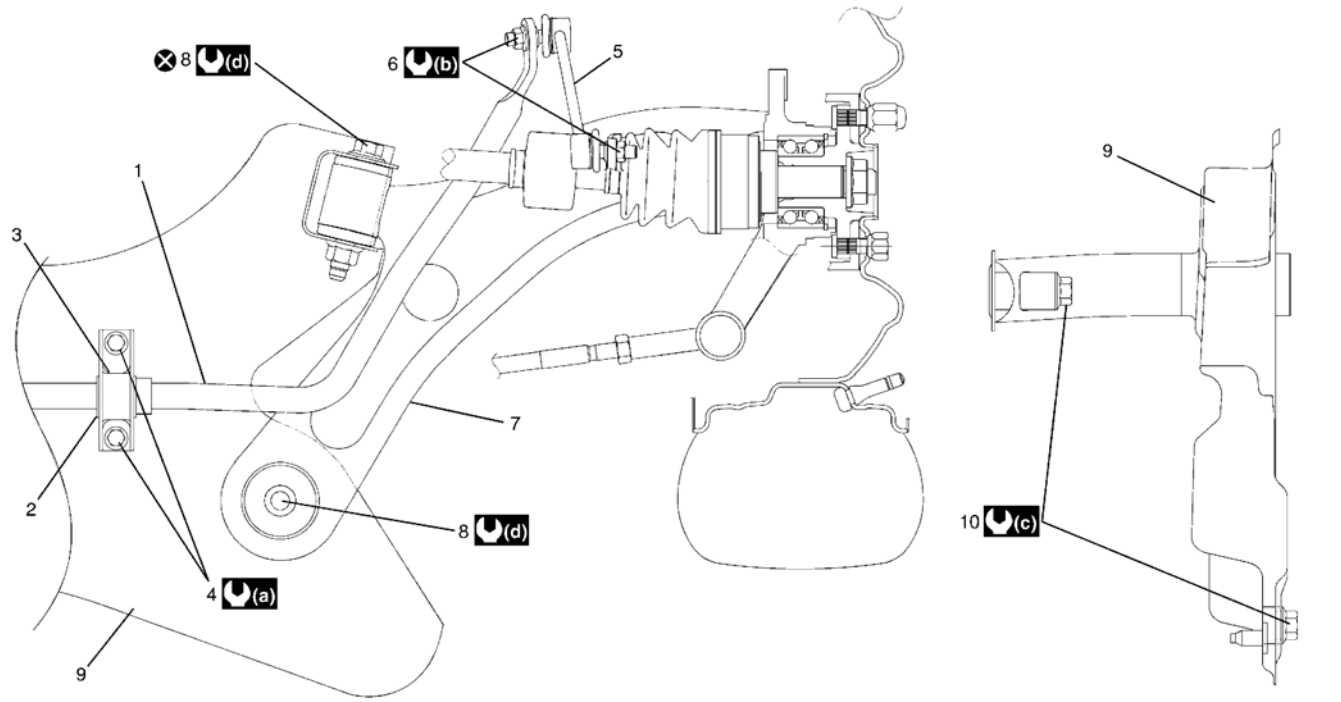
If there is any damage to either, control arm assembly must be replaced as a complete unit.



I4RS0A220036-

Front Suspension Frame, Stabilizer Bar and/or Bushings Components

S4RS0A2206018



I4RS0A220037-

1. Stabilizer bar	5. Stabilizer joint	9. Suspension frame	(c) : 150 N·m (15.0 kg-m, 108.5 lb-ft)
2. Stabilizer bushing	6. Stabilizer joint nut	10. Suspension frame mounting bolt	(d) : 170 N·m (17.0 kg-m, 123.0 lb-ft)
3. Stabilizer mounting bracket	7. Suspension control arm	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)	: Do not reuse.
4. Stabilizer bar mounting bracket bolt	8. Control arm mounting bolt	(b) : 50 N·m (5.0 kg-m, 36.5 lb-ft)	

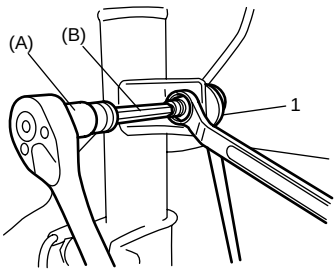
Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation

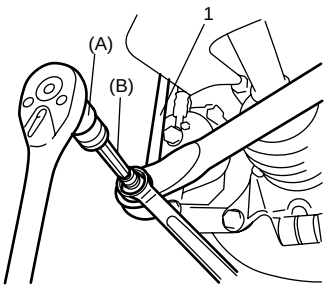
S4RS0A2206019

Removal

1) Hoist vehicle and remove wheels (right & left).
2) Remove suspension control arm referring to “Suspension Control Arm / Bushing Removal and Installation: ”.
3) Remove stabilizer joints (1).
   When loosening joint nut, hold stud with special tools.

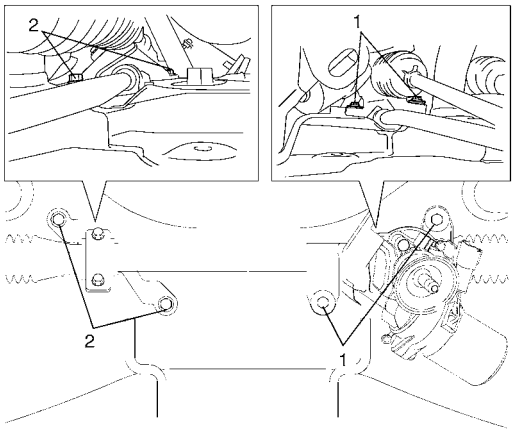
   Special tool
   (A): 09900–00411 (socket)
   (B): 09900–00413 (5 mm)





I4RS0A220038-

4) Support engine assemble by using supporting device referring to “Engine Supporting Points: in Section 0A”.
5) Remove steering gear case No.1 bolts (1) and No.2 bolts (2).



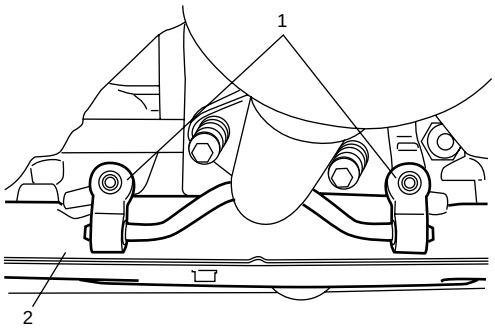
I4RS0A220039-

3. Suspension frame

6) Disconnect muffler No.1 mounting (1) from suspension frame (2).

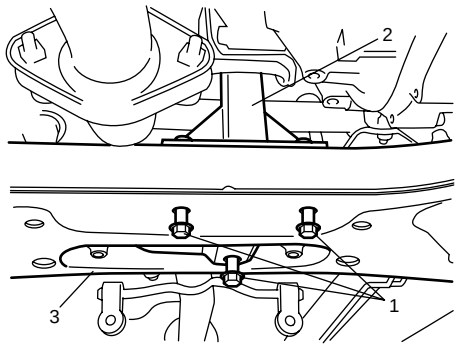
WARNING:

To avoid danger of being burned, do not touch exhaust system when it is still hot. Any service on exhaust system should be performed when it is cool.



I4RS0A220040-

7) Remove engine rear mounting bolts (1) from engine rear mounting (2).



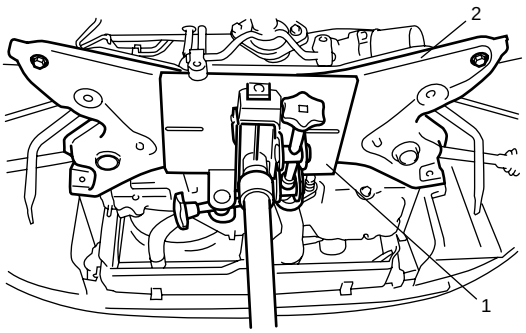
I4RS0A220041-

3. Suspension frame

8) Support suspension frame by using mission jack (1) under suspension frame (2).

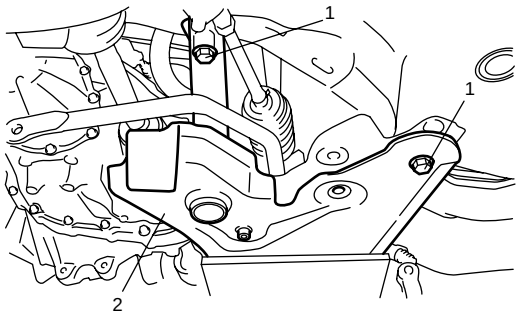
WARNING:

When removing suspension frame, be sure to apply some supporting equipment (such as jack) under it at well-balanced position in the center section so as to prevent suspension frame dropping.



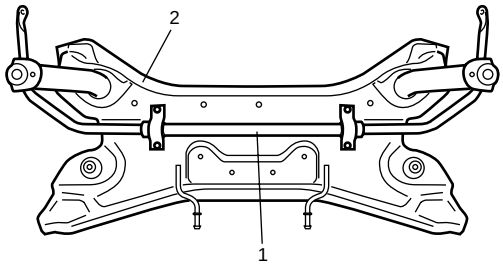
I4RS0A220042-

9) Remove suspension frame mounting bolts (1), and then lower mission jack and remove suspension frame (2) with stabilizer bar.



I4RS0A220043-

10) Remove stabilizer bar (1) and bushing from suspension frame (2).



I4RS0A220044-

Installation

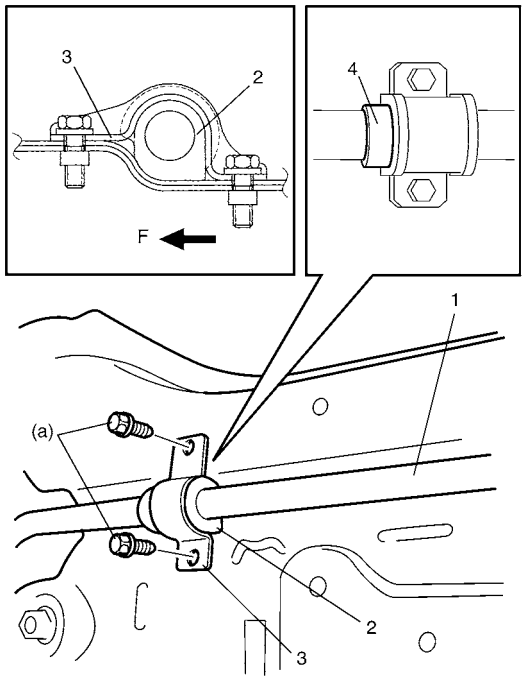
1) When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side.
2) Install stabilizer bar (1), stabilizer bushing (2) and stabilizer mounting bracket (3) to suspension frame as shown in figure.

NOTE:

For correct installation of stabilizer bar, side-to-side, be sure that stopper ring (4) on stabilizer bar aligns with mount bush, both right and left, as shown in figure.

3) Tighten stabilizer bar mounting bracket bolts to specified torque.

Tightening torque
Stabilizer bar mounting bracket bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



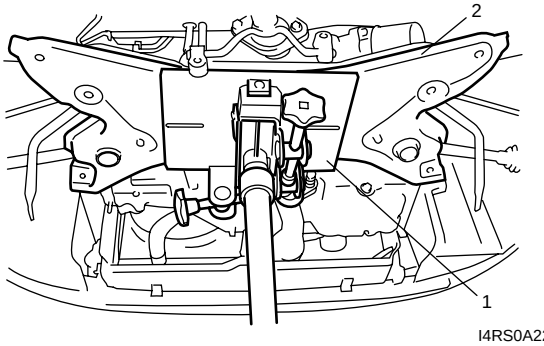
I4RS0A220055-

F: Forward

4) Support suspension frame (2) with stabilizer bar by using mission jack (1), and jack up it.

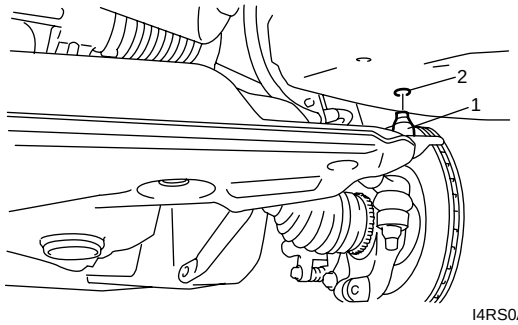
WARNING:

When mounting suspension frame, be sure to apply some supporting equipment (such as jack) under it at well-balanced position in the center section so as to prevent suspension frame dropping.



I4RS0A220046-

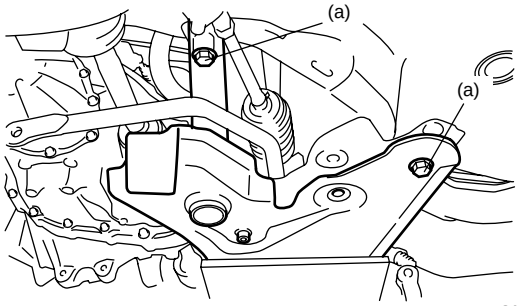
5) Align lugs (1) (right and left) of suspension frame with holes (2) in vehicle body respectively.



I4RS0A220047-

6) Install suspension frame mounting bolts (a) to specified torque.

Tightening torque
Suspension frame mounting bolt (a): 150 N·m (15.0 kg-m, 108.5 lb-ft)

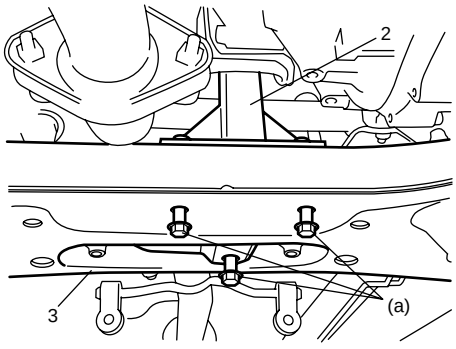


I4RS0A220048-

7) Lower mission jack.

8) Install engine rear mounting bolts (a) to specified torque.

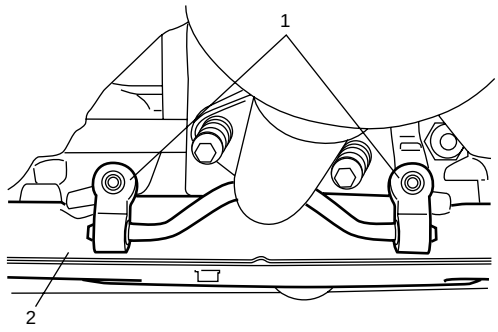
Tightening torque
Engine rear mounting bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)



I4RS0A220049-

2. Engine rear mounting
3. Suspension frame

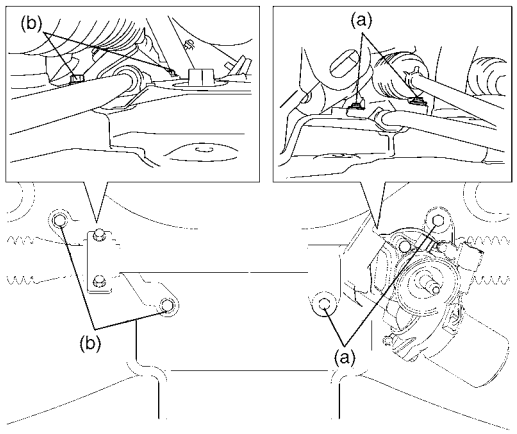
9) Connect muffler No.1 mounting (1) to suspension frame (2).



I4RS0A220040-

10) Install steering gear case No.1 bolts (a) and No.2 bolts (b) to specified torque

Tightening torque
Steering gear case No.1 bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
Steering gear case No.2 bolt (b): 55 N·m (5.5 kg-m, 40.0 lb-ft)



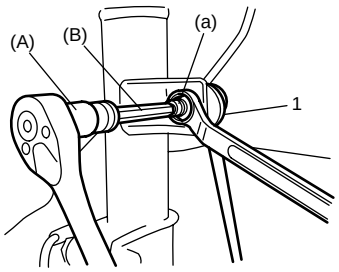
I4RS0A220050-

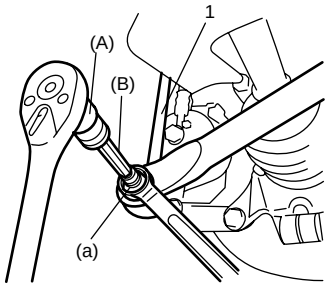
11) Remove supporting device from engine.

12) Install stabilizer joints (1), and tighten nuts to specified torque.
When tightening, hold stud with special tools.

Special tool
(A): 09900–00411 (socket)
(B): 09900–00413 (5 mm)

Tightening torque
Stabilizer joint nut (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)





I4RS0A220051-

13) Install suspension control arm referring to "Suspension Control Arm / Bushing Removal and Installation: ".

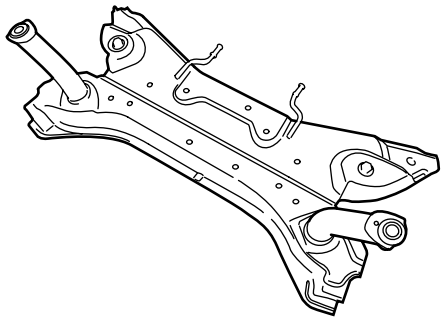
14) Install wheels (right & left) and lower hoist.

15) Confirm front wheel alignment referring to "Front Wheel Alignment Inspection and Adjustment: ".

Front Suspension Frame Check

S4RS0A2206020

Inspect for cracks, deformation or damage.
If defective, replace.



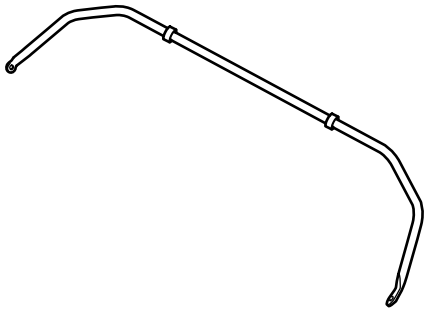
I4RS0A220054-

Front Stabilizer Bar, Bushing and/or Joint Check

S4RS0A2206022

Stabilizer Bar

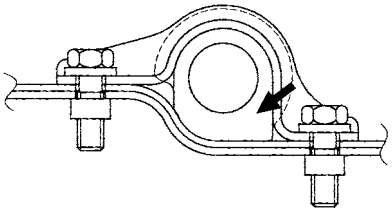
Inspect for damage or deformation.
If defective, replace.



I4RS0A220052-

Stabilizer Bushing

Inspect for damage, wear or deterioration.
If defective, replace.



I4RS0A220056-

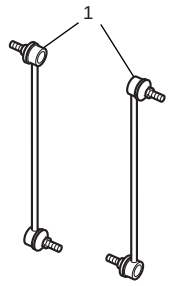
Stabilizer Joint

1) Check for smooth rotation.
2) Inspect ball stud for damage.
3) Inspect dust cover for damage.

NOTE:

Stabilizer joint (1) cannot be disassembled.

If there is any damage to either, stabilizer joint assembly must be replaced as a complete unit.



I4RH01220007-

Front Suspension Fasteners Check

S4RS0A2206021

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque, referring to “Front Suspension Construction: ”.

Specifications

Tightening Torque Specifications

S4RS0A2207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Tie-rod end lock nut	45	4.5	32.5	☞
Strut bracket nut	105	10.5	76.0	☞ / ☞
Brake hose mounting bolt	25	2.5	18.0	☞
Stabilizer joint nut	50	5.0	36.5	☞ / ☞
Strut nut	50	5.0	36.5	☞
Wheel nut	85	8.5	61.5	☞ / ☞ / ☞
Strut support lower nut	50	5.0	36.5	☞
Suspension arm ball joint nut	60	6.0	43.5	☞ / ☞
ABS wheel speed sensor mounting bolt	25	2.5	18.0	☞
Tie-rod end nut	45	4.5	32.5	☞
Caliper carrier bolt	85	8.5	61.5	☞
Drive shaft nut	175	17.5	126.5	☞
Control arm mounting bolt	170	17.0	123.0	☞
Stabilizer bar mounting bracket bolt	23	2.3	17.0	☞
Suspension frame mounting bolt	150	15.0	108.5	☞
Engine rear mounting bolt	55	5.5	40.0	☞
Steering gear case No.1 bolt	55	5.5	40.0	☞
Steering gear case No.2 bolt	55	5.5	40.0	☞

NOTE:

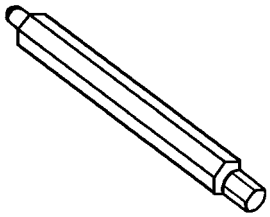
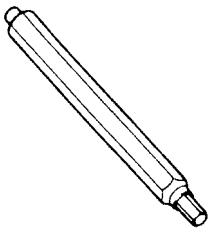
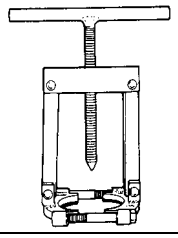
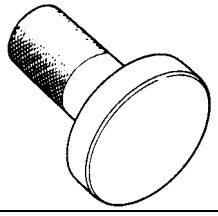
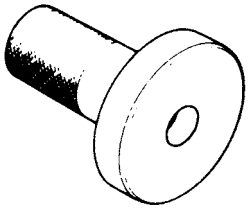
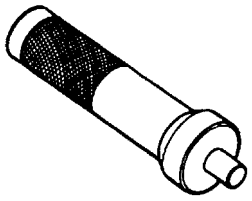
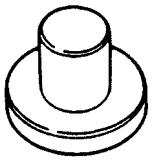
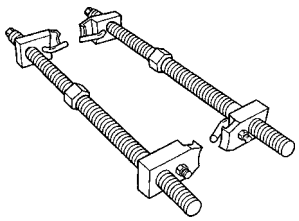
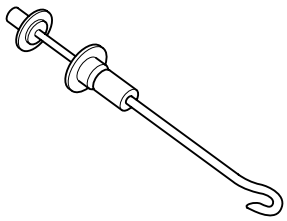
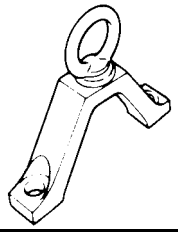
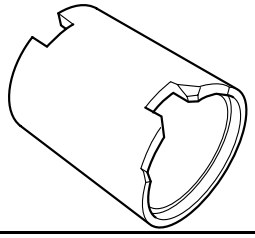
The specified tightening torque is also described in the following.
“Front Suspension Construction: ”
“Front Strut Assembly Components: ”
“Front Wheel Hub and Steering Knuckle Components: ”
“Front Suspension Frame, Stabilizer Bar and/or Bushings Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A2208001

09900–00411 Hexagon bit socket ☞ / ☞ / ☞ / ☞ / ☞ 	09900–00413 Hexagon bit (5 mm) ☞ / ☞ / ☞ 
09900–00414 Hexagon bit (6 mm) ☞ / ☞ 	09913–65810 Crankshaft bearing puller ☞ 
09913–75510 Bearing installer ☞ 	09913–75520 Bearing installer ☞ / ☞ 
09913–75821 Bearing installer attachment ☞ / ☞ 	09913–85230 Bearing remover tool ☞ 
09940–71431 Suspension spring compressor ☞ 	09942–15511 Sliding hammer ☞ 
09943–17912 Wheel hub remover ☞ 	09943–76310 Bush remover ☞ / ☞ 

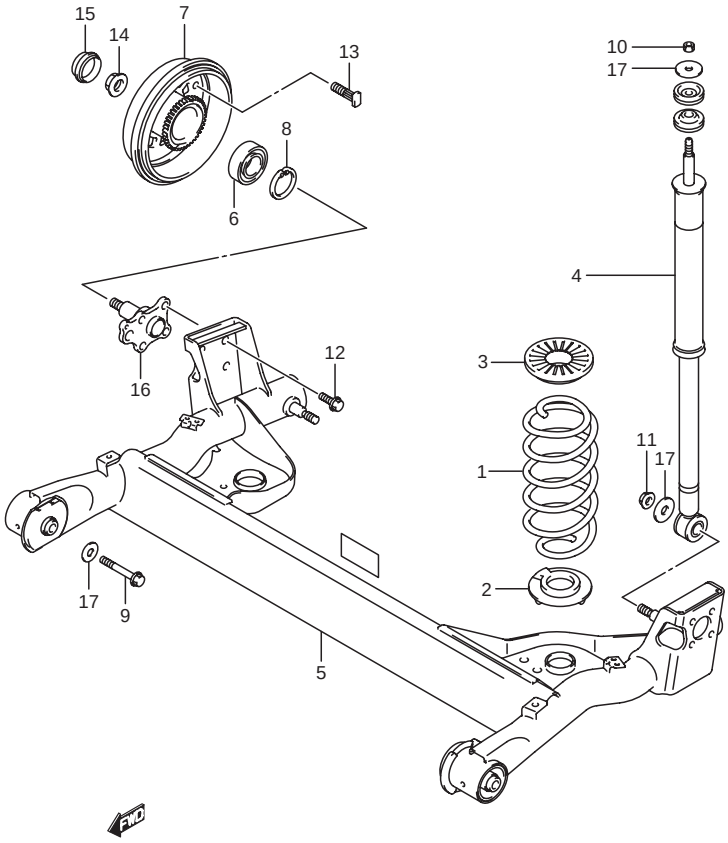
Rear Suspension

General Description

Rear Suspension Construction

S4RS0A2301001

2WD Vehicle



I4RS0A230001-

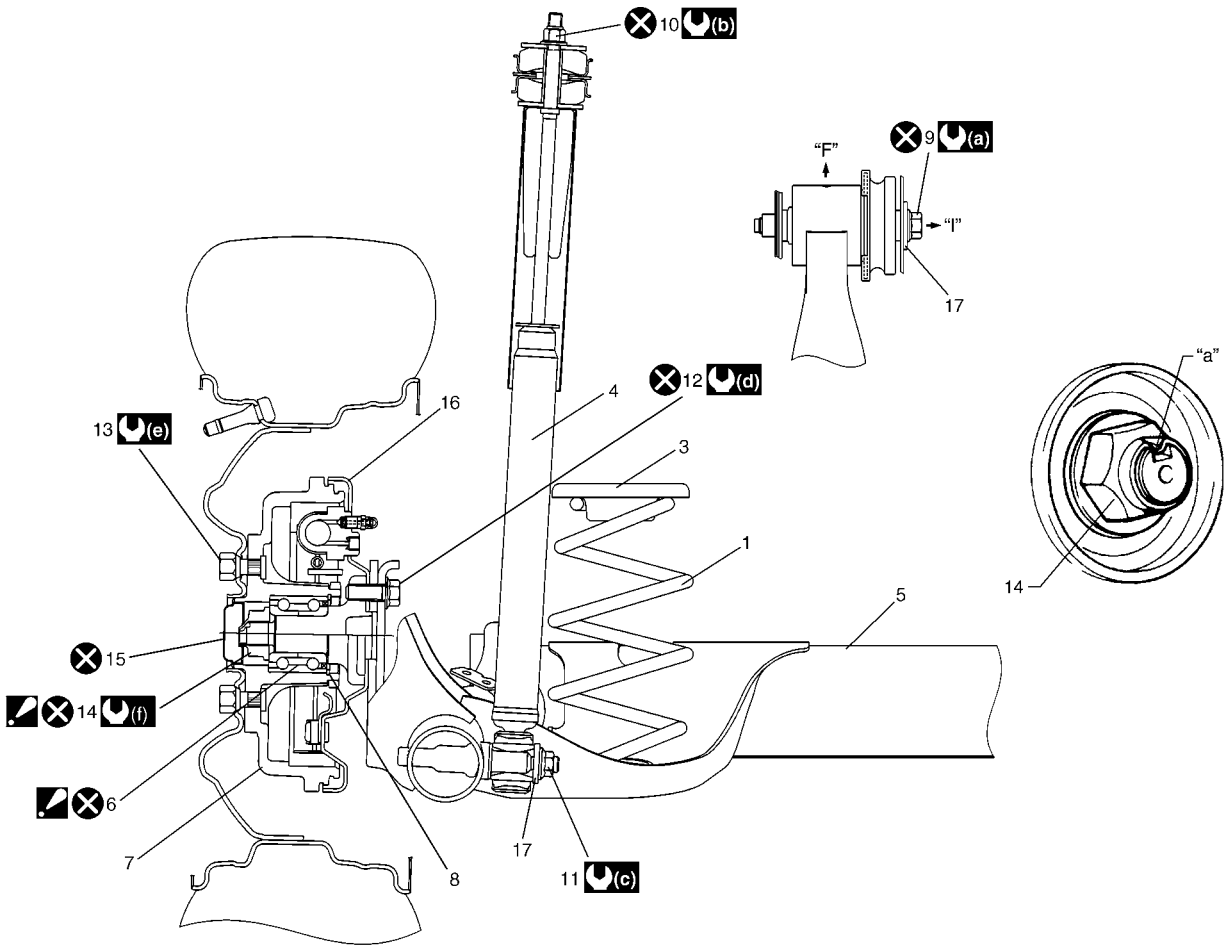
1. Rear coil spring	6. Wheel bearing	11. Rear shock absorber lower nut	16. Rear spindle
2. Rear spring lower seat	7. Brake drum	12. Rear spindle bolt	17. Washer
3. Rear spring upper seat	8. Circlip	13. Wheel stud bolt	
4. Rear shock absorber	9. Rear trailing arm bolt	14 Rear spindle nut	
5. Rear axle	10. Rear shock absorber upper nut	15. Spindle cap	

Component Location

Rear Suspension Component Location

S4RS0A2303001

2WD Vehicle



I4RS0A230002-

1. Rear coil spring	8. Circlip	15. Spindle cap	(c) : 90 N·m (9.0 kg-m, 65.0 lb-ft)
2. Blank	9. Rear trailing arm bolt	16. Brake back plate	(d) : 75 N·m (7.5 kg-m, 54.0 lb-ft)
3. Rear spring upper seat	10. Rear shock absorber upper nut	17. Washer	(e) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
4. Rear shock absorber	11. Rear shock absorber lower nut	"F"?: Front side	(f) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
5. Rear axle	12. Rear spindle bolt	"I"?: Body inside	: Do not reuse.
6. Wheel bearing : Seal side of bearing comes brake back plate side.	13. Wheel nut	(a) : 75 N·m (7.5 kg-m, 54.5 lb-ft)	
7. Brake drum	14. Rear spindle nut : Caulk spindle nut as shown "a"?.	(b) : 25 N·m (2.5 kg-m, 18.0 lb-ft)	

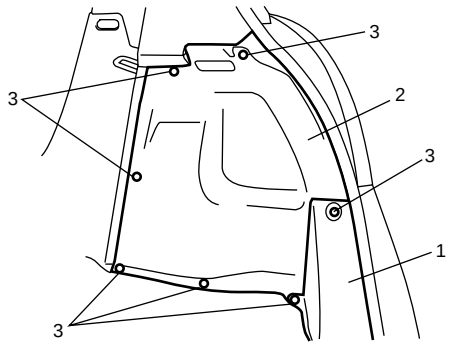
Repair Instructions

Rear Shock Absorber Removal and Installation

S4RS0A2306028

Removal

1) Hoist vehicle.
2) Remove tail end member trim (1) and quarter inner trim (2).



I4RS0A230003-

3. Clip

3) Support rear axle by using floor jack to prevent it from lowering.
4) Remove absorber lower nut.
5) Remove absorber upper nut. Then remove shock absorber.

Installation

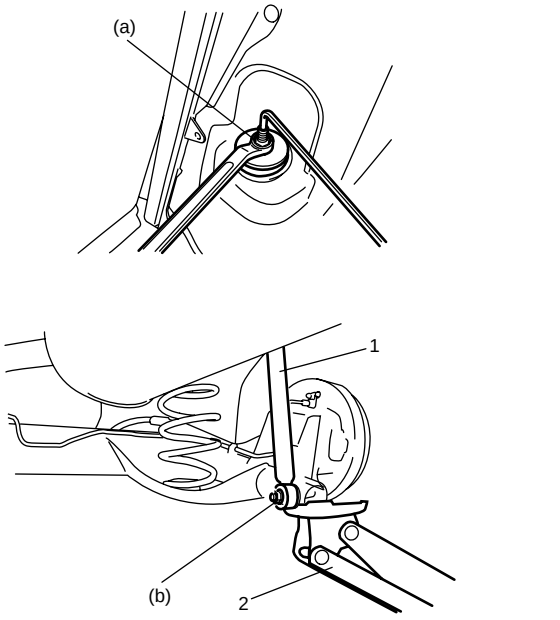
1) Install shock absorber (1).
   Tighten new rear shock absorber upper nut and lower nut temporarily at this step.

   CAUTION:

   Never reuse the removed rear shock absorber upper nut.

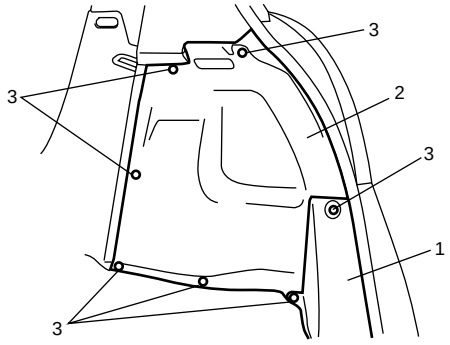
2) Remove floor jack (2) from rear axle and lower hoist.
3) Tighten nuts to specified torque.

   Tightening torque
   Rear shock absorber upper nut (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
   Rear shock absorber lower nut (b): 90 N·m (9.0 kg-m, 65.0 lb-ft)



I4RS0A230004-

4) Install tail end member trim (1) and quarter inner trim (2).



I4RS0A230003-

3. Clip

Rear Shock Absorber Inspection

S4RS0A2306029

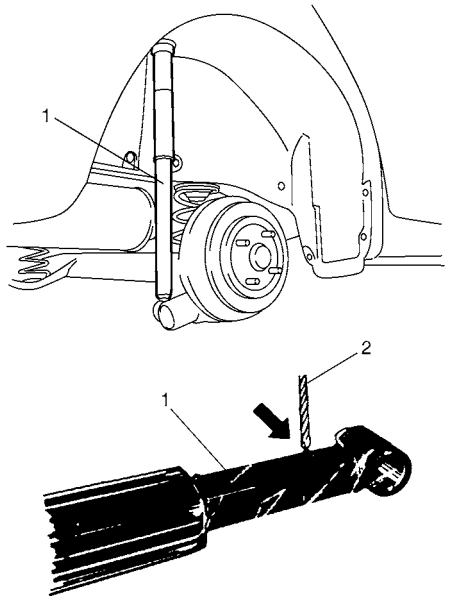
- Inspect for deformation or damage.
- Inspect bushings for wear or damage.
- Inspect for evidence of oil leakage.

Replace any defective part.

WARNING:

When handling rear shock absorber (1) in which high-pressure gas is sealed, make sure to observe the following precautions.

- **Don't disassemble it.**
- **Don't put it into the fire.**
- **Don't store it where it gets hot.**
- **Before disposing it, be sure to drill a hole (approximately 3 mm (0.12 in.) diameter) (2) in it where shown by an arrow in the figure and let gas and oil out.**
  Lay it down sideways for this work. The gas itself is harmless but it may issue out of the hole together with chips generated by the drill. Therefore, be sure to wear goggle.



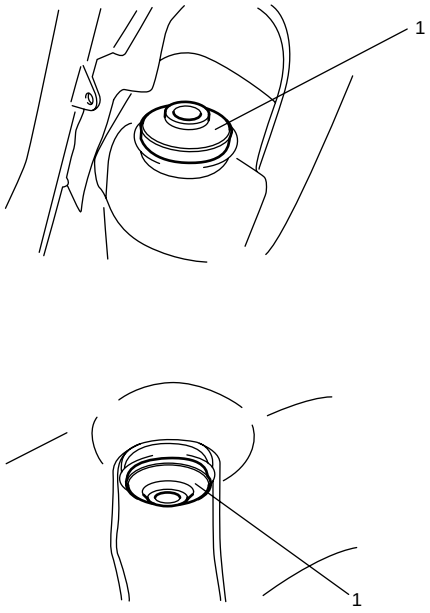
I4RS0A230005-

Rear Shock Absorber Bush Removal and Installation

S4RS0A2306040

Removal

1) Remove rear shock absorber referring to "Rear Shock Absorber Removal and Installation: ".
2) Remove rear shock absorber bushes (1).



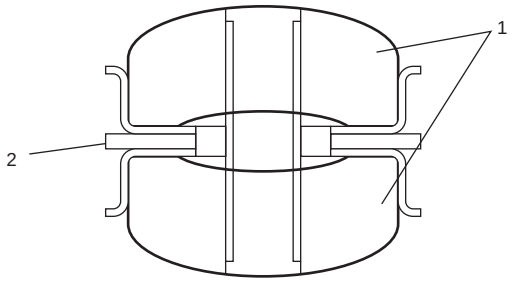
I4RS0A230006-

Installation

1) Install rear shock absorber bushes (1).

NOTE:

For proper installing direction of shock absorber bushes (1), refer to the figure.



I4RS0A230007-

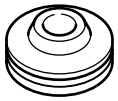
2. Body panel

2) Install rear shock absorber referring to "Rear Shock Absorber Removal and Installation: ".

Rear Shock Absorber Bush Inspection

S4RS0A2306041

Inspect for cracks, deformation or damage. Replace any defective part.



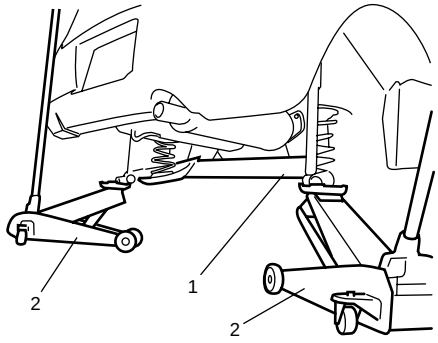
I4RS0A230008-

Coil Spring Removal and Installation

S4RS0A2306030

Removal

1) Hoist vehicle and remove rear wheels.
2) Support rear axle (1) by using two floor jacks (2) to prevent it from lowering.



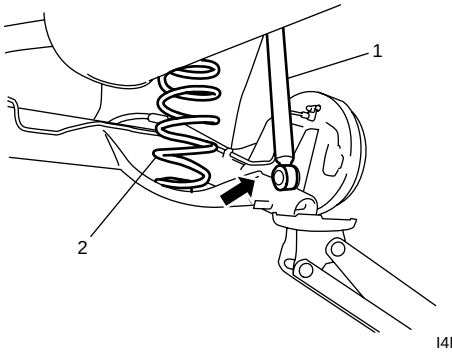
I4RS0A230009-

3) Detach shock absorbers (1) lower side (right & left) from rear axle.
4) Lower rear axle gradually as far down as where coil spring (2) can be removed.

CAUTION:

Be careful not to let rear axle down too much. It may cause damage to brake flexible hose, wheel speed sensor lead wire and parking brake cable.

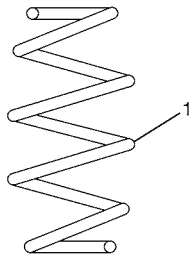
5) Remove coil spring (2).

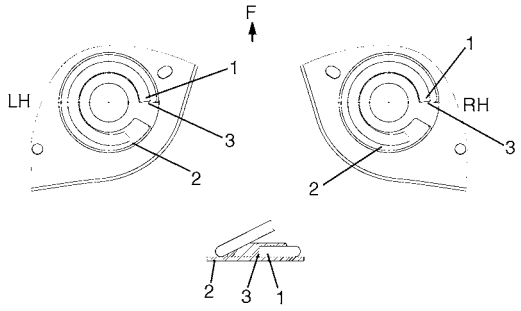


I4RS0A230010-

Installation

1) Install coil spring (1) on spring seat (2) of rear axle and mate spring open end with stepped part (3) of spring lower seat and raise rear axle.

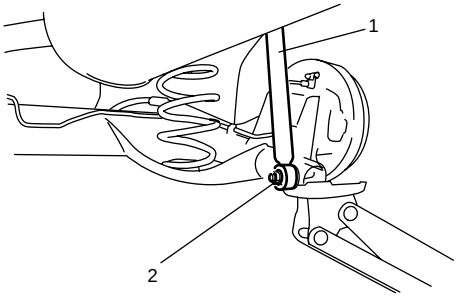




I4RS0A230011-

F: Front side

2) Install shock absorbers (1) lower side (right & left) to rear axle.
Tighten shock absorber lower nuts (2) temporarily by hand at this step.

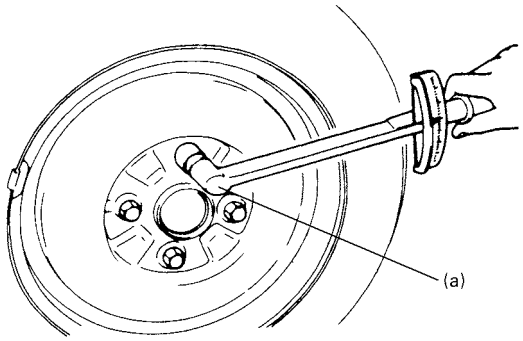


I4RS0A230012-

3) Remove floor jacks from rear axle.

4) Install wheels and tighten wheel nuts to specified torque.

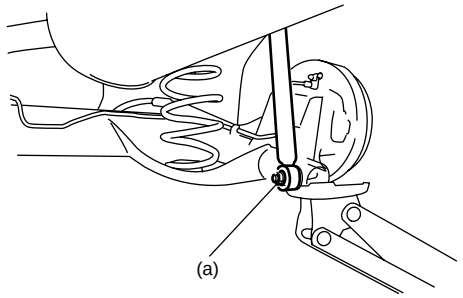
Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01220009-

5) Lower hoist and vehicle in non-loaded condition, tighten absorber lower nuts (a) to specified torque.

Tightening torque
Rear shock absorber lower nut (a): 90 N·m (9.0 kg-m, 65.0 lb-ft)

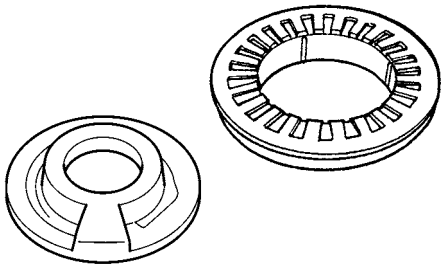


I4RS0A230013-

Spring Upper Seat / Spring Lower Seat Inspection

S4RS0A2306032

Inspect for cracks, deformation or damage. Replace any defective part.



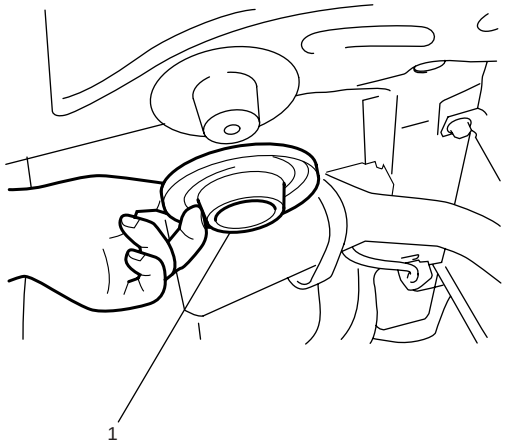
I4RS0A230015-

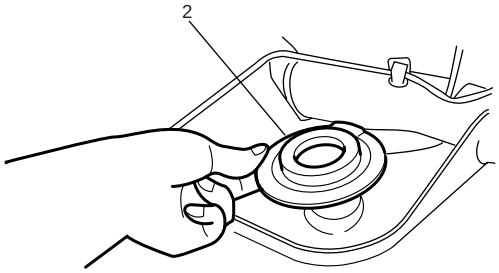
Spring Upper Seat and Lower Seat Removal and Installation

S4RS0A2306033

Removal

1) Remove coil spring referring to “Coil Spring Removal and Installation: ”.
2) Remove spring upper seat (1) and lower seat (2).





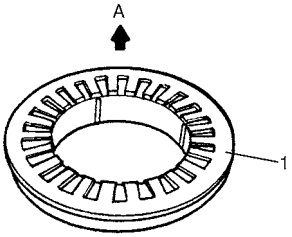
I4RS0A230016-

Installation

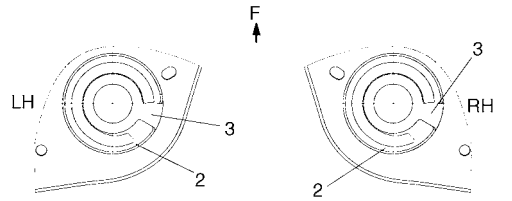
1) Install spring upper seat (1) and lower seat (2).

NOTE:

For proper installing direction of spring upper seat (1) and lower seat (2), refer to the figure.



I3RM0A230021-



I4RS0A230017-

A: Vehicle body side (Upper side)	LH: Left side
F: Front side	RH: Right side
3. Stepped part	

2) Install coil spring referring to “Coil Spring Removal and Installation: ”.

Rear Axle Removal and Installation

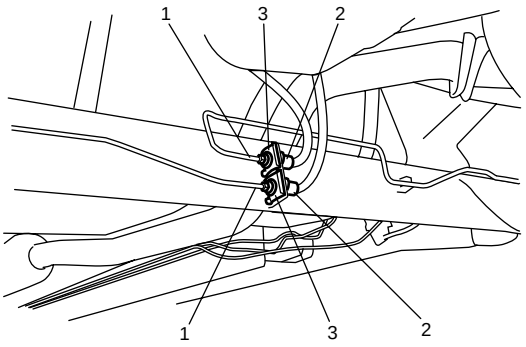
S4RS0A2306035

Removal

1) Hoist vehicle and remove rear wheels (right & left) referring to “Wheel Removal and Installation: in Section 2D”.
2) Remove rear brake drums (right & left). For details, refer to Steps 2) to 6) of “Rear Brake Drum Removal and Installation: in Section 4C”.
3) Disconnect brake pipes (1) from brake hoses (2) and remove E-rings (3).

CAUTION:

Do not allow brake fluid to get on painted surfaces



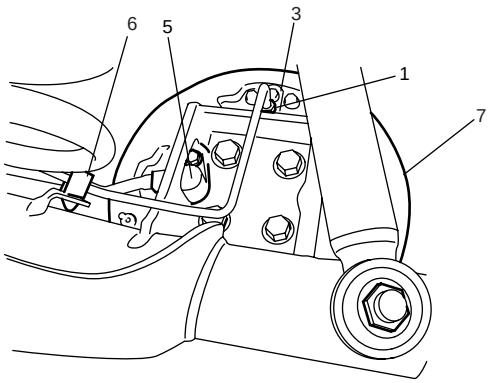
I4RS0A230018-

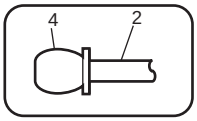
4) Disconnect brake pipe flare nuts (1) from wheel cylinders (3) (right & left) and put bleeder plug cap (4) onto pipe (2) to prevent fluid from spilling.

CAUTION:

Do not allow brake fluid to get on painted surfaces.

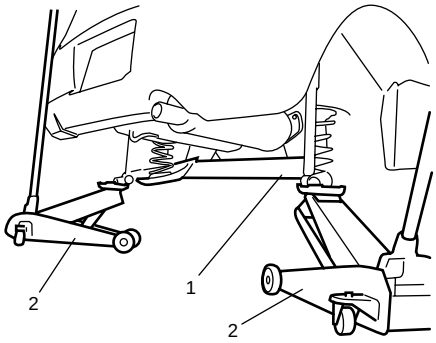
5) Disconnect wheel speed sensors (5) and lead wire clamps (6) (right & left) (if equipped).
6) Remove brake back plates (7) and spindles (right & left) from rear axle and hang removed brake back plate with a wire hook.





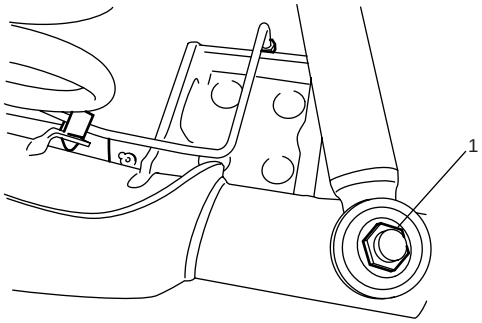
I4RS0A230043-

7) Support rear axle (1) by using two floor jacks (2).



I4RS0A230009-

8) Remove shock absorber lower washers and nuts (1) (right & left).



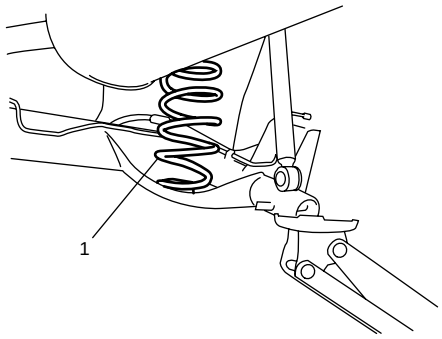
I4RS0A230019-

9) Lower rear axle gradually as far down as where coil springs (1) (right & left) can be removed.

CAUTION:

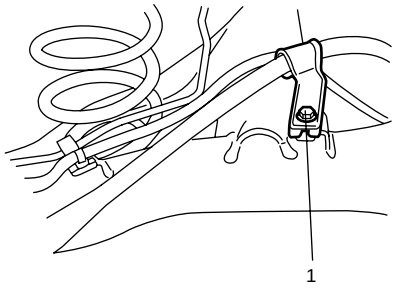
Be careful not to let rear axle down too much. It may cause damage to brake flexible hose, wheel speed sensor lead wire and parking brake cable.

10) Remove coil springs (1) (right & left).



I4RS0A230020-

11) Disconnect wheel speed sensor clamp and parking brake cable clamp from rear axle.

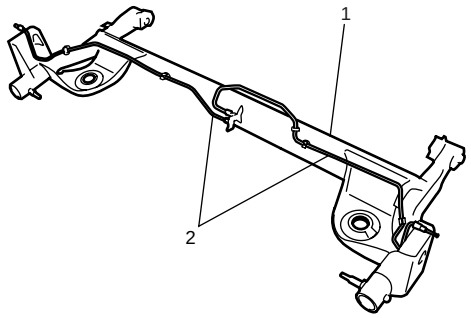


I4RS0A230021-

1. Parking brake cable clamp bolt

12) While supporting rear axle (1) at both ends (right & left), remove rear trailing arm bolts and then remove rear axle from chassis by lowering floor jack gradually.

13) Remove brake pipes (2) from rear axle (1) if necessary.

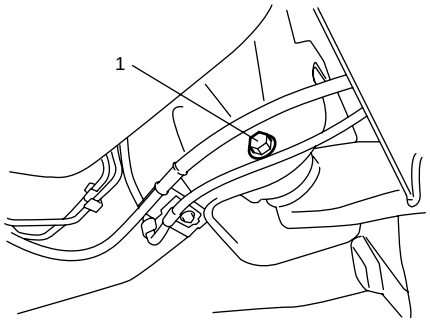


I4RS0A230022-

Installation

1) Install brake pipes to rear axle.

2) Place rear axle on floor jacks.
Then install trailing arm and new trailing arm bolts (1) (right & left) and tighten bolts temporarily by hand.

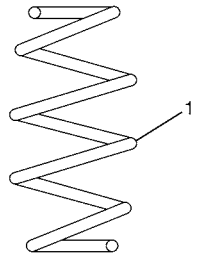


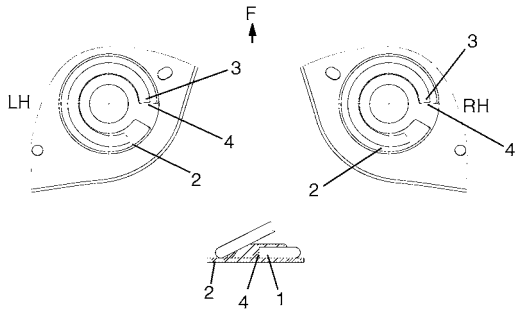
I4RS0A230023-

3) Install coil springs (1) (right & left) on spring seats (2) of rear axle as shown in the figure and then raise rear axle.

NOTE:

When seating coil spring (1), mate spring open end (3) with stepped part (4) of rear axle spring seat as shown.



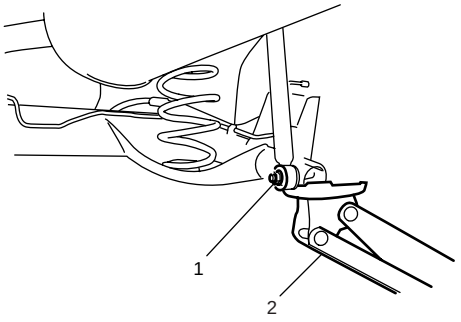


I4RS0A230044-

F: Front side

4) Tighten shock absorber lower nuts (1) (right & left) temporarily by hand.

5) Remove floor jacks (2) from rear axle.



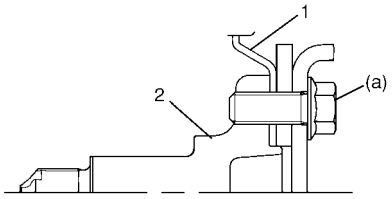
I4RS0A230024-

6) Install brake back plates (1), spindles (2) and new spindle bolts (a) and then tighten spindle bolts (a) to specified torque.

CAUTION:

Do not reuse (reinstall) removed rear spindle bolts (a).

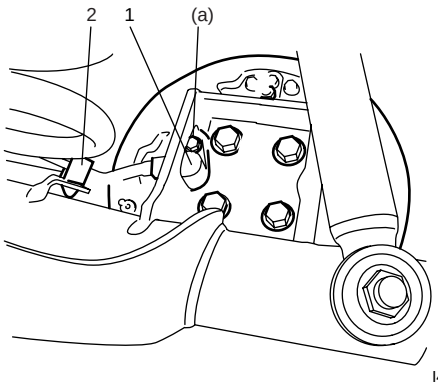
Tightening torque
Rear spindle bolt (a): 75 N·m (7.5 kg-m, 54.0 lb-ft)



I4RS0A230025-

7) Connect wheel speed sensors (1) and lead wire clamps (2) (right & left) (if equipped with ABS).

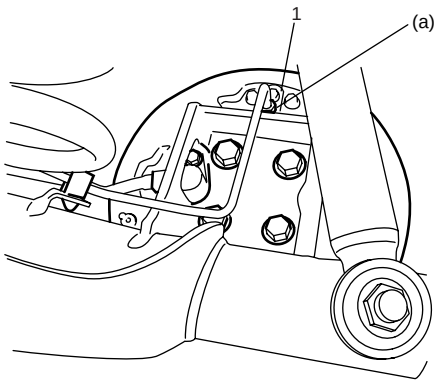
Tightening torque
Wheel speed sensor bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A230026-

8) Connect brake pipes to wheel cylinders (1) (right & left) and tighten brake pipe flare nuts (a) to specified torque.

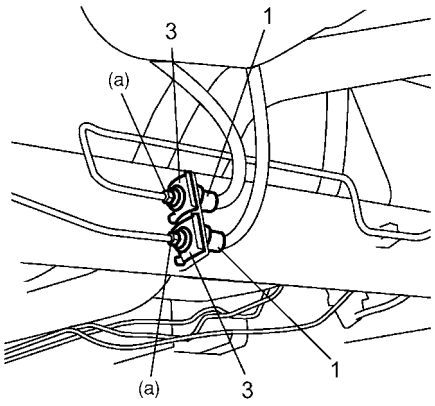
Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)



I4RS0A230027-

9) Connect brake flexible hoses (1) to bracket on rear axle with E-rings (3) (right & left) and tighten brake pipe flare nuts (a) to specified torque.

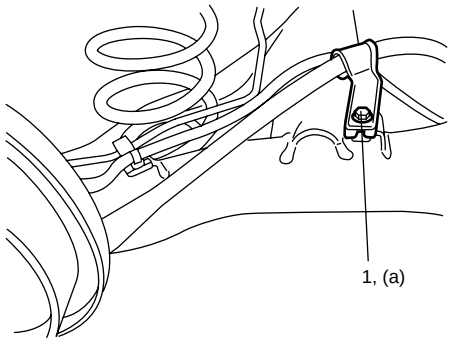
Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)



I4RS0A230028-

10) Install wheel speed sensor clamp and parking brake clamp and tighten parking brake clamp bolts (1) to specified torque.

Tightening torque
Parking brake cable clamp bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



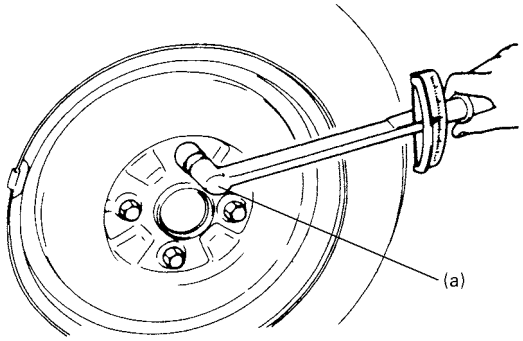
I4RS0A230029-

11) Install brake drums (right & left). For details, refer to Steps 2) – 7) of “Rear Brake Drum Removal and Installation: in Section 4C”.

12) Fill reservoir with brake fluid and bleed brake system. For bleeding operation, see “Air Bleeding of Brake System: in Section 4A”.

13) Install wheel and tighten wheel nuts to specified torque.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01220009-

14) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 Ibs) load three to five times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable. For adjustment, refer to “Parking Brake Inspection and Adjustment: in Section 4D”.

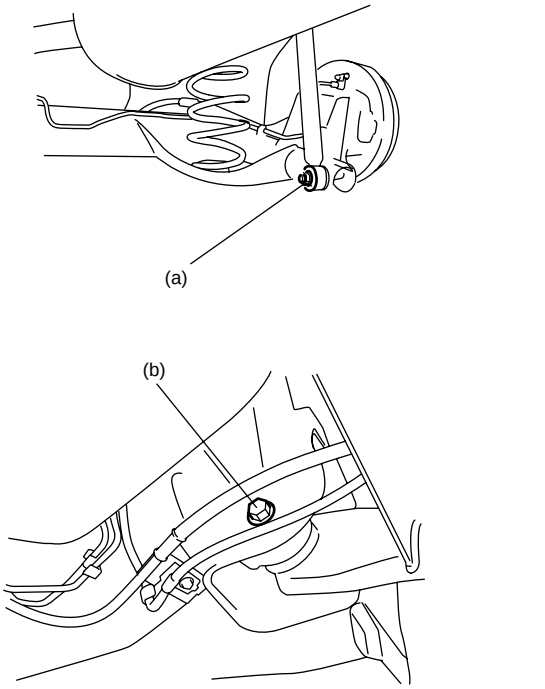
15) Lower hoist and bounce vehicle up and down several times to stabilize suspension.

16) Tighten shock absorber lower nuts (a) and rear trailing arm bolts (b) to specified torque.

NOTE:

When tightening these nuts and bolts, be sure that vehicle is off hoist and in non loaded condition.

Tightening torque
Rear shock absorber lower nut (a): 90 N·m (9.0 kg-m, 65.0 lb-ft)
Rear trailing arm bolt (b): 75 N·m (7.5 kg-m, 54.5 lb-ft)



I4RS0A230030-

17) Check to ensure that brake drum is free from dragging and proper braking is obtained.

18) Perform brake test (foot brake and parking brake).

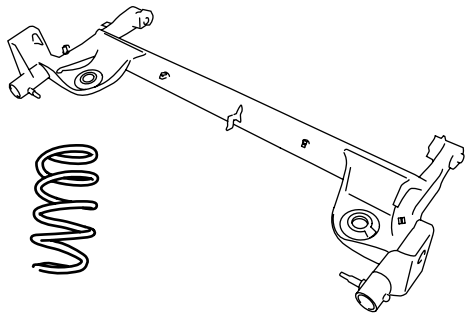
19) Check each installed part for fluid leakage.

Trailing Arm, Rear Axle and Coil Spring Inspection

S4RS0A2306027

- Inspect for cracks, deformation or damage.
- Inspect bushing for damage, wear or breakage.

Replace any defective part.



I4RS0A230031-

Rear Axle Bush Inspection

S4RS0A2306043

Inspect for cracks, deformation or damage. Replace any defective part.

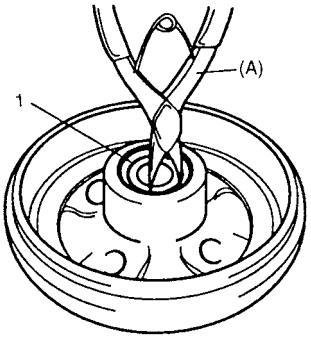
Wheel Bearing and Wheel Stud Bolt Removal and Installation

S4RS0A2306036

Removal

1) Remove rear brake drum referring to “Rear Brake Drum Removal and Installation: in Section 4C”.
2) Remove circlip (1).

Special tool
(A): 09900–06108



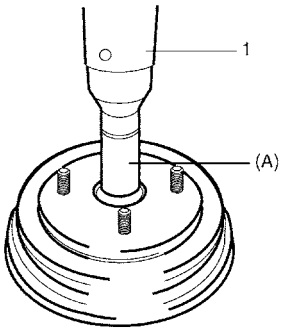
I3RM0A230046-

3) Remove wheel bearing by using special tool and hydraulic press (1).

Special tool
(A): 09913–76010

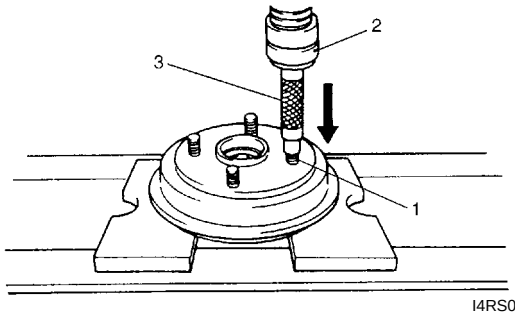
CAUTION:

Never reuse wheel bearing.
Reused bearing should have excessive play.



I4RS0A230035-

4) Remove wheel stud bolts (1) using hydraulic press (2) and general rod (3).



I4RS0A230036-

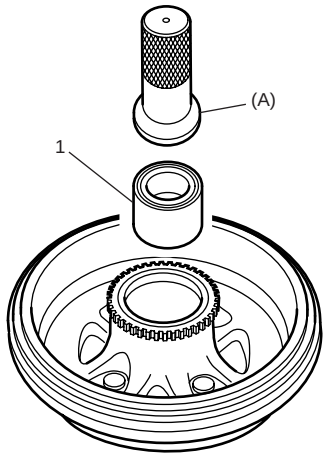
Installation

1) Install new wheel bearing (1) by using special tool and hydraulic press.

NOTE:

Seal side of bearing comes brake back plate side.

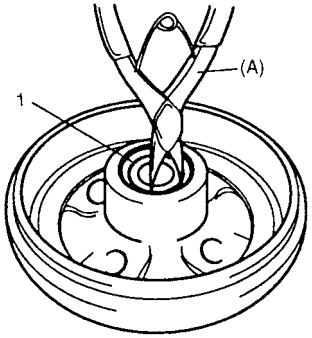
Special tool
(A): 09925–15410



I4RS0A230037-

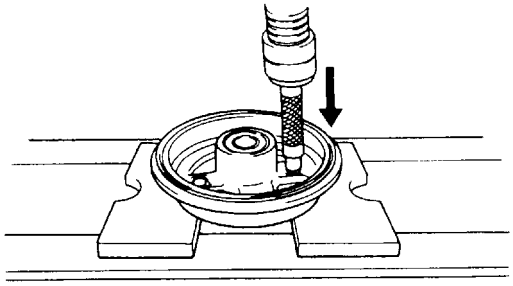
2) Install circlip (1).

Special tool
(A): 09900–06108



I3RM0A230046-

3) Insert new stud in drum hole and rotate it slowly to assure serrations are aligned with those made by replaced bolt.



I4RS0A230038-

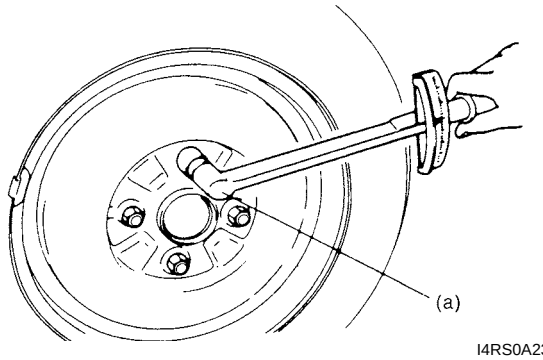
4) Install brake drum and wheel, referring to Steps 2) – 10) of “Rear Brake Drum Removal and Installation: in Section 4C”.

Rear Wheel Disc, Nut and Bearing Inspection

S4RS0A2306021

- Check wheel nuts for tightness and, as necessary, retighten to specification.
- Check wheel bolt press-fitted into brake drum for wear, damage, poor thread condition, and looseness. Replace defective bolt with a new one.
  When bolt installation is found loose, replace both bolt and brake drum with new ones.
- Check wheel disc for deformation, damage, crack, etc.
  Replace defective disc with a new one.
- Check installation face inside of wheel disc for rust. As rust affects adversely, remove it thoroughly.

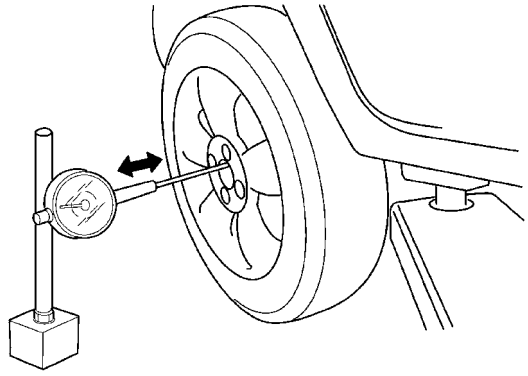
Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I4RS0A230039-

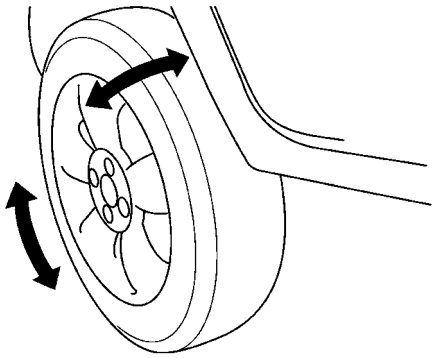
- Check wheel bearings for wear. When measuring thrust play, apply a dial gauge to axle shaft center. When measurement exceeds limit, replace bearing.

Thrust play limit
"a": 0.1 mm (0.004 in.)



I3RM0A230049-

- By rotating wheel actually, check wheel bearing for noise and smooth rotation. If it is defective, replace bearing.



I3RM0A230050-

Spindle Removal and Installation

S4RS0A2306044

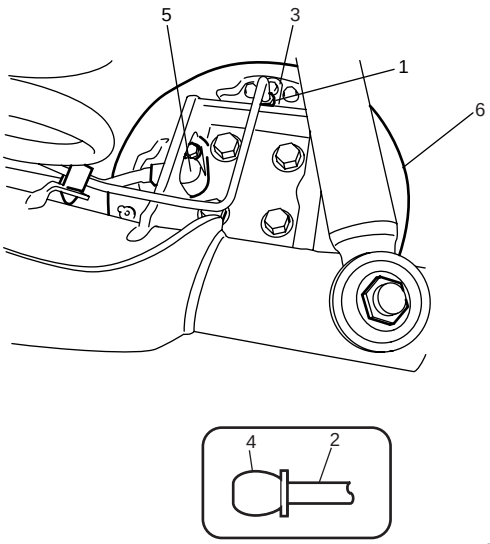
Removal

1) Remove brake drum referring to "Rear Brake Drum Removal and Installation: in Section 4C".
2) Disconnect brake pipe flare nut (1) from wheel cylinder (3) and put bleeder plug cap (4) onto pipe (2) to prevent fluid from spilling.

CAUTION:

Do not allow brake fluid to get on painted surfaces.

3) Disconnect wheel speed sensor (5).
4) Remove brake back plate (6) and spindle from rear axle and hang removed brake back plate with a wire hook.



I4RS0A230040-

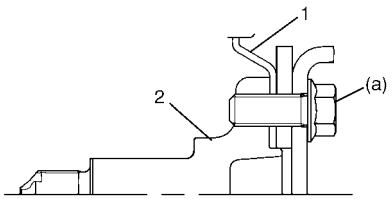
Installation

1) Install brake back plate (1), spindle (2) and new spindle bolts (a) and then tighten spindle bolts (a) to specified torque.

CAUTION:

Do not reuse (reinstall) removed rear spindle bolts (a).

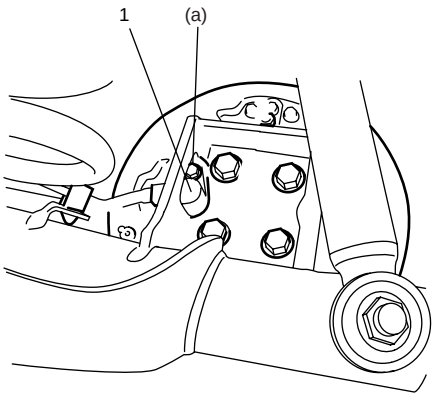
Tightening torque
Rear spindle bolt (a): 75 N·m (7.5 kg-m, 54.0 lb-ft)



I4RS0A230025-

2) Connect wheel speed sensor (1) and tighten wheel speed sensor bolt (a) to specified torque.

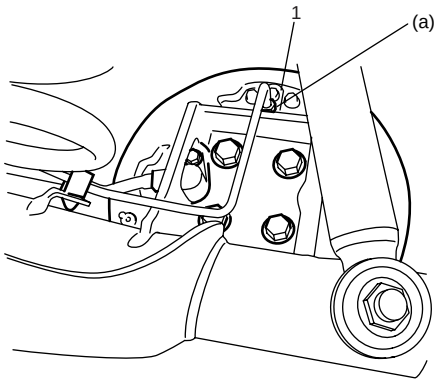
Tightening torque
Wheel speed sensor bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A230041-

3) Connect brake pipes to wheel cylinder (1) and tighten brake pipe flare nut (a) to specified torque.

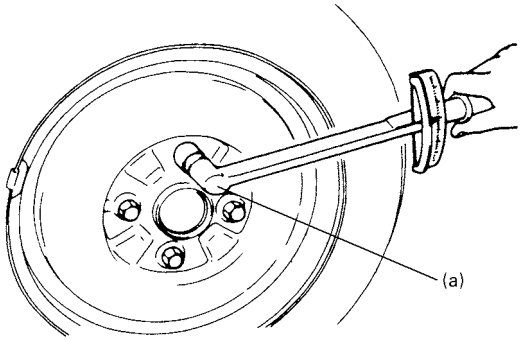
Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)



I4RS0A230027-

4) Install brake drum referring to Steps 2) – 7) of “Rear Brake Drum Removal and Installation: in Section 4C”.
5) Fill reservoir with brake fluid and bleed brake system. For bleeding operation, see “Air Bleeding of Brake System: in Section 4A”.
6) Install wheel and tighten wheel nuts to specified torque.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



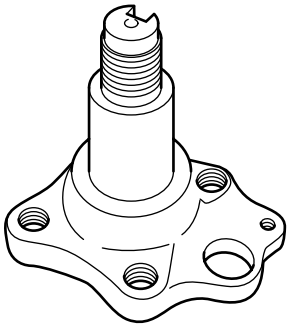
I2RH01220009-

7) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable. For adjustment, see “Parking Brake Inspection and Adjustment: in Section 4D”.
8) Check to ensure that brake drum is free from dragging and proper braking is obtained.
9) Perform brake test (foot brake and parking brake).
10) Check each installed part for fluid leakage.

Spindle Inspection

S4RS0A2306045

- Inspect for cracks, deformation or damage. Replace any defective part.



I4RS0A230042-

Rear Suspension Fasteners Inspection

S4RS0A2306025

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque referring to the figure in “Rear Suspension Component Location: ”.

Specifications

Tightening Torque Specifications

S4RS0A2307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Rear shock absorber upper nut	25	2.5	18.0	☞
Rear shock absorber lower nut	90	9.0	65.0	☞ / ☞ / ☞
Wheel nut	85	8.5	61.5	☞ / ☞ / ☞ / ☞
Rear spindle bolt	75	7.5	54.0	☞ / ☞
Wheel speed sensor bolt	11	1.1	8.0	☞ / ☞
Brake pipe flare nut	16	1.6	11.5	☞ / ☞ / ☞
Parking brake cable clamp bolt	11	1.1	8.0	☞
Rear trailing arm bolt	75	7.5	54.5	☞

NOTE:

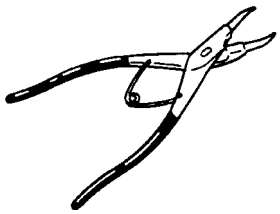
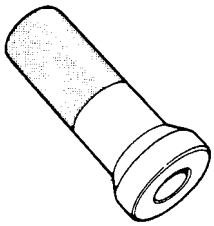
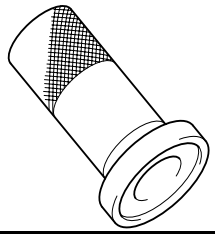
The specified tightening torque is also described in the following.
“Rear Suspension Component Location: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A2308001

09900–06108 Snap ring pliers (closing type) ☞ / ☞		09913–76010 Bearing installer ☞	
09925–15410 Oil seal installer ☞			

Wheels and Tires

General Description

Tires Description

S4RS0A2401001

The tire is of tubeless type. The tire is designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressures.
Correct tire pressures and driving habits have an important influence on tire life. Heavy cornering, excessively rapid acceleration, and unnecessary sharp braking increase tire wear.

Tire Placard
The “Tire Placard” is located on the right door lock pillar and should be referred to tire information.
The placard lists the maximum load, tire size and cold tire pressure where applicable.

NOTE:

Whether rim size and/or maximum load are listed or not depends on regulations of each country.

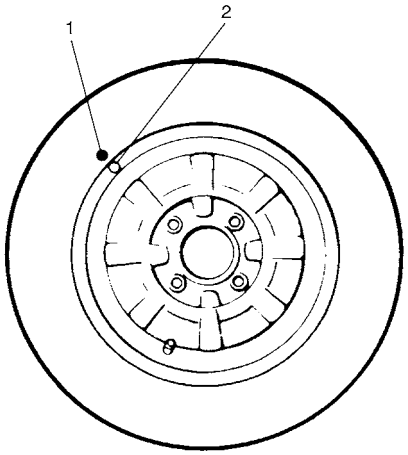
Inflation of Tires
The pressure recommended for any model is carefully calculated to give a satisfactory ride, stability, steering, tread wear, tire life and resistance to bruises.
Tire pressure, with tires cold, (after vehicle has set for 3 hours or more, or driven less than one mile) should be checked monthly or before any extended trip. Set to the specifications on the “Tire Placard” located on the left door lock pillar.
It is normal for tire pressure to increase when the tires become hot during driving.
Do not bleed or reduce tire pressure after driving. Bleeding reduces the “Cold Inflation Pressure”.

Higher than recommended pressure can cause:
- Hard ride
- Tire bruising or carcass damage
- Rapid tread wear at center of tire

Unequal pressure on same axle can cause:
- Uneven braking
- Steering lead
- Reduced handling
- Swerve on acceleration

Lower than recommended pressure can cause:
- Tire squeal on turns
- Hard Steering
- Rapid and uneven wear on the edges of the tread
- Tire rim bruises and rupture
- Tire cord breakage
- High tire temperature
- Reduced handling
- High fuel consumption

Matched Tires and Wheels (Steel Type)
Tires and wheels are match mounted at the assembly plant.
This means that the radially stiffest part of the tire, or “high spot”, is matched to the smallest radius or “low spot” of the wheel.
This is done to provide the smoothest possible ride.
The “high spot” of the tire is originally marked by paint dot (1) on the outboard sidewall. This paint dot will eventually wash off the tire.
The “low spot” of the wheel is originally marked by paint dot (2) on the wheel rim-flange. Properly assembled, the wheel rims’ paint dot should be aligned with the tires’ paint dot as shown in figure.



I2RH01240001-

Whenever a tire is dismounted from its wheel, it should be remounted so that the tire and wheel are matched. If the tire’s paint dot cannot be located, a line should be scribed on the tire and wheel before dismounting to assure that it is remounted in the same position.

Replacement Tires
When replacement is necessary, the original equipment type tire should be used. Refer to the Tire Placard.
Replacement tires should be of the same size, load range and construction as those originally on the vehicle. Use of any other size or type tire may affect ride, handling, speedometer / odometer calibration, vehicle ground clearance and tire or snow chain clearance to the body and chassis.
It is recommended that new tires be installed in pairs on the same axle. If necessary to replace only one tire, it should be paired with the tire having the most tread, to equalize braking traction.

WARNING:

Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because handling may be seriously affected and may result in loss of control.

The metric term for tire inflation pressure is the kilo pascal (kPa). Tire pressures is usually printed in both kPa and kgf/cm^2 on the “Tire Placard”.
Metric tire gauges are available from tool suppliers. The chart, shown the table, converts commonly used inflation pressures from kPa to kgf/cm^2 and psi.

	kPa	kgf/cm^2	psi
Conversion:	160	1.6	23
1 psi = 6.895 kPa	180	1.8	26
1 kgf/cm^2 = 98.066 kPa	200	2.0	29
	220	2.2	32
	240	2.4	35
	260	2.6	38
	280	2.8	41
	300	3.0	44

Wheels Description

S4RS0A2401002

Wheel Maintenance

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

Replacement Wheels

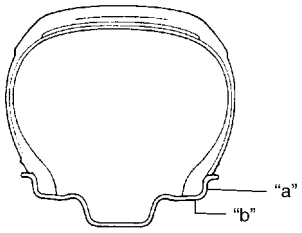
Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, air leak through welds, have elongated bolt holes, if lug nuts won’t stay tight, or if they are heavily rusted. Wheels with greater runout than shown in the following may cause objectional vibrations.
Replacement wheels must be equivalent to the original equipment wheels in load capacity, diameter, rim with offset and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer / odometer calibration, vehicle ground clearance and tire clearance to body and chassis.

How to Measure Wheel Runout

To measure the wheel runout, it is necessary to use an accurate dial indicator. The tire may be on or off the wheel. The wheel should be installed to the wheel balancer of the like for proper measurement.
Take measurements of both lateral runout “a” and radial runout “b” at both inside and outside of the rim flange. With the dial indicator set in place securely, turn the wheel one full revolution slowly and record every reading of the indicator.
When the measured runout exceeds the specification and correction by the balancer adjustment is impossible, replace the wheel. If the reading is affected by welding, paint or scratch, it should be ignored.

Lateral runout limit
“a”: 1.40 mm (0.055 in.)

Radial runout limit
“b”: 1.14 mm (0.045 in.)



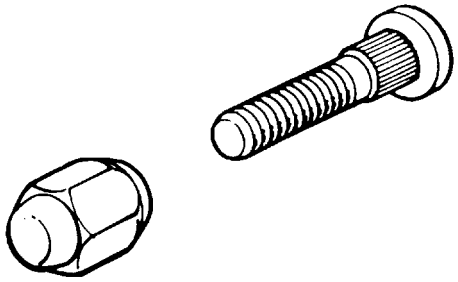
I4RS0A240001-

Metric Lug Nuts and Wheel Studs

All models use metric lug nuts and wheel studs.

Metric lug nuts and wheel studs size
M12 x 1.25

If a broken stud is found, see “Front Wheel Hub, Disc, Nut and Bearing Check: in Section 2B”, “Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation: in Section 2B”, “Rear Suspension Component Location: in Section 2C”, “Rear Brake Drum Removal and Installation: in Section 4C”and “Wheel Bearing and Wheel Stud Bolt Removal and Installation: in Section 2C” for Note and Replacement procedure.



I2RH01240003-

Irregular and/or Premature Wear Description

S4RS0A2401003

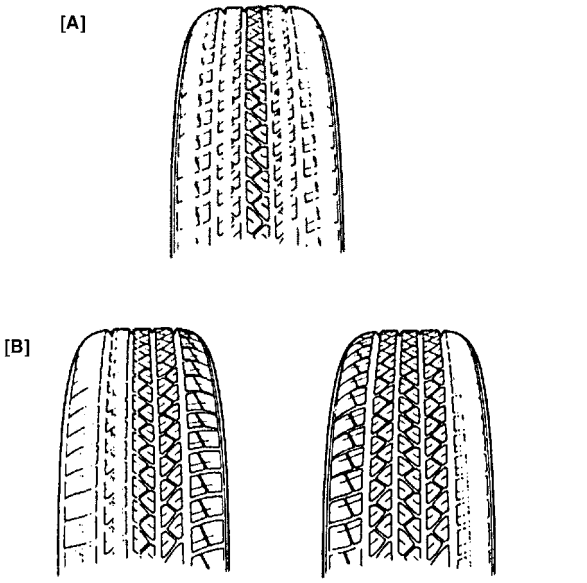
Irregular and premature wear has many causes. Some of them are: incorrect inflation pressures, lack of tire rotation, driving habits, improper alignment.
If the following conditions are noted, rotation is necessary:

- Front tire wear is different from rear.
- Uneven wear exists across the tread of any tire.
- Front tire wear is unequal between the right and left.
- Rear tire wear is unequal between the right and left.
- There is cupping, flat spotting, etc.

A wheel alignment check is necessary if following conditions are noted:

- Front tire wear is unequal between the right and left.
- Wear is uneven across the tread of any front tire.

- Front tire treads have scuffed appearance with “feather” edges on one side of tread ribs or blocks.



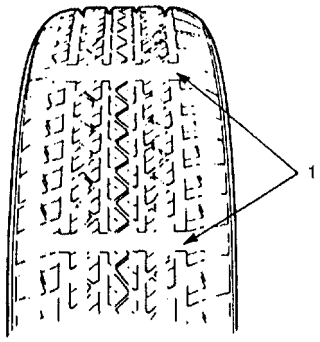
I3RH0A240002-

[A]:	Hard Cornering, under inflation or lack of tire rotation
[B]:	Incorrect wheel alignment, tire construction not uniform or wheel heavy acceleration

Wear Indicators Description

S4RS0A2401004

Original equipment tires have built-in tread wear indicators (1) to show when they need replacement. These indicators (1) will appear as 12 mm (0.47 in) wide bands when the tire tread depth becomes 1.6 mm (0.063 in).
When the indicators (1) appear in 3 or more grooves at 6 locations, tire replacement is recommended.

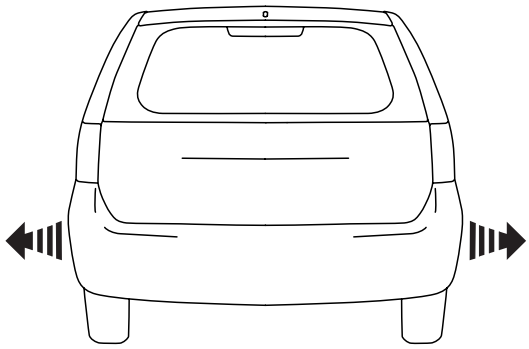


I2RH01240005-

Radial Tire Waddle Description

S4RS0A2401005

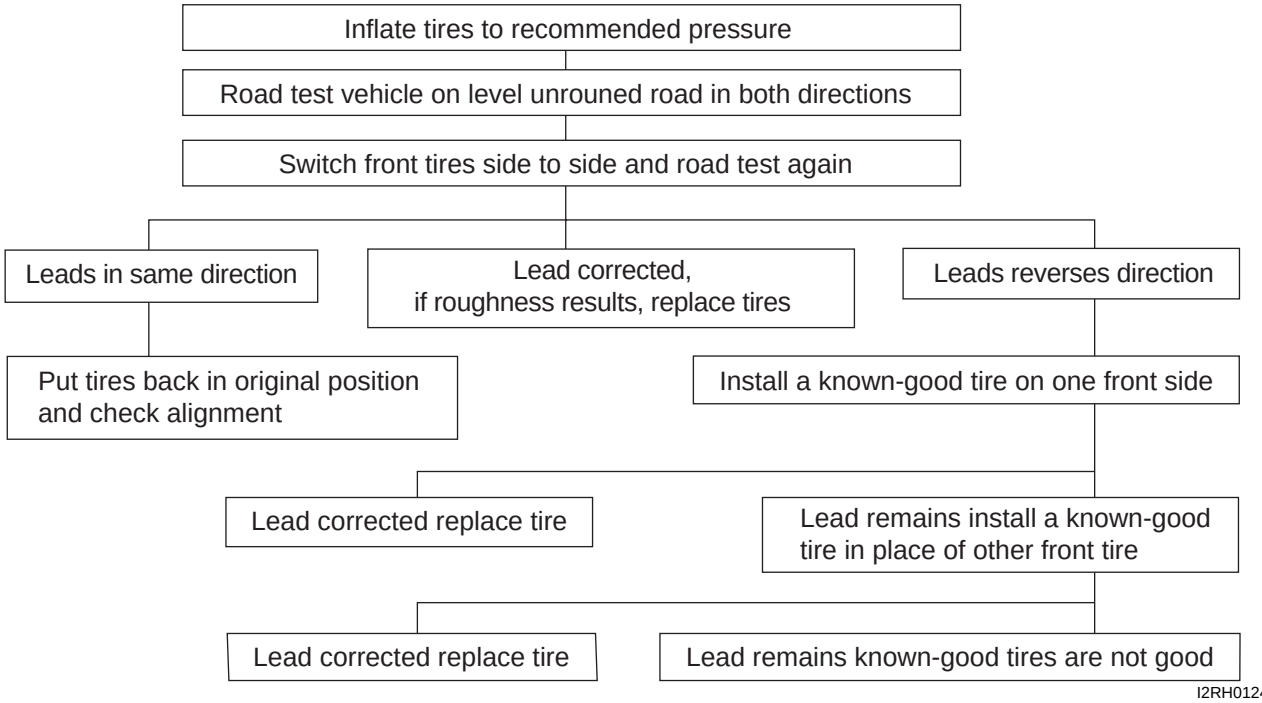
Waddle is side to side movement at the front and/or rear of the vehicle. It is caused by the steel belt not being straight within the tire. It is most noticeable at a low speed, 8 to 48 kph (5 to 30 mph).
It is possible to locate the faulty tire by road testing the vehicle. If it is on the rear, the rear end of the vehicle shakes from side to side or “waddles”. To the driver in the seat, it feels as though someone is pushing on the side of vehicle. If the faulty tire is on the front, waddling is more visual. The front sheet metal appears to be moving back and forth and the driver feels as though he is at the pivot point in vehicle.
Waddle can be quickly diagnosed by using Tire Problem Detector (TPD) and following the equipment manufacture’s recommendations.
If TPD is not available, an alternative method of substituting known-good tire / wheel assemblies can be used as follows, although it takes a longer time.



I2RH01240006-

1) Ride vehicle to determine whether the front or rear waddles.
2) Install tires and wheels that are known to be good (on similar vehicle) in place of those on waddling end of vehicle. If waddling end cannot be identified, substitute rear ones.
3) Road test again. If improvement is noted, reinstall originals one at a time till waddle causal tire is found. If no improvement is noted, install known-good tires in place of all four. Then reinstall originals in the same manner.

Equipment manufacture's recommendations



I2RH01240007-

Radial Tire Lead / Pull Description

S4RS0A2401006

"Lead / Pull" is the deviation of the vehicle from a straight path on a level road even with no pressure on the steering wheel.
Lead is usually caused by the following conditions.

- Improper tire and wheel alignment.
- Uneven brake assemblies.
- Tire construction.

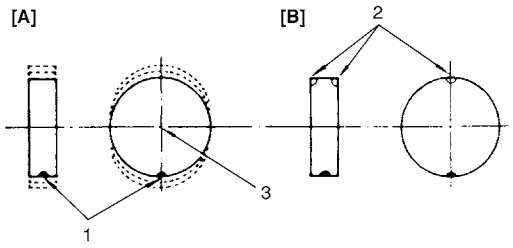
The way in which a tire is built can produce lead in a vehicle. An example of this is placement of the belt. Off center belts on radial tires can cause the tire to develop a side force while rolling straight down the road. If one side of the tire has a little larger diameter than the other, the tire will tend to roll to one side. This will develop a side force which can produce vehicle lead.
The procedure in the figure (Lead Diagnosis) should be used to make sure that wheel alignment is not mistaken for tire lead.

- Part of the lead diagnosis procedure is different from the proper tire rotation pattern currently in the owner and service manuals. If a medium to high mileage tire is moved to the other side of the vehicle, be sure to check that ride roughness has not developed
- Rear tires will not cause lead.

Balancing Wheels Description

S4RS0A2401007

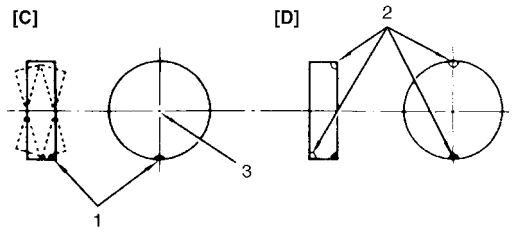
There are two types of wheel and tire balance: static and dynamic. Static balance, as shown in figure, is the equal distribution of weight around the wheel. Wheels that are statically unbalanced cause a bouncing action called tramp. This condition will eventually cause uneven tire wear.



I2RH01240008-

1. Heavy spot wheel tramp	[A]: Before correction
2. Balance weights addition point	[B]: Corrective weights
3. C/L of spindle	

Dynamic balance, as shown in figure, is the equal distribution of weight on each side of the wheel centerline so that when the tire spins there is no tendency for the assembly to move from side to side. Wheels that are dynamically unbalanced may cause shimmy.



I2RH01240009-

1. Heavy spot wheel shimmy	[C]: Before correction
2. Balance weights addition point	[D]: Corrective weights
3. C/L of spindle	

Repair Instructions

General Balance Procedures

S4RS0A2406001

Deposits of mud, etc. must be cleaned from inside of rim.

WARNING:

Stones should be removed from the tread in order to avoid operator injury during spin balancing and to obtain good balance.

Each tire should be inspected for any damage, then balanced according to equipment manufacturer's recommendation.

Off-Vehicle Balancing

Most electronic off-vehicle balancers are more accurate than the on-vehicle spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-vehicle spin balancing, this is overcome by their accuracy, usually to within 1/8 ounce.

On-Vehicle Balancing

On-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

WARNING:

Wheel spin should be limited to 35 mph (55 km/h) as indicated on speedometer.
This limit is necessary because speedometer only indicates one-half of actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped.
Unless care is taken in limiting drive wheel spin, spinning wheel can reach excessive speeds. This can result in possible tire disintegration or differential failure, which could cause serious personal injury or extensive vehicle damage.

CAUTION:

For vehicle equipped with ABS, using on-vehicle balancing method with ignition switch ON may set malfunction diagnostic trouble code (DTC) of ABS even when system is in good condition.
Never turn ignition switch ON while spinning wheel.

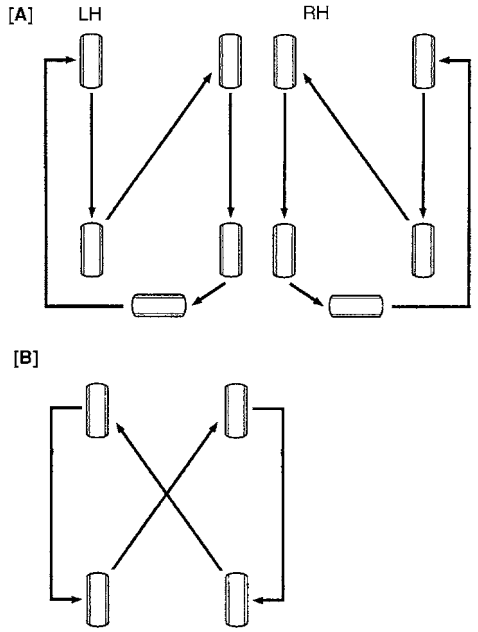
Tire Rotation

S4RS0A2406002

To equalize wear, rotate tires according to figure. Radial tires should be rotated periodically. Set tire pressure.

NOTE:

Due to their design, radial tires tend to wear faster in the shoulder area, particularly in front positions. This makes regular rotation especially necessary.



I3RH0A240001-

[A]: 5-tire rotation

NOTE:

Applicable to vehicles equipped with 5 tires including spare tire all of which are identical in size

[B]: 4-tire rotation

LH: Left-hand drive

RH: Right-hand drive

Wheel Removal and Installation

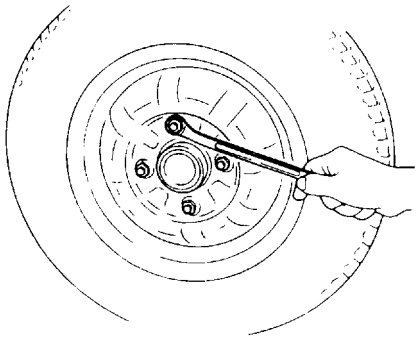
S4RS0A2406003

Removal

1) Loosen wheel nuts by approximately 180 ° (half a rotation).
2) Hoist vehicle.
3) Remove wheel.

CAUTION:

Never use heat to loosen tight wheel because application of heat to wheel can shorten life of wheel and damage wheel bearings.



I2RH01240010-

Installation

For installation, reverse removal procedure, noting the following.

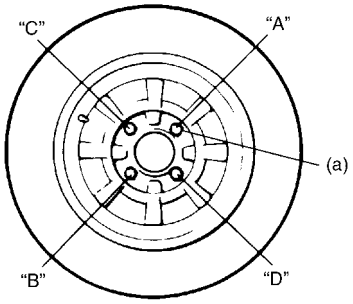
- Wheel nuts must be tightened in sequence and to proper torque to avoid bending wheel or brake disc.

NOTE:

Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel nuts to loosen, which can later allow a wheel to come off while vehicle is moving.

Tightening order
"A" – "B" – "C" – "D"

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01240011-

Tire Mounting and Dismounting

S4RS0A2406004

Use a tire changing machine to mount or dismount tires. Follow equipment manufacturer's instructions. Do not use hand tools or tire irons alone to change tires as they may damage tire beads or wheel rim.
Rim bead seats should be cleaned with a wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or dismounting a tire, bead area should be well lubricated with approved tire lubricant.
After mounting, inflate to specified pressure shown on tire placard so that beads are completely seated.

WARNING:

Do not stand over tire when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury.
Do not exceed specified pressure when inflating. If specified pressure will not seat beads, deflate, re-lubricate and reinflate.
Over inflation may cause bead to break and cause serious personal injury.

Install valve core and inflate to proper pressure.

Tire Repair

S4RS0A2406005

There are many different materials and techniques on the market to repair tires. As not all of these work on all types of tires, tire manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from each tire manufacturer.

Specifications

Wheels and Tires Specifications

S4RS0A2407001

Tire size (Standard)
185/60R15 84H

Wheel size (Standard)
15 x 5 1/2 JJ (for 185/60R15)

Tightening torque
Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

NOTE:

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner's manual which came with the vehicle.**

Tightening Torque Specifications

S4RS0A2407002

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Wheel nut	85	8.5	61.5	☞ / ☞

Reference:
For the tightening torque of fastener not specified in this section, refer to "Fasteners Information: in Section 0A".

Section 3

Driveline / Axle

CONTENTS

Drive Shaft / Axle 3A-1
General Description 3A-1
Front Drive Shaft Construction 3A-1
Component Location 3A-1
Front Drive Shaft Assembly Components Location 3A-1
Diagnostic Information and Procedures 3A-2
Front Drive Shaft Symptom Diagnosis 3A-2
Repair Instructions 3A-2
Front Drive Shaft Components 3A-2
Front Drive Shaft Assembly On-Vehicle Inspection 3A-3
Front Drive Shaft Assembly Removal and Installation 3A-3
Front Drive Shaft Disassembly and Assembly 3A-4
Center Shaft and Center Bearing Support Disassembly and Assembly 3A-7
Front Drive Shaft Inspection 3A-9
Specifications 3A-9
Tightening Torque Specifications 3A-9
Special Tools and Equipment 3A-10
Recommended Service Material 3A-10
Special Tool 3A-10

Drive Shaft / Axle

General Description

Front Drive Shaft Construction

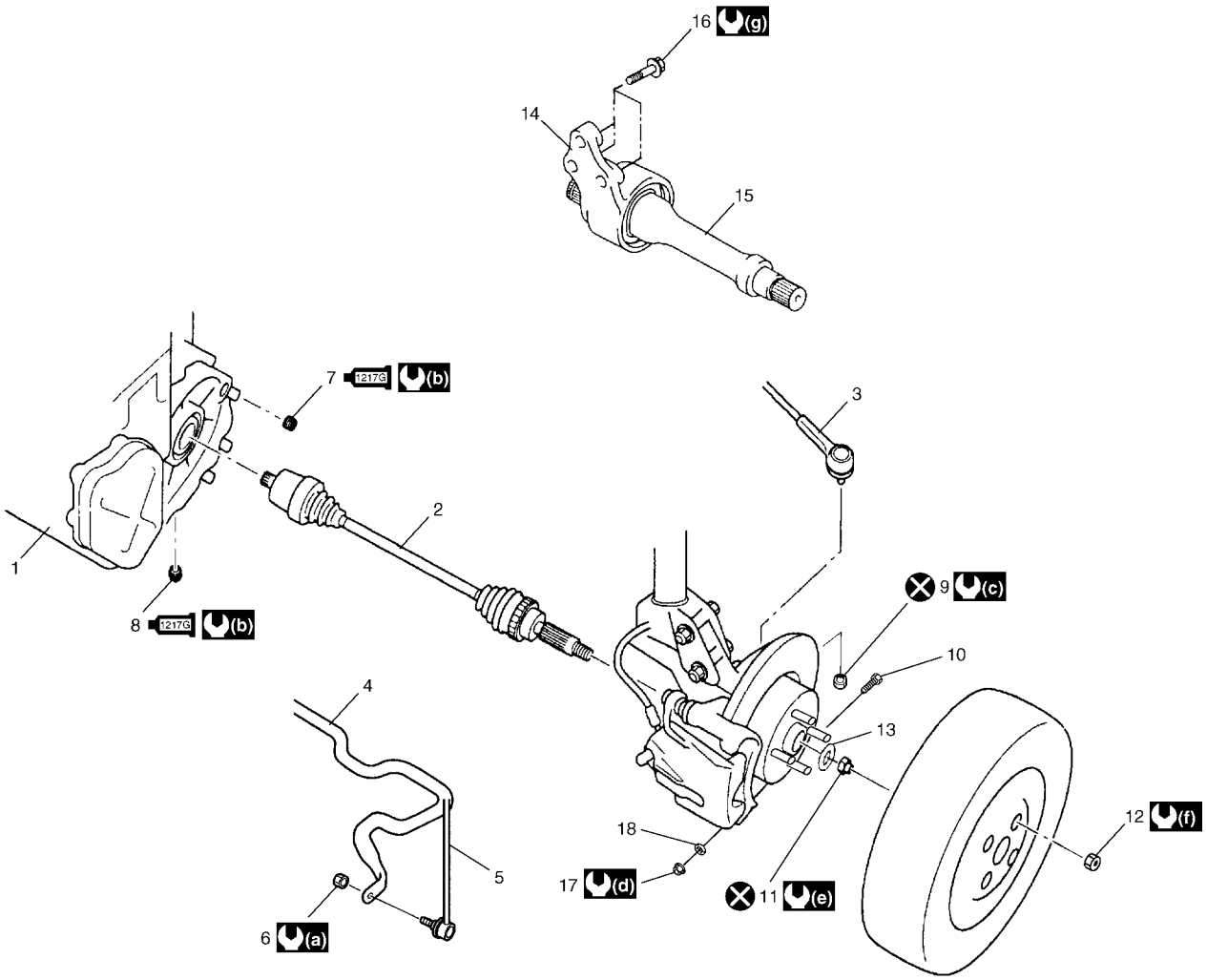
S4RS0A3101001

A constant velocity tripod joint is used on the differential side of both right and left side drive shaft assemblies. A constant velocity ball joint is used on the wheel side of both right and left side drive shaft assemblies. The drive shaft can slide through the tripod joint in the extension/contraction direction.

Component Location

Front Drive Shaft Assembly Components Location

S4RS0A3103001



I4RS0A310001-

1. Transaxle	10. Ball stud bolt	(a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)
2. Drive shaft assembly	11. Drive shaft nut	(b) : 21 N·m (2.1 kg-m, 15.5 lb-ft)
3. Tie-rod end	12. Wheel nut	(c) : 45 N·m (4.5 kg-m, 32.5 lb-ft)
4. Stabilizer	13. Drive shaft washer	(d) : 60 N·m (6.0 kg-m, 43.5 lb-ft)
5. Stabilizer joint	14. Center bearing support	(e) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
6. Stabilizer joint nut	15. Center shaft	(f) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
1217G 7. Oil filler/level plug : Apply sealant 99000-31260 to plug thread.	16. Center bearing support bolts	(g) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
1217G 8. Oil drain plug : Apply sealant 99000-31260 to plug thread.	17. Ball stud nut	: Do not reuse.
9. Tie-rod end nut	18. Ball stud washer	

Diagnostic Information and Procedures

Front Drive Shaft Symptom Diagnosis

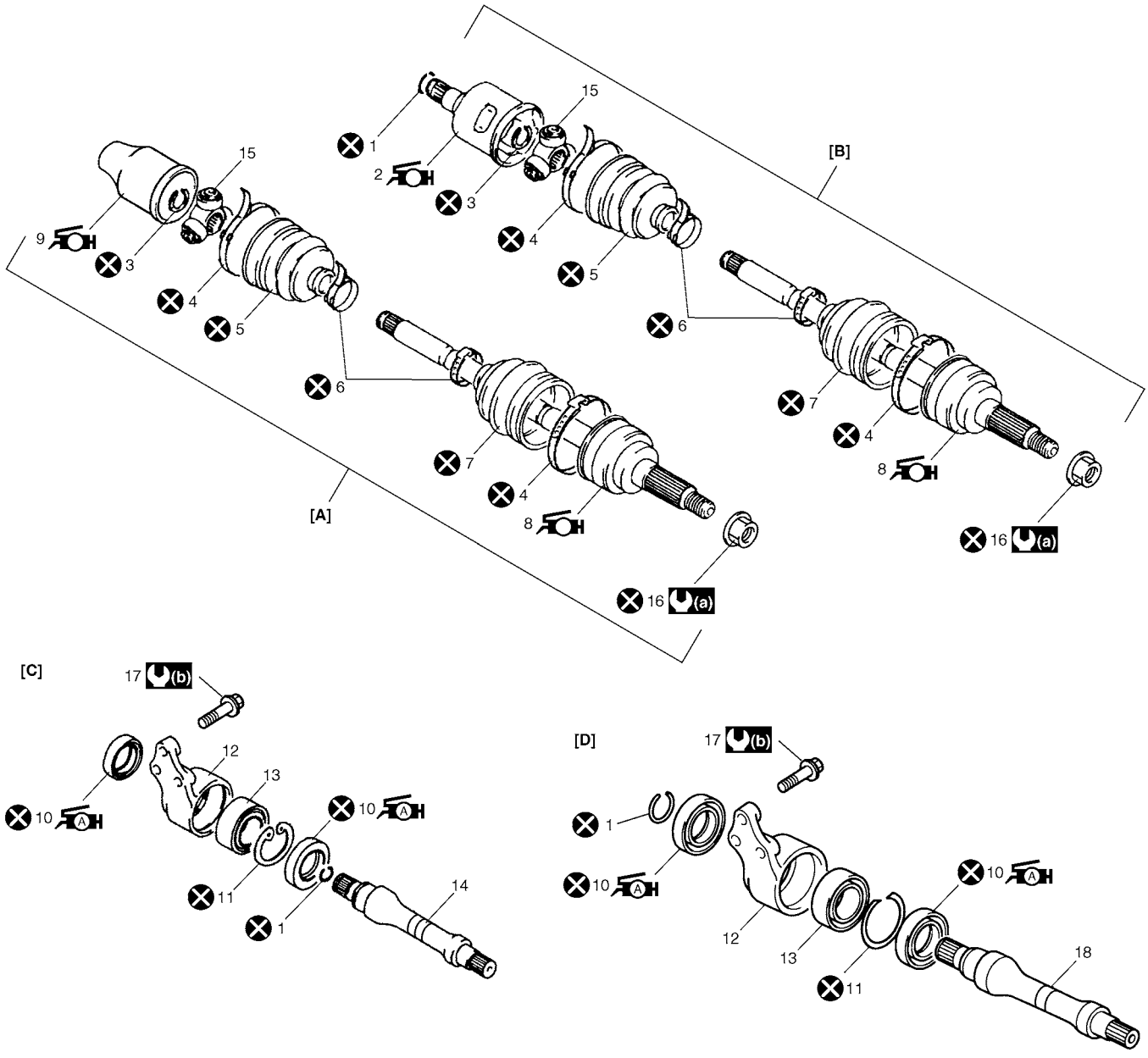
S4RS0A3104001

Condition	Possible cause	Correction / Reference Item
Abnormal noise	Worn or breakage of the drive shaft joint	*Replace.*
	Worn or breakage of the center bearing	*Replace.*

Repair Instructions

Front Drive Shaft Components

S4RS0A3106001



I4RS0A310002-

[A]: Right side drive shaft assembly	9. Center shaft side joint (Constant velocity tripod joint) : Apply dark gray grease included in spare part to joint.
[B]: Left side drive shaft assembly	10. Oil seal : Apply grease 99000-25010 to oil seal lip.
[C]: Type A (This type has 3 lines on this center shaft)	11. Center bearing support circlip
[D]: Type B (This type has 2 lines on this center shaft)	12. Center bearing support

1. Circlip	13. Center bearing
2. Differential side joint (Constant velocity tripod joint) : Apply dark gray grease included in spare part to joint.	14. Center shaft
3. Snap ring	15. Tripod joint spider
4. Boot band (Large)	16. Drive shaft nut
5. Boot (Differential or center shaft side)	17. Center bearing support bolt
6. Boot band (Small)	(a) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
7. Boot (Wheel side)	(b) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
8. Wheel side joint (Constant velocity ball joint) : Apply black grease included in spare part to joint.	: Do not reuse.

Front Drive Shaft Assembly On-Vehicle Inspection

S4RS0A3106002

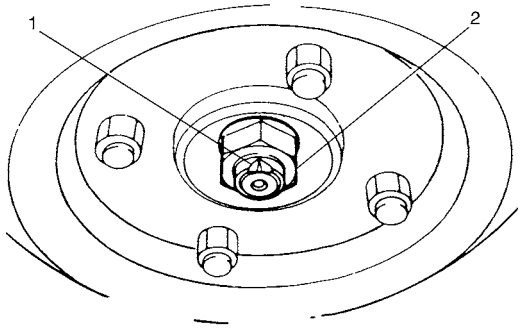
- Check boots for breakage or deterioration.
- Check wheel side joint for rattle or smooth rotation.
- Check differential side (or center shaft side) joint for smooth rotation.
  If any abnormality is found, replace.

Front Drive Shaft Assembly Removal and Installation

S4RS0A3106003

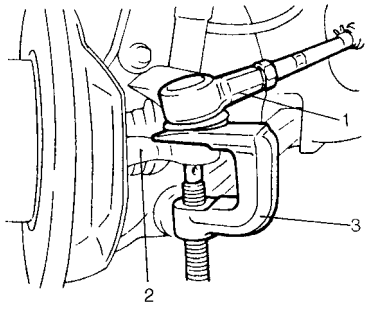
Removal

1) Undo caulking (1) and remove drive shaft nut (2).



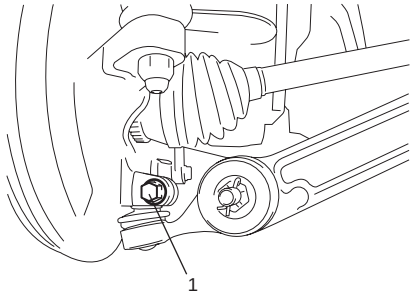
I4RS0A310003-

2) Remove wheel.
3) Drain transaxle oil referring to “Manual Transaxle Oil Change: in Section 5B” or “A/T Fluid Change: in Section 5A”.
4) Disconnect tie-rod end (1) from steering knuckle (2) using puller (3).



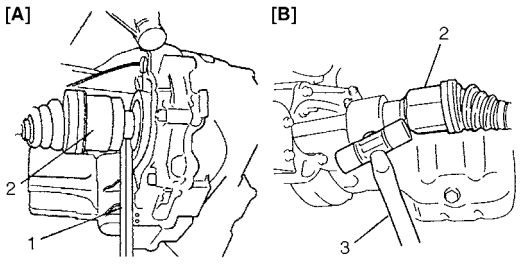
I3RM0A310003-

5) Remove stabilizer joint referring to “Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B”.
6) Remove brake hose mounting bolt.
7) Remove wheel speed sensor and suspension control arm ball joint bolt (1).



I4RS0A310004-

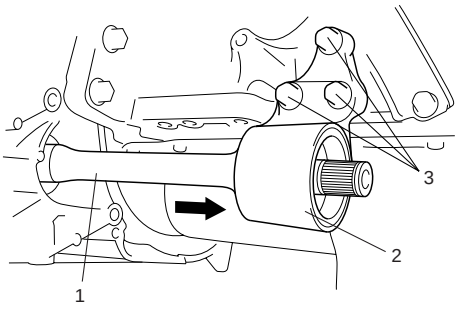
8) Disconnect front suspension control arm ball joint stud from steering knuckle.
9) Pull out drive shaft joint (2) as follows.
   - For left side shaft:
     Using tire lever (1), pull out drive shaft joint (2) so as to release snap ring fitting of joint spline at differential side.
   - For right side shaft:
     Using plastic hammer (3), drive out drive shaft joint (2) so as to release snap ring fitting of joint spline at center shaft.



I4RS0A310005-

[A]:	Left side
[B]:	Right side

10) Remove drive shaft assembly.
11) Remove center bearing support bolts (3) and remove center bearing support (2) with center shaft (1) from differential side gear.



I2RH01310007-

Installation

CAUTION:

- **Be careful not to damage oil seals and boots when installing drive shaft.**
- **Do not hit joint boot with hammer. Inserting joint only by hands is allowed.**
- **Make sure that differential side joint is inserted fully and its snap ring is seated as it was.**

Install drive shaft assembly by reversing removal procedure and noting the following points.

- Tighten each bolt and nut to the specified torque referring to “Front Drive Shaft Assembly Components Location: ”.
- Install stabilizer joint referring to “Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B”.
- Tighten brake hose mounting bolt to specified torque.

  Tightening torque
  Brake hose mounting bolt: 25 N·m (2.5 kg-m, 18.0 lb-ft)

- Fill transaxle with oil as specified referring to “Manual Transaxle Oil Change: in Section 5B” or “A/T Fluid Change: in Section 5A”.
- Check toe setting referring to “Front Wheel Alignment Inspection and Adjustment: in Section 2B” and adjust as required.

Front Drive Shaft Disassembly and Assembly

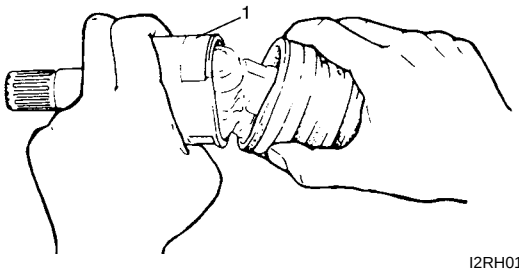
S4RS0A3106007

Disassembly

CAUTION:

- **Disassembly of wheel side joint is not allowed. If any noise or damage exists in it, replace it as assembly.**
- **Do not disassemble tripod joint spider. If any malcondition is found in it, replace it as differential side joint assembly.**

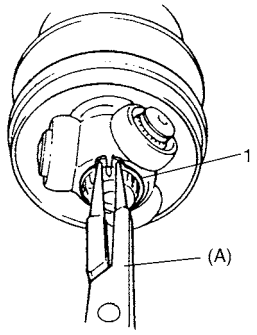
1) Remove differential side (or center shaft side) boot big band, and then take out joint housing (1).



I2RH01310008-

2) Wipe off grease from shaft and take off snap ring (1) using special tool.

Special tool
(A): 09900–06107

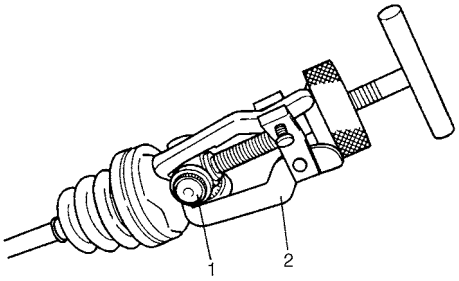


I3RH0A311009-

3) Remove tripod joint spider (1) using 3 arms puller (2).

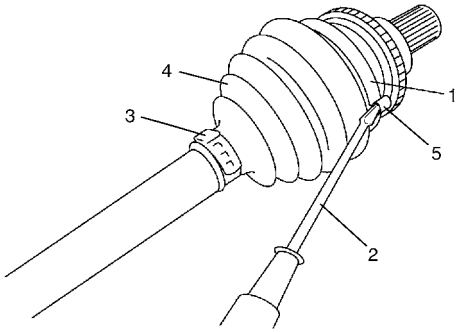
CAUTION:

To prevent any problem caused by washing solution, do not wash tripod joint except its housing. Degreasing of tripod joint with cloth is allowed.



I3RH0A311004-

4) Remove differential side (or center shaft side) boot small band, and then pull out differential side (or center shaft side) boot from shaft.
5) Undo caulking (5) of wheel side boot big band (1) and small band (3) using flat end rod (2) or the like, then pull out wheel side boot (4) from shaft.



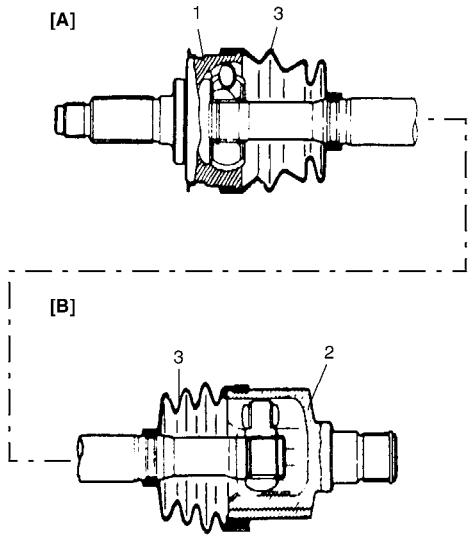
I4RS0A310006-

Assembly

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly.
Make sure that wheel side joint assembly (1) and tripod joint housing (2) are washed thoroughly and air dried.
Replace boot(s) (3) with new one(s).

CAUTION:

- **Do not wash boots in degreaser such as gasoline or kerosene. etc. Washing in degreaser causes deterioration of boot.**
- **To ensure full performance of joint as designed, be sure to distinguish between two types of grease in repair set and apply specified volume to respective joint referring to the followings for identification of the grease.**



I4RS0A310007-

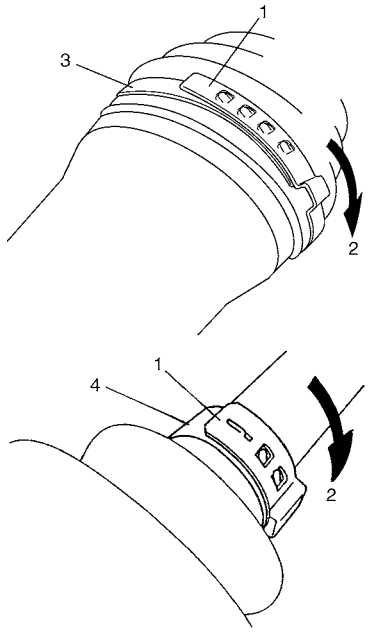
[A]:	Wheel side
[B]:	Differential side (or center shaft side)

1) Wash disassembled parts (except boots). After washing, dry parts completely by blowing air.
2) Clean boots with cloth.
3) Apply grease to wheel side joint. Use specified grease in tube in wheel side boot set.

Grease color
: Black

Amount
: 55 – 75 g (1.9 – 2.6 oz)

4) Install wheel side boot on shaft.
5) Fill up boot inside with specified grease.
6) Place new wheel side boot big band (3) and small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



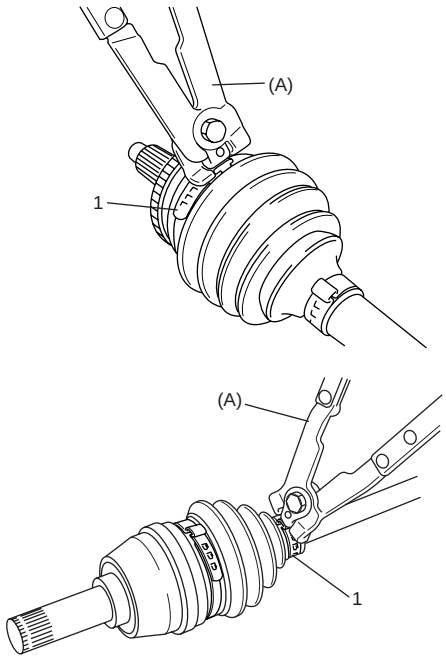
I4RS0A310009-

7) Fasten boot band (1) securely using special tool.

CAUTION:

Do not squeeze or distort boot when fastening it with bands.
Distorted boot caused by squeezing air may reduce its durability.

Special tool
(A): 09943–57010

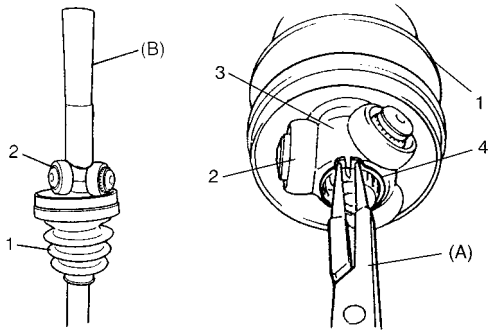


I4RS0A310010-

8) Set new differential side (or center shaft side) small band and new differential side (or center shaft side) boot (1) on shaft temporarily, and then apply grease to tripod joint (2). Use specified grease in tube included in spare parts.

9) Install tripod joint spider (3) on shaft using special tool with hammer, directing its chamfered spline toward wheel side, and then fasten it with new snap ring (4).

Special tool
(A): 09900–06107
(B): 09925–98220

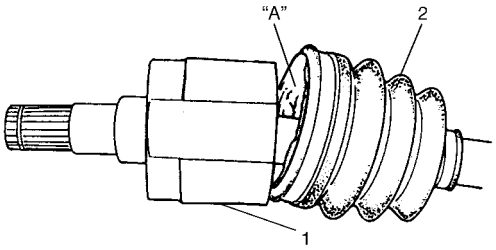


I3RH0A311006-

10) Apply grease in the supplied parts to inside of tripod joint housing (1), joint it with tripod joint and fit boot (2) to tripod joint housing.

Grease color
"A": Dark gray

Amount
"A": 70 – 90 g (2.5 – 3.2 oz)

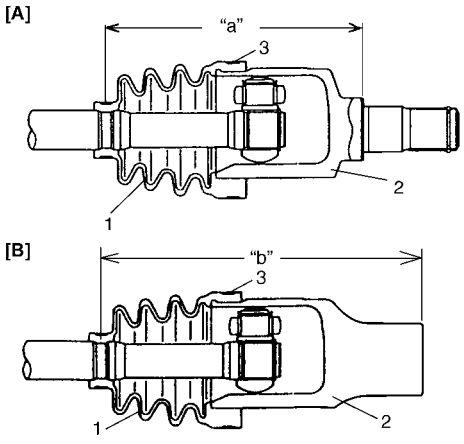


I4RS0A310011-

11) Insert screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

12) When fixing boot (1) to tripod joint housing (2) with differential side (or center shaft side) big band (3), adjust so that measured dimensions become as indicated in the following.

Drive shaft boot fixing position (distance between reference position and small boot band)
Left side drive shaft of M/T model "a": 142.0 mm (5.59 in.)
Left side drive shaft of A/T model "a": 141.7 mm (5.58 in.)
Right side drive shaft "b": 176.0 mm (6.93 in.)

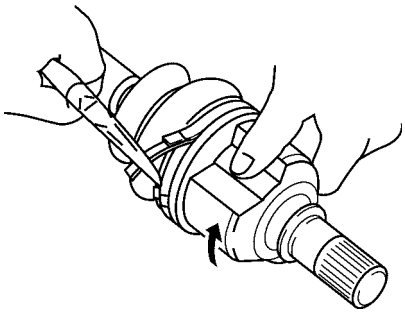


I4RS0A310012-

[A]:	Left side
[B]:	Right side

CAUTION:

- **Bend each boot band against forward rotation.**
- **Do not squeeze or distort boot when fastening it with bands. Distorted boot caused by squeezing air may reduce its durability.**



I2RH01310030-

Center Shaft and Center Bearing Support Disassembly and Assembly

S4RS0A3106006

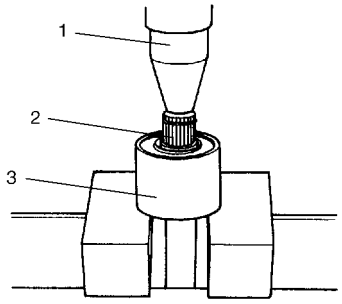
NOTE:

Be sure to identify center shaft as type A or type B referring to "Front Drive Shaft Components: ".

Type A

Disassembly

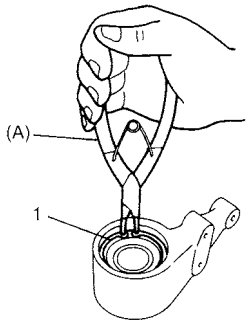
1) Using hydraulic press (1), draw out center shaft (2) from center bearing.
2) Remove oil seals from center bearing support (3).



I3RM0A310012-

3) Remove bearing support circlip (1) using special tool.

Special tool
(A): 09900–06108



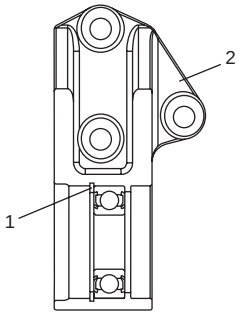
I3RH0A311005-

4) Remove center bearing from center bearing support.

Assembly

Install center shaft by reversing removal procedure and noting the following points.

- When installing bearing support circlip (1), make sure that if fits in circlip groove in center bearing support (2) securely as shown.



I4RS0A310013-

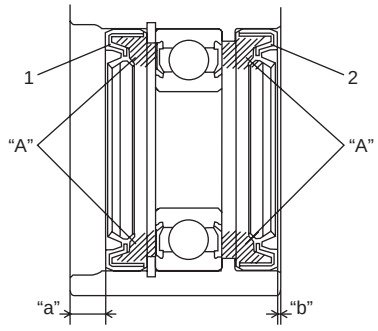
- When installing left oil seal (1) and right oil seal (2) using special tool, use care so that oil seals in proper direction and position as shown in the figure.

Special tool
: 09925–15410

Distance
"a": 7 – 8 mm (0.28 – 0.31 in.)
"b": 0 – 1 mm (0 – 0.04 in.)

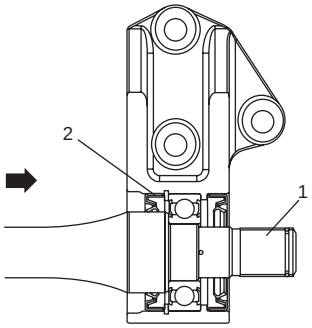
- Be sure to apply grease to oil seal lip and bearing side space indicated in the figure.

"A": Grease 99000–25010



I4RS0A310014-

- Press-fit center shaft (1) from left oil seal (2) side.

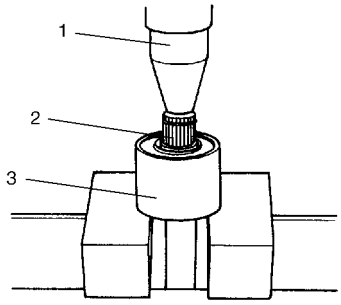


I4RS0A310015-

Type B

Disassembly

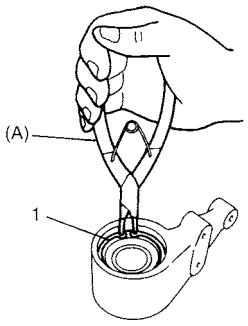
1) Remove wheel side oil seal and circlip from center bearing support (3).
2) By using hydraulic press (1), draw out center shaft (2) from center bearing.
3) Remove oil seal from center bearing support (3).



I3RM0A310012-

4) Remove bearing support circlip (1) using special tool.

Special tool
(A): 09900–06108

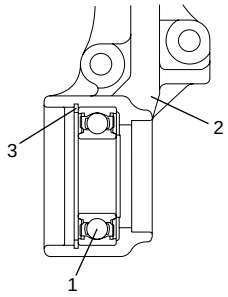


I3RH0A311005-

5) Remove center bearing from center bearing support.

Assembly

1) Install center bearing (1) to center bearing support (2), and then install circlip (3) into groove of bearing support as shown in figure.

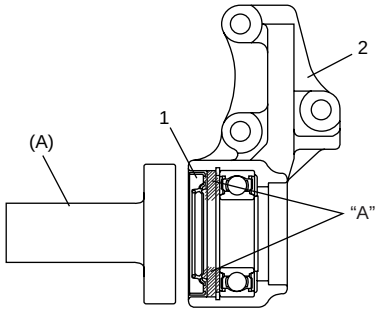


I4RS0A310016-

2) Install left oil seal (1) to center bearing support (2) until it become flush with bearing support using special tool, and then apply grease to oil seal lip.

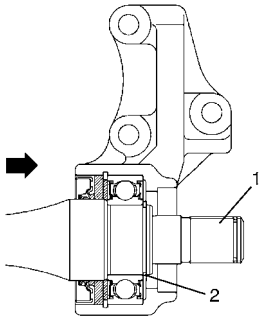
"A": Grease 99000–25010

Special tool
(A): 09913–75510



I4RS0A310017-

3) Press-fit center shaft (1) from left oil seal side, and then install circlip (2) into groove of center shaft as shown in figure.

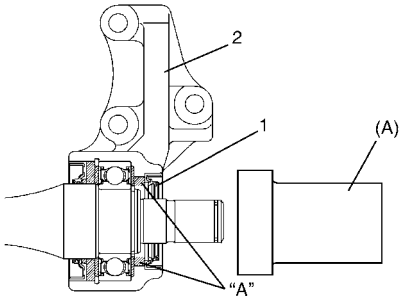


I4RS0A310018-

4) Install right oil seal (1) to center bearing support (2) until it become flush with bearing support using special tool, and then apply grease to oil seal lip.

“A”: Grease 99000–25010

Special tool
(A): 09913–85210



I4RS0A310019-

Front Drive Shaft Inspection

S4RS0A3106005

- Check shaft and joint for damage, wear or bend. Replace them as necessary.
- Check retaining ring and snap ring for breakage or deformation. Replace as necessary.
- Check boots for breakage or deterioration.

Specifications

Tightening Torque Specifications

S4RS0A3107001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Brake hose mounting bolt	25	2.5	18.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Drive Shaft Assembly Components Location: ”
“Front Drive Shaft Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A3108001

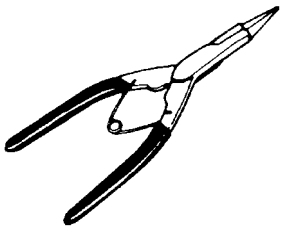
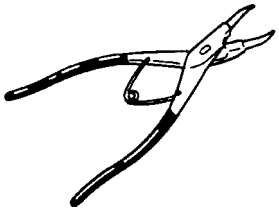
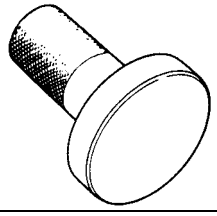
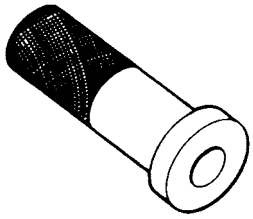
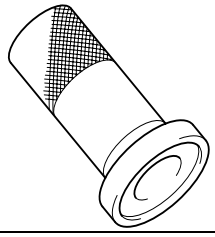
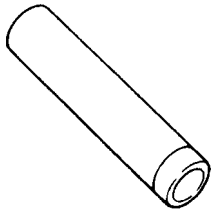
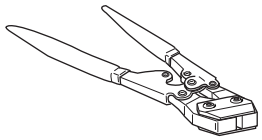
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞

NOTE:

Required service material is also described in the following.
“Front Drive Shaft Assembly Components Location: ”
“Front Drive Shaft Components: ”

Special Tool

S4RS0A3108002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ 	09900–06108 Snap ring pliers (closing type) ☞ / ☞ 
09913–75510 Bearing installer ☞ 	09913–85210 Bearing installer ☞ 
09925–15410 Oil seal installer ☞ 	09925–98220 Bearing installer ☞ 
09943–57010 Band compressor ☞ 	

Section 4

Brakes

CONTENTS

Precautions 4-1
Precautions 4-1
Precautions for Brakes 4-1

Brake Control System and Diagnosis ... 4A-1
Precautions 4A-1
Precautions on Brake 4A-1
General Description 4A-1
Brakes Construction 4A-1
Front Brake Hose / Pipe Construction 4A-2
Rear Brake Hose / Pipe Construction 4A-3
Diagnostic Information and Procedures 4A-3
Brakes Diagnosis Note 4A-3
Brakes Symptom Diagnosis 4A-4
Repair Instructions 4A-6
Brake Pedal Free Height Inspection 4A-6
Brake Pedal Play Inspection 4A-6
Excessive Pedal Travel Inspection 4A-6
Master Cylinder and Brake Fluid Level Inspection 4A-7
Stop Light Switch Adjustment 4A-7
Air Bleeding of Brake System 4A-7
Front Brake Hose / Pipe Removal and Installation 4A-8
Rear Brake Hose / Pipe Removal and Installation 4A-9
Brake Hose and Pipe Inspection 4A-9
Master Cylinder Components 4A-9
Master Cylinder Reservoir Removal and Installation 4A-10
Master Cylinder Assembly Removal and Installation 4A-11
Master Cylinder Assembly Disassembly and Assembly 4A-12
Master Cylinder Assembly Inspection 4A-13
Brake Booster Components 4A-13
Booster Operation Inspection 4A-14
Brake Booster Removal and Installation 4A-15
Brake Booster Inspection and Adjustment 4A-16
Specifications 4A-16
Tightening Torque Specifications 4A-16
Special Tools and Equipment 4A-16
Recommended Service Material 4A-16

Front Brakes 4B-1
Repair Instructions 4B-1
Front Disc Brake Components 4B-1
Front Disc Brake Pad On-Vehicle Inspection 4B-2
Front Disc Brake Pad Removal and Installation 4B-2
Front Disc Brake Pad Inspection 4B-3
Front Disc Brake Caliper Removal and Installation 4B-3
Front Disc Brake Caliper Disassembly and Assembly 4B-4
Front Disc Brake Caliper Inspection 4B-6
Front Brake Disc Removal and Installation 4B-6
Front Brake Disc Inspection 4B-7
Specifications 4B-8
Tightening Torque Specifications 4B-8
Special Tools and Equipment 4B-8
Recommended Service Material 4B-8
Special Tool 4B-8

Rear Brakes 4C-1
Repair Instructions 4C-1
Rear Drum Brake Components 4C-1
Rear Brake Drum Removal and Installation 4C-1
Rear Brake Drum and Shoe Inspection 4C-3
ABS Sensor Ring Removal and Installation (If Equipped) 4C-3
ABS Sensor Ring Inspection 4C-4
Rear Brake Shoe Removal and Installation 4C-4
Rear Brake Shoe Inspection 4C-5
Wheel Cylinder Removal and Installation 4C-5
Wheel Cylinder Inspection 4C-6
Brake Back Plate Removal and Installation 4C-6
Specifications 4C-8
Tightening Torque Specifications 4C-8
Special Tools and Equipment 4C-8
Recommended Service Material 4C-8
Special Tool 4C-8

Parking Brake 4D-1
General Description 4D-1
Parking Brake Cable Construction 4D-1
Repair Instructions 4D-2
Parking Brake Inspection and Adjustment 4D-2
Parking Brake Cable Removal and Installation 4D-3
Parking Brake Lever Removal and Installation 4D-3
Specifications 4D-4
Tightening Torque Specifications 4D-4

ABS 4E-1
Precautions 4E-1
Precautions in Diagnosing Troubles 4E-1
Precautions in On-Vehicle Service 4E-1
General Description 4E-2
ABS Description 4E-2
ABS Hydraulic Unit / Control Module Assembly Description 4E-2
Schematic and Routing Diagram 4E-3
ABS Schematic 4E-3
ABS Wiring Circuit Diagram 4E-4
Component Location 4E-5
ABS Components Location 4E-5
Front Wheel Speed Sensor Components Location 4E-6
Rear Wheel Speed Sensor Components Location 4E-6
Diagnostic Information and Procedures 4E-7
ABS Check 4E-7
ABS Warning Lamp Check 4E-9
EBD Warning Lamp (Brake Warning Lamp) Check 4E-9
DTC Check 4E-9
DTC Table 4E-10
DTC Clearance 4E-10
Scan Tool Data 4E-10
ABS Warning Lamp Does Not Come ON at Ignition Switch ON 4E-11
ABS Warning Lamp Comes ON Steady 4E-12
ABS Warning Lamp Flashes Continuously while Ignition Switch Is ON 4E-14
EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady 4E-15
Serial Data Link Circuit Check 4E-16
DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Sensor Ring 4E-18
DTC C1041 / C1045 / C1051 / C1055, DTC C1042 / C1046 / C1052 / C1056: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Circuit, Right-Front / Left-Front / Right-Rear / Left-Rear Outlet Solenoid Circuit 4E-20
DTC C1057: Power Source Circuit 4E-21
DTC C1061: ABS Pump Motor and/or Motor Driver Circuit 4E-22
DTC C1063: Solenoid Valve Power Supply Driver Circuit 4E-23
DTC C1071: ABS Control Module 4E-24
Repair Instructions 4E-25
ABS Hydraulic Unit Operation Check 4E-25
ABS Hydraulic Unit / Control Module Assembly Components 4E-25
ABS Hydraulic Unit / Control Module Assembly On-Vehicle Inspection 4E-26
ABS Hydraulic Unit / Control Module Assembly Removal and Installation 4E-26
Front Wheel Speed Sensor On-Vehicle Inspection 4E-28
Front Wheel Speed Sensor Removal and Installation 4E-28
Front Wheel Speed Sensor Inspection 4E-29
Rear Wheel Speed Sensor On-Vehicle Inspection 4E-29
Rear Wheel Speed Sensor Removal and Installation 4E-30
Rear Wheel Speed Sensor Inspection 4E-31
Front Wheel Speed Sensor Ring On-Vehicle Inspection 4E-31
Front Wheel Speed Sensor Ring Removal and Installation 4E-32
Rear Wheel Speed Sensor Ring On-Vehicle Inspection 4E-32
Rear Wheel Speed Sensor Ring Removal and Installation 4E-32
Specifications 4E-32
Tightening Torque Specifications 4E-32
Special Tools and Equipment 4E-33
Special Tool 4E-33

Precautions

Precautions

Precautions for Brakes

S4RS0A4000001

Suspension Caution
Refer to “Suspension Caution: in Section 00”.

Wheels and Tires Caution
Refer to “Wheels and Tires Caution: in Section 00”.

Brake Caution
Refer to “Brake Caution: in Section 00”.

General Precautions
Refer to “General Precautions: in Section 00”.

Vehicle Lifting Points
Refer to “Vehicle Lifting Points: in Section 0A”.

Fastener Caution
Refer to “Fastener Caution: in Section 00”.

Fastener Information
Refer to “Fasteners Information: in Section 0A”.

Brake Control System and Diagnosis

Precautions

Precautions on Brake

S4RS0A4100001

Air Bag Warning
Refer to “Air Bag System Service Warning: in Section 00”.

Brakes Diagnosis Note
Refer to “Brakes Diagnosis Note: ”.

General Description

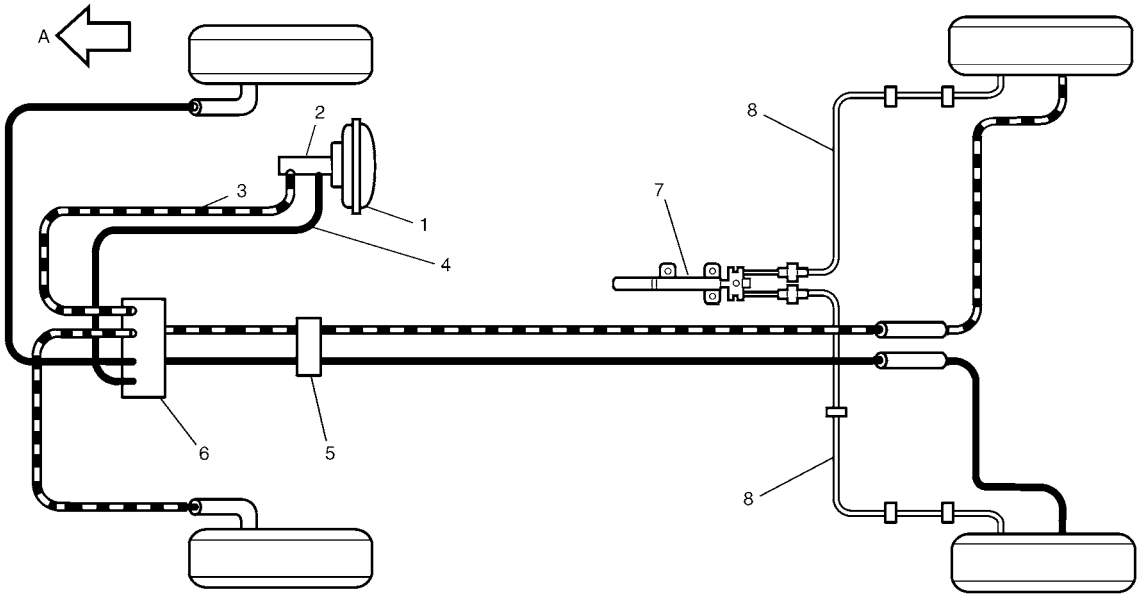
Brakes Construction

S4RS0A4101001

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and four in rear).
The master cylinder is a tandem master cylinder. Brake pipes are connected to the master cylinder and they make two independent circuits. One connects front right & rear left brakes and the other connects front left & rear right brakes.
In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading / trailing shoes) for the rear brake.
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

NOTE:

The figures shows RH steering vehicle.



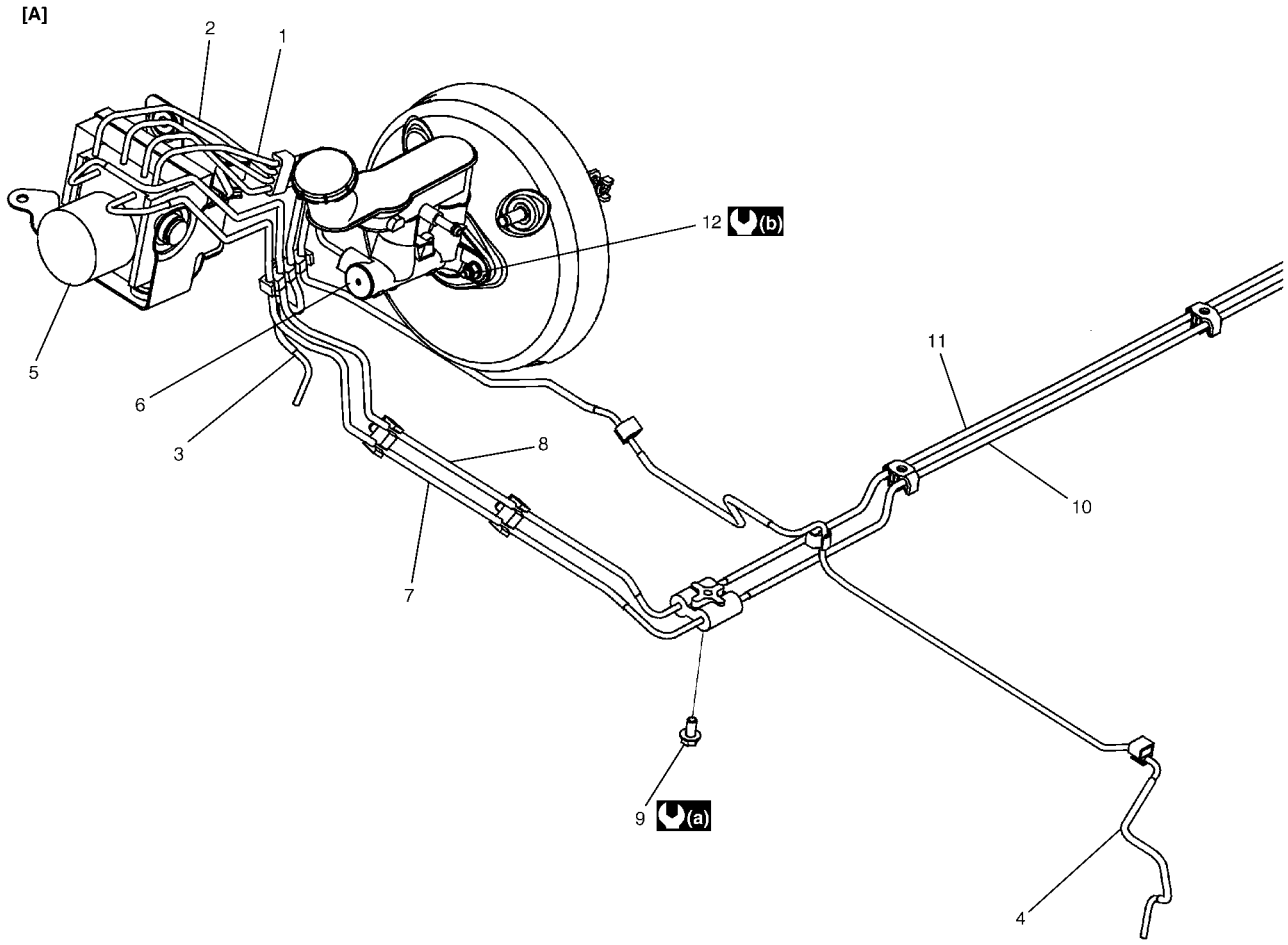
I4RS0A410001-

1. Brake booster	4. Primary side	7. Parking brake lever
2. Master cylinder	5. 4-way joint	8. Parking brake cable
3. Secondary side	6. ABS hydraulic unit / control module assembly	A: Forward

Front Brake Hose / Pipe Construction

S4RS0A4101002

For Vehicle with ABS

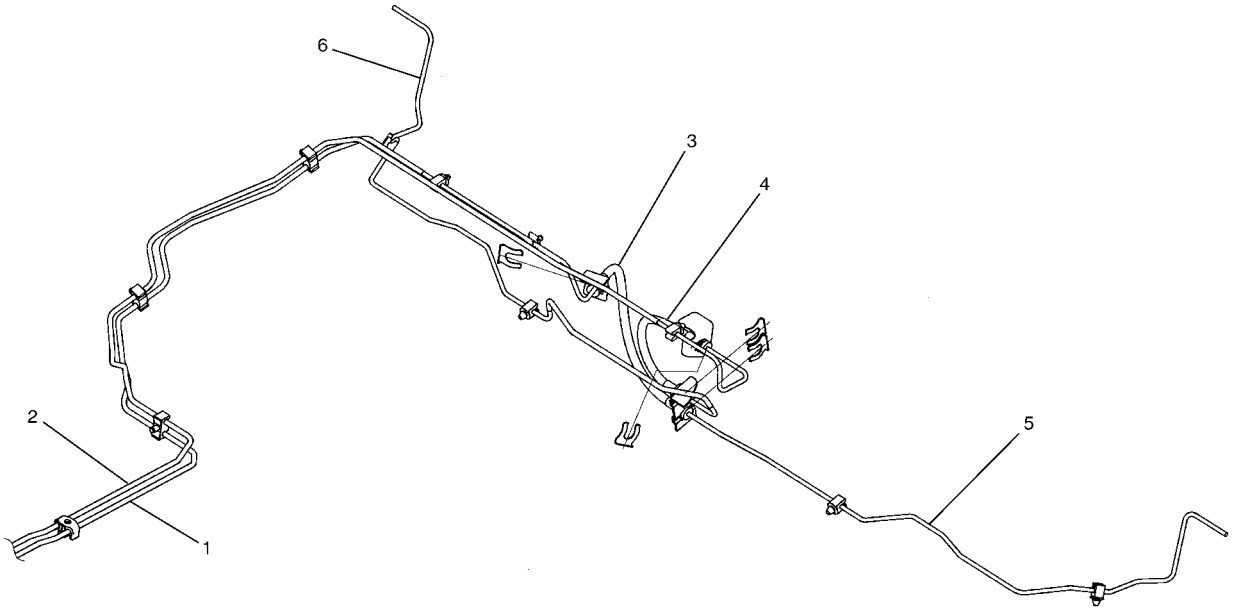


I4RS0A410002-

[A]: For RH steering vehicle	5. ABS hydraulic unit	10. 4-way joint to left rear brake hose
1. From master cylinder primary to ABS hydraulic unit	6. Master cylinder	11. 4-way joint to right rear brake hose
2. From master cylinder secondary to ABS hydraulic unit	7. From ABS hydraulic unit to 4-way joint	12. Master cylinder fixing nut
3. From ABS hydraulic unit to right front brake	8. From ABS hydraulic unit to 4-way joint	(a) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
4. From ABS hydraulic unit to left front brake	9. 4-way joint bolt	(b) : 15 N·m (1.5 kg-m, 11.0 lb-ft)

Rear Brake Hose / Pipe Construction

S4RS0A4101003



I4RS0A410003-

1. 4-way joint to left rear brake hose	4: Right rear brake hose
2. 4-way joint to right rear brake hose	5: Left rear brake hose to left brake
3. Left rear brake hose	6: Right rear brake hose to right brake

Diagnostic Information and Procedures

Brakes Diagnosis Note

S4RS0A4104001

Road Testing Brakes

Brakes should be tested on dry, clean, smooth and reasonably level roadway which is not crowned. Road test brakes by making brake applications with both light and heavy pedal forces at various speeds to determine if the vehicle stops evenly and effectively. Also drive vehicle to see if it leads to one side or the other without brake application. If it does, check the tire pressure, front wheel alignment and front suspension attachments for looseness. See diagnosis table for other causes.

Brake Fluid Leaks

Check the master cylinder fluid levels. While a slight drop in reservoir level does result from normal lining wear, an abnormally low level indicates a leak in the system. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

Substandard or Contaminated Brake Fluid

Improper brake fluid, mineral oil or water in the fluid may cause the brake fluid to boil or the rubber components in the hydraulic system to deteriorate.

If primary piston cups are swollen, then rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston cups on the drum brake wheels.

If deterioration of rubber is evident, disassemble all hydraulic parts and wash with alcohol. Dry these parts with compressed air before assembly to keep alcohol out of the system. Replace all rubber parts in the system, including hoses. Also, when working on the brake mechanisms, check for fluid on the linings.

If excessive fluid is found, replace the pads.

If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If leakage is not found, drain fluid, flush with brake fluid, refill and bleed system.

The system must be flushed if there is any doubt as to the grade of fluid in the system or if fluid has been used which contained parts that have been subjected to contaminated fluid.

Brakes Symptom Diagnosis

S4RS0A4104002

Condition	Possible cause	Correction / Reference Item
Not enough braking force	Brake oil leakage from brake lines	*Locate leaking point and repair.*
	Brake disc or pads stained with oil	*Clean or replace.*
	Overheated brakes	*Determine cause and repair.*
	Poor contact of shoes on brake drum	*Repair for proper contact.*
	Brake shoes linings stained with oil or wet with water	*Replace.*
	Badly worn brake pad linings	*Replace.*
	Defective wheel cylinders	*Repair or replace.*
	Malfunctioning caliper assembly	*Repair or replace.*
	Air in system	*Bleed system.*
	Maladjusted sensor spring length of LSPV, if equipped	*Check or adjust.*
	Broken sensor spring of LSPV, if equipped	*Replace.*
	Defective LSPV, if equipped	*Replace.*
	Malfunctioning ABS (Antilock brake system), if equipped	*Check system and replace as necessary.*
Brake pull (Brakes not working in unison)	Pad linings and/or shoe linings are wet with water or stained with oil in some brakes	*Replace.*
	Drum-to-shoe clearance out of adjustment in some brakes (Malfunctioning auto adjusting mechanism)	*Check for inoperative auto adjusting mechanism.*
	Disc and/or drum is out of round in some brakes	*Replace.*
	Tires are inflated unequally	*Inflate equally.*
	Malfunction in wheel cylinders	*Repair or replace.*
	Disturbed front wheel alignment	*Adjust as prescribed.*
	Unmatched tires on same axle	*Tires with approximately the same amount of tread should be used on the same axle.*
	Restricted brake pipes or hoses	*Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.*
	Malfunctioning caliper assembly	*Caliper should slide. Check for stuck or sluggish pistons and proper lubrication of caliper slide pin.*
	Loose suspension parts	*Check all suspension mountings.*
	Loose calipers	*Check and torque bolts to specifications.*
Noise (high pitched squeak without brake applied)	Front lining worn out	*Replace linings.*
	Contact wear indicator to brake disc	*Replace pads.*
Rear brake locked prematurely	Maladjusted sensor spring length of LSPV, if equipped	*Check or adjust.*
	Malfunction LSPV assembly, if equipped	*Replace assembly.*
Excessive pedal travel (Pedal stroke too large)	Partial brake system failure	*Check brake systems and repair as necessary.*
	Insufficient fluid in master cylinder reservoirs	*Check warning light. Bleed system if required. Check for leaks and air in brake system. Fill reservoirs with approved brake fluid.*
	Air in system (soft / spongy pedal)	*Bleed system.*
	Rear brake system not adjusted (malfunctioning auto adjusting mechanism)	*Adjust rear brakes. Repair auto adjusting mechanism.*
	Bent brake shoes	*Replace brake shoes.*
	Worn rear brake shoes	*Replace brake shoes.*
Brake locked (For vehicle equipped with ABS)	Malfunctioning ABS	*Check system referring to “ABS Check: in Section 4E”.*

Condition	Possible cause	Correction / Reference Item
Dragging brakes (A very light drag is present in all brakes immediately after pedal is released)	Master cylinder pistons not returning correctly	*Replace master cylinder.*
	Restricted brake pipes or hoses	*Check for soft hoses or damaged pipes and replace with new hoses and/or new brake piping.*
	Incorrect parking brake adjustment on rear brakes	*Check and adjust to correct specifications.*
	Weakened or broken return springs in the brake	*Replace.*
	Sluggish parking brake cables or linkage	*Repair or replace.*
	Wheel cylinder or caliper piston sticking	*Repair as necessary.*
	Badly worn piston seal in caliper	*Replace piston seal.*
	Improper brake pedal free height	*Check brake pedal free height.*
Pedal pulsation (Pedal pulsates when depressed for braking)	Damaged or loose wheel bearings	*Replace wheel bearings.*
	Distorted steering knuckle or rear wheel spindle	*Replace knuckle or rear wheel spindle.*
	Excessive disc lateral runout	*Check per instructions. If not within specifications, replace or machine disc.*
	Parallelism between pad and disc not within specifications	*Check per instructions. If not within specifications, replace or machine disc.*
	Rear drums out of round	*Repair or replace drum as necessary. Check runout.*
Braking noise	Glazed shoe linings, or foreign matters stuck to linings	*Repair or replace shoe linings.*
	Worn or distorted shoe linings	*Replace shoe lining (or pad).*
	Loose front wheel bearings	*Replace wheel bearings.*
	Distorted backing plates or loose mounting bolts	*Replace or retighten securing bolts.*
	Contact wear indicator to brake disc	*Replace pads.*
Brake warning lamp lights after engine start	Parking brake applied	*Release parking brake and check that brake warning lamp turns off.*
	Insufficient amount of brake fluid	*Add brake fluid.*
	Brake fluid leaking from brake line	*Investigate leaky point, correct it and add brake fluid.*
	Brake warning lamp circuit faulty	*Repair circuit.*
	Malfunctioning EBD system, if equipped with ABS.	*Check system referring to "EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady: in Section 4E".*
Brake warning lamp turns on when brake is applied	Brake fluid leaking from brake line	*Investigate leaky point, correct it and add brake fluid.*
	Insufficient amount of brake fluid	*Add brake fluid.*
Brake warning lamp fails to turn on even when parking brake is applied	Brake warning lamp circuit faulty	*Replace bulb or repair circuit.*
ABS warning lamp turns on after engine start (If equipped)	Malfunctioning ABS	*Check system referring to "ABS Check: in Section 4E".*
ABS warning lamp turns on when brake is applied (If equipped)	Malfunctioning ABS	*Check system referring to "ABS Check: in Section 4E".*
ABS warning lamp does not turn on for 2 sec. after ignition switch has turned ON (If equipped)	Bulb burnt out	*Replace bulb.*
	Malfunctioning ABS	*Check system referring to "ABS Check: in Section 4E".*
ABS warning lamp flashes (If equipped)	New ABS hydraulic unit / control module assembly installed.	*Perform "ABS Hydraulic Unit Operation Check: in Section 4E".*

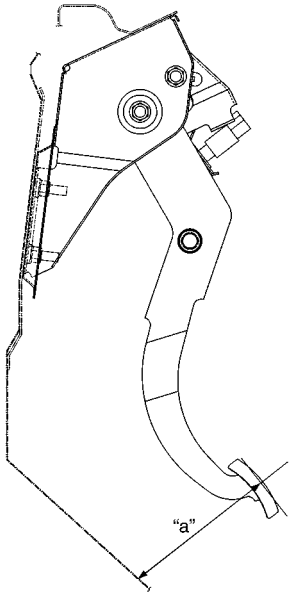
Repair Instructions

Brake Pedal Free Height Inspection

S4RS0A4106001

1) Check brake pedal free height. If it is not within specification, check and adjust following item 2) and 6).

Brake pedal free height “a” from floor panel
130 – 150 mm (5.1 – 5.9 in.)



I4RS0A410004-

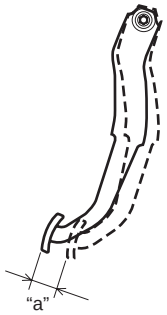
2) Check measurement between booster mounting surface and center of clevis pin hole. When booster push rod clevis has been reinstalled, it is important that the measurement is adjusted (refer to “Brake Booster Inspection and Adjustment: ”).
3) Check stop light switch position. Adjust it if it is out of specification.
4) Check pedal for dent.
5) Check brake booster for installation.
6) Check brake booster push rod for length.

Brake Pedal Play Inspection

S4RS0A4106002

Pedal play should be within the following specification. If out of specification, check stop light switch for proper installation position and adjust if necessary.
Also check pedal shaft bolt and booster clevis pin installation for looseness and replace if defective.

Brake pedal play
“a”: 1 – 8 mm (0.04 – 0.31 in.)



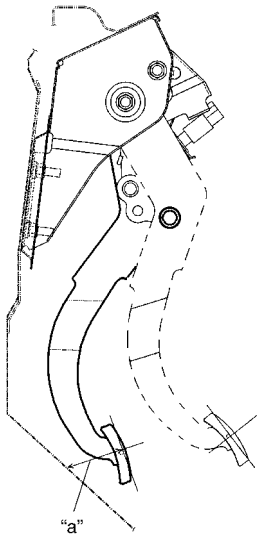
I3RH0A410010-

Excessive Pedal Travel Inspection

S4RS0A4106003

1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 300 N (30 kg, 66 lbs) load, measure brake pedal to wall (dash panel silencer) clearance “a”. If clearance “a” is less than specification, the most possible cause is either rear brake shoes are worn out beyond limit or air is in lines. Should clearance “a” remain less than specification even after replacement of brake shoes and bleeding of system, other possible but infrequent cause is malfunction of rear brake shoe adjusters or booster push rod length out of adjustment.
   - Bleed brake system. Refer to “Air Bleeding of Brake System: ”.
   - Remove brake drums for adjuster inspection. (Refer to “Rear Brake Drum Removal and Installation: in Section 4C”.) If defective, correct or replace.

Clearance “a” between brake pedal and floor panel
over 85 mm (3.34 in.)

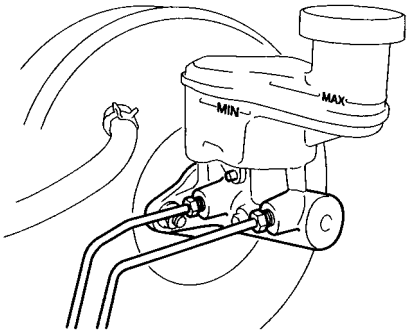


I4RS0A410005-

Master Cylinder and Brake Fluid Level Inspection

S4RS0A4106004

1) Check master cylinder, reservoir and reservoir hose (if equipped) for crack, damage and brake fluid leakage. If any faulty condition exists, correct or replace.
2) Check that brake fluid level is between MAX and MIN marks on reservoir.



I4RS0A410006-

NOTE:

Be sure to use particular brake fluid either as indicated on reservoir cap of that vehicle or recommended in owner's manual which comes along with that vehicle. Use of any other fluid is strictly prohibited.
Fluid level should be between MIN and MAX lines marked on reservoir.
When brake warning lamp lights sometimes during driving, replenish fluid to MAX level. When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

CAUTION:

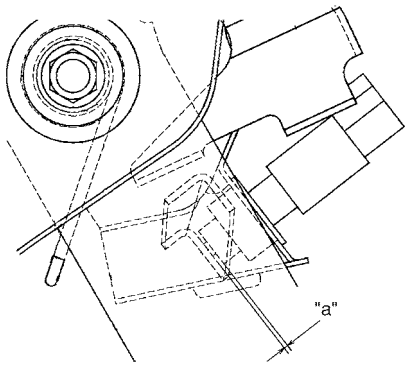
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

Stop Light Switch Adjustment

S4RS0A4106005

Adjustment should be made as follows. Pull up brake pedal toward you and while holding it there, adjust switch position so that clearance between end of thread and brake pedal is as specified. Then lock it by turning clockwise.

Clearance between brake pedal and stop light switch "a": 1.2 – 2.2 mm (0.05 – 0.08 in.)



I4RS0A410007-

Air Bleeding of Brake System

S4RS0A4106006

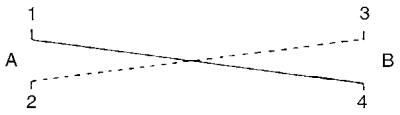
CAUTION:

Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
Hydraulic lines of brake system are based on the diagonal split system. When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder of other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be bled at all 4 wheel brakes.

NOTE:

Perform bleeding operation starting with wheel cylinder farthest from master cylinder and then at front caliper of the same brake line. Do the same on the other brake line.

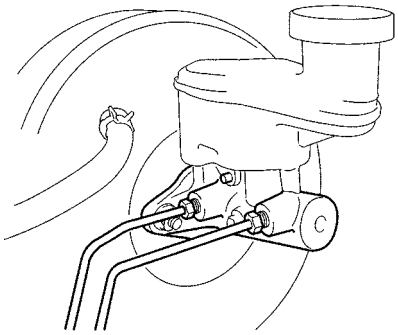


I2RH01410013-

1. Right brake caliper	4. Left wheel cylinder
2. Left brake caliper	A: FRONT
3. Right wheel cylinder	B: REAR

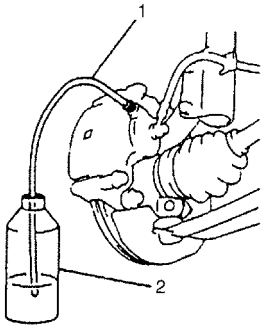
1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.

: Brake fluid (DOT 3)



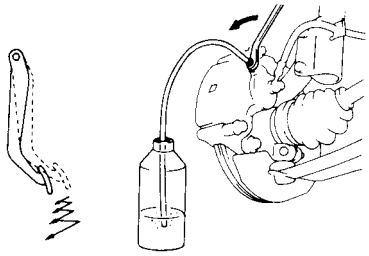
I4RS0A410008-

2) Remove bleeder plug cap. Attach a vinyl tube (1) to bleeder plug, and insert the other end into container (2).



I2RH01410015-

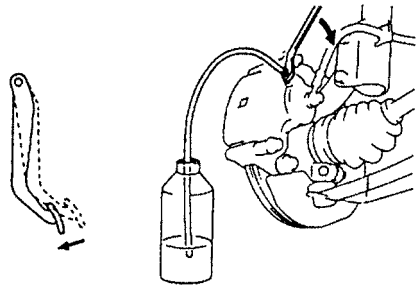
3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.
4) When fluid pressure in cylinder is almost depleted, retighten bleeder plug.
5) Repeat this operation until there are no more air bubbles in hydraulic line.



I2RH01410016-

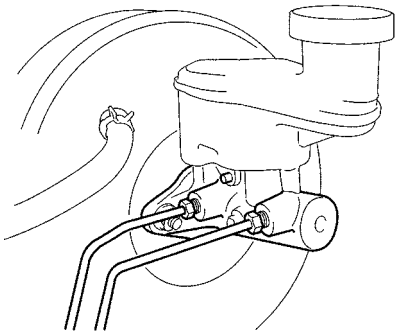
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

Tightening torque
Front brake caliper bleeder plug: 8.0 N·m (0.8 kg-m, 6.0 lb-ft)
Rear wheel cylinder bleeder plug: 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



I2RH01410017-

7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.



I4RS0A410008-

10) Check brake pedal for sponginess. If found spongy, repeat entire procedure of bleeding.

Front Brake Hose / Pipe Removal and Installation

S4RS0A4106007

Removal

1) Raise and support vehicle properly. Remove tire and wheel.

NOTE:

This operation is not necessary when removing pipes connecting master cylinder.

2) Clean dirt and foreign material from both flexible hose end and pipe end fittings.
3) Remove brake flexible hose or pipe.

Installation

Reverse brake flexible hose installation procedure, noting the following.

- Make sure that steering wheel is in straight-forward position and flexible hose has not twist or kink.
- Check to make sure that flexible hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir.
- Bleed brake system. Refer to "Air Bleeding of Brake System: ".

- Perform brake test and check installed part for fluid leakage.

Rear Brake Hose / Pipe Removal and Installation

S4RS0A4106008

Removal

1) Raise and support vehicle properly. Remove tire and wheel.
2) Clean dirt and foreign material from both flexible hose end and pipe end fittings.
3) Remove brake flexible hose or pipe.

Installation

Reverse brake flexible hose installation procedure, noting the following.

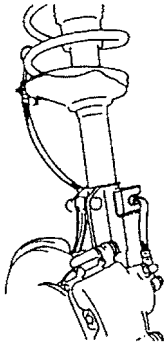
- Fill and maintain brake fluid level in reservoir.
- Bleed brake system. Refer to “Air Bleeding of Brake System: ”.
- Perform brake test and check each installed part for fluid leakage.
- Never reuse protector nut once removed. Be sure to use a new one.
- Install clamps properly referring to the figure and tighten bolts.
- When installing hose, make sure that it has no twist or kink.

Brake Hose and Pipe Inspection

S4RS0A4106009

Hose

The brake hose assembly should be checked for road hazard damage, for cracks and chafing of outer cover, for leaks and blisters. A light and mirror may be needed for an adequate inspection. If any conditions are observed on brake hose, it is necessary to replace it.



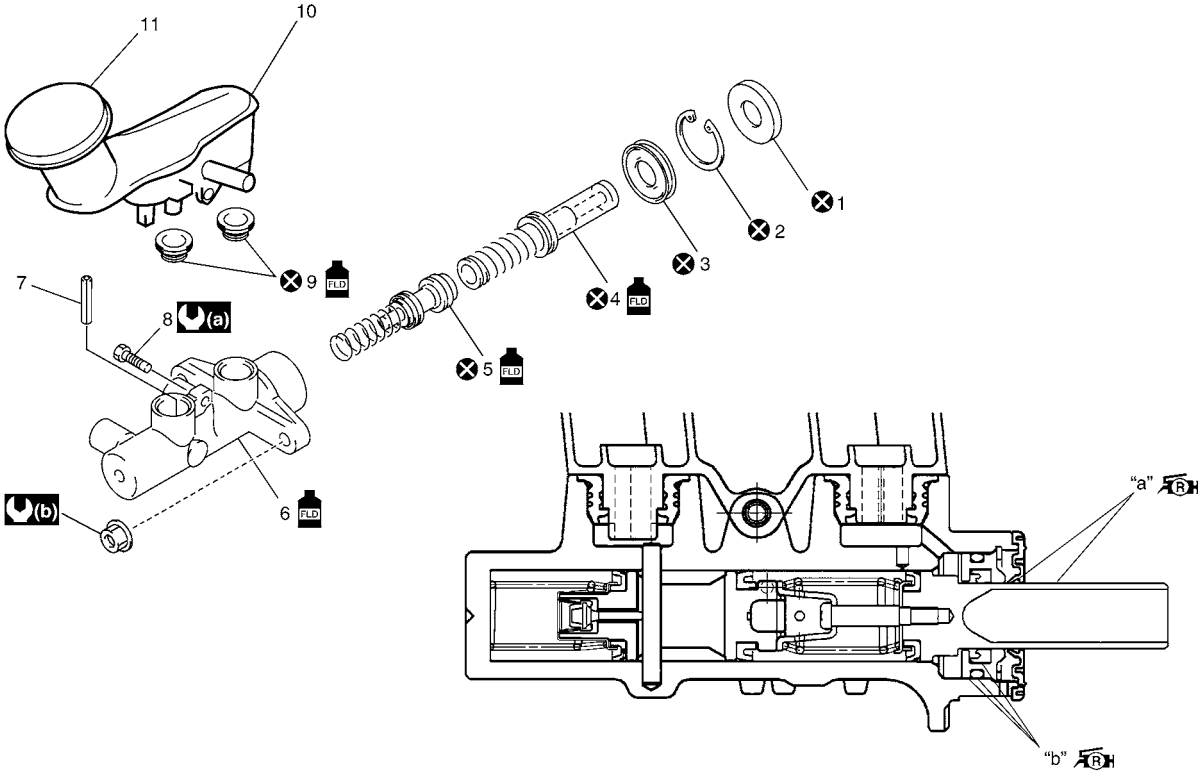
I2RH01410012-

Pipe

Inspect the pipe for damage, cracks, dents and corrosion. If any defect is found, replace it.

Master Cylinder Components

S4RS0A4106010



I4RS0A410025-

1. Master cylinder seal	7. Secondary piston stopper pin	(b) : 15 N·m (1.5 kg-m, 11.0 lb-ft)
2. Circlip	8. Reservoir bolt	"a" : Apply small amount of silicon grease (included in spare parts) to mating surfaces of rod seal and primary piston.
3. Piston guide	9. Grommet : Apply brake fluid.	"b" : Apply small amount of rubber grease (included in spare parts) to mating surfaces of O-ring and piston guide / Secondary cup and piston guide.
4. Primary piston assembly : Apply brake fluid to piston cup.	10. Reservoir	: Do not reuse.
5. Secondary piston assembly : Apply brake fluid to piston cup.	11. Reservoir cap	
6. Master cylinder body : Apply brake fluid to inside of cylinder.	(a) : 2.5 N·m (0.25 kg-m, 2.0 lb-ft)	

Master Cylinder Reservoir Removal and Installation

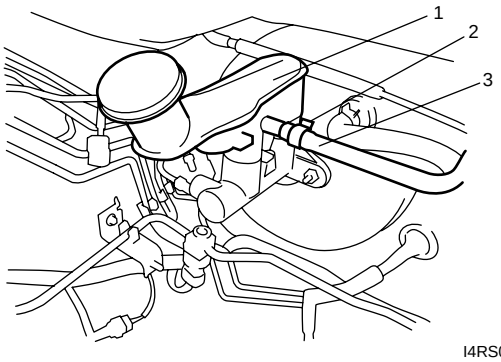
S4RS0A4106011

Removal

CAUTION:

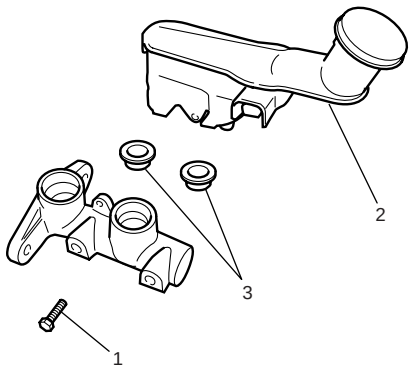
Brake fluid is extremely damaging to paint. Do not allow brake fluid to get on painted surfaces.

1) Disconnect fluid level switch coupler on reservoir.
2) Clean outside of reservoir.
3) Take out fluid with syringe or such.
4) Disconnect clutch reservoir hose clamp (2) and hose (3) from reservoir (1) for MT vehicle.



I4RS0A410010-

5) Remove reservoir bolt (1).
6) Remove reservoir (2) and grommets (3).

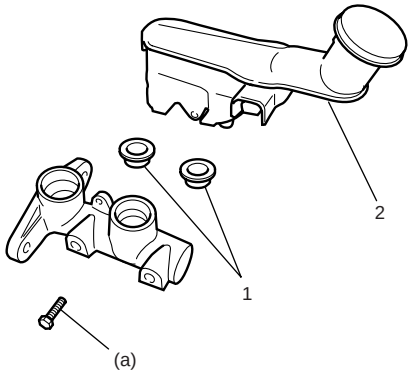


I4RS0A410011-

Installation

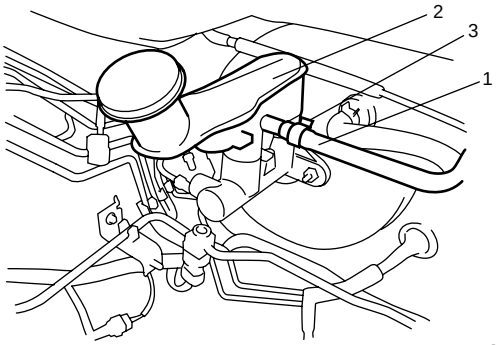
1) When using new grommets, lubricate them with the same fluid as the one to fill reservoir with. Then press-fit grommets (1) to reservoir (2). Grommets must be seated in place.
2) Install reservoir (2) to master cylinder with bolt (a).

Tightening torque
Reservoir bolt (a): 2.5 N·m (0.25 kg-m, 2.0 lb-ft)



I4RS0A410012-

3) Connect fluid level switch coupler on reservoir.
4) Connect clutch reservoir hose (1) to reservoir (2) for MT vehicle.
5) Install clutch reservoir hose clamp (3) for MT model.



I4RS0A410023-

6) Fill reservoir with special fluid.
7) Upon completion of installation, check for fluid leakage.

Master Cylinder Assembly Removal and Installation

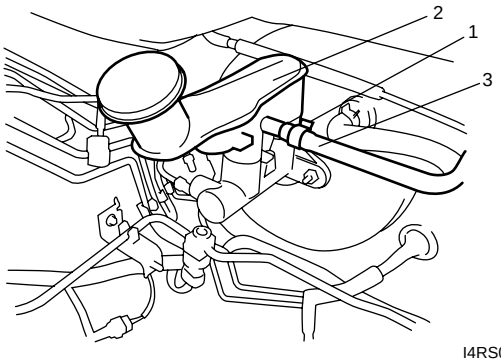
S4RS0A4106012

Removal

CAUTION:

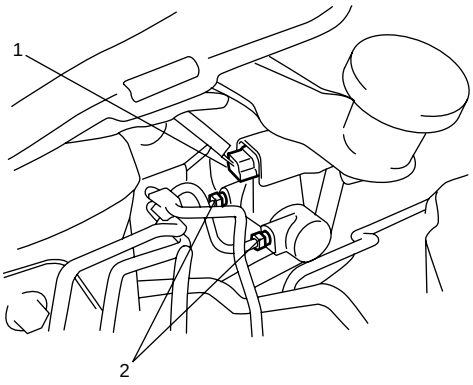
Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.

1) Clean outside of master cylinder.
2) Drain brake fluid in reservoir.
3) Remove clutch reservoir hose clamp (1) and disconnect clutch reservoir hose (3) from reservoir (2) for MT vehicle.



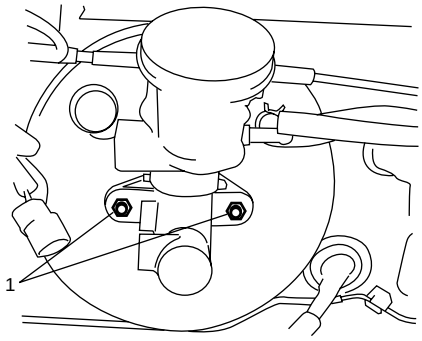
I4RS0A410026-

4) Disconnect fluid level switch coupler (1) on reservoir.
5) Disconnect brake pipes (2) connected to master cylinder.



I4RS0A410013-

6) Remove master cylinder fixing nuts (1).



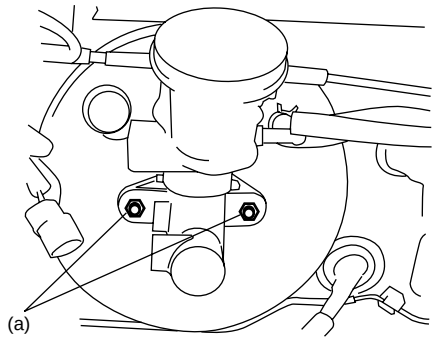
I4RS0A410014-

7) Remove master cylinder and master cylinder seal.

Installation

1) Install new master cylinder seal.
2) Install master cylinder to booster and tighten master cylinder fixing nuts (a) to specified torque.

Tightening torque
Master cylinder fixing nut (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

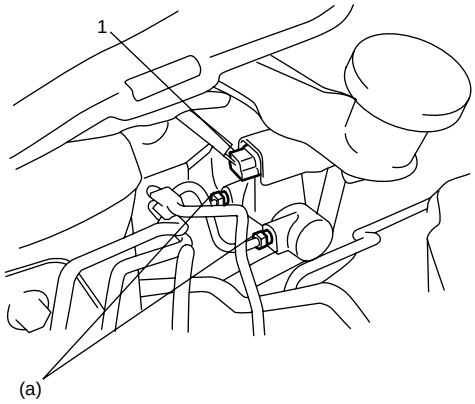


I4RS0A410015-

3) Connect brake pipe to master cylinder and tighten flare nuts (a) to specified torque.

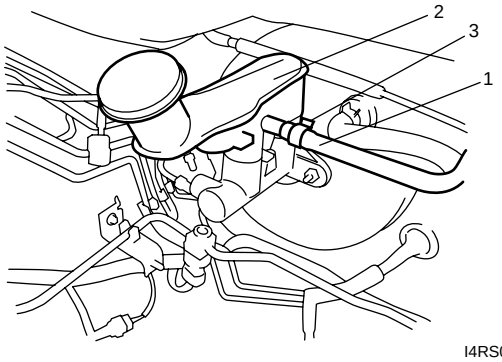
Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)

4) Connect fluid level switch connector (1) of reservoir.



I4RS0A410016-

5) Connect clutch reservoir hose (1) to reservoir (2) and install reservoir hose clamp (3) for MT vehicle.



I4RS0A410023-

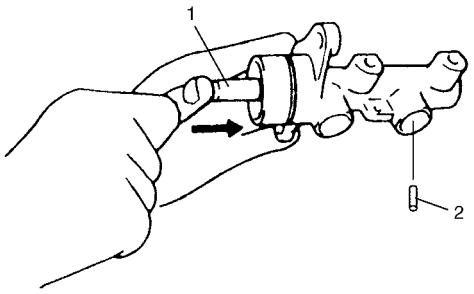
6) Fill reservoir with specified brake fluid up to its MAX mark.
7) After completing the work, bleed air referring to “Air Bleeding of Brake System: ”.
8) Check each installed parts for fluid leakage.
9) Check brake pedal for play referring to “Brake Pedal Play Inspection: ”.
10) Perform brake test and check fluid leakage.

Master Cylinder Assembly Disassembly and Assembly

S4RS0A4106013

Disassembly

1) Push in primary piston (1) to remove secondary piston stopper pin (2) from master cylinder as shown.

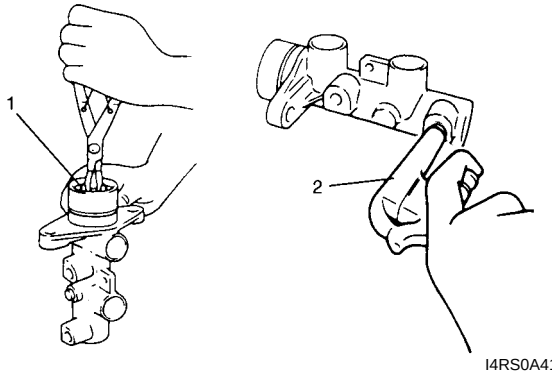


I2RH01410025-

2) Remove circlip (1).
3) Remove piston guide and primary piston. Then remove secondary piston by blowing compressed air (2) into hole. Be cautious during removal as secondary piston jumps out.

WARNING:

Do not apply too highly compressed air which will cause piston to jump out of cylinder. Place a cloth to prevent piston from damage. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.



I4RS0A410017-

Assembly

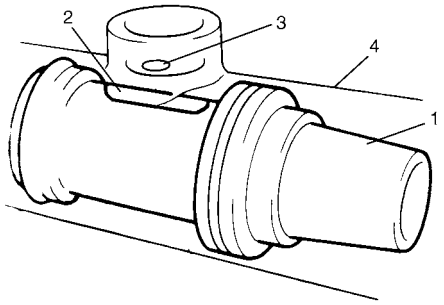
CAUTION:

- **Never use any mineral oil such as kerosene oil and gasoline when washing and assembling parts.**
- **Check inside of cylinder wall, pistons and cup seals are free from any foreign objects such as dust and dirt and use case not to cause any damage with a tool during assembly.**
- **Do not drop parts. Do not use any part which has been dropped.**

1) Apply brake fluid to inside of cylinder and contact surface of piston assembly (new piston cups, new O-ring and piston guide).
2) Install secondary return spring and secondary piston (1) into cylinder body (4).

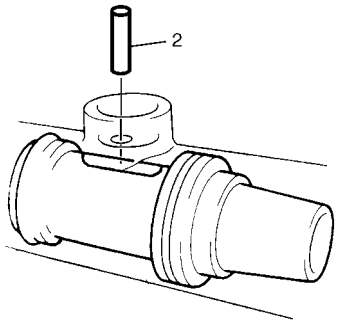
NOTE:

Align oblong hole in secondary piston (2) with stopper pin hole (3) in master cylinder body (4) when installing it.



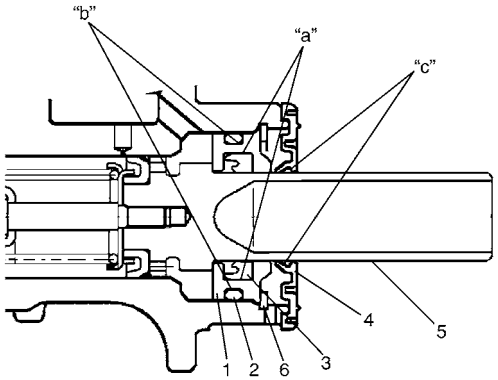
I2RH01410027-

3) Install primary piston assembly into cylinder body.
4) Install piston stopper pin (2) with pistons pushed in all the way and install it.



I4RS0A410018-

5) Apply small amount of rubber grease (included in spare parts) to mating surface of “a” (piston cup (3) and piston guide (1)) and “b” (piston guide (1) and O-ring (2)).
6) Apply small amount of silicon grease (included in spare parts) to mating surfaces of “c” (rod seal (4) and primary piston (5)).
7) Install piston guide (1) and circlip (6).



I4RS0A410024-

Master Cylinder Assembly Inspection

S4RS0A4106014

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:

- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston cups and cylinder cup.**

Inspect master cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:

Polishing bore of master cylinder with cast aluminium body with anything abrasive is prohibited, as damage to cylinder bore may occur.

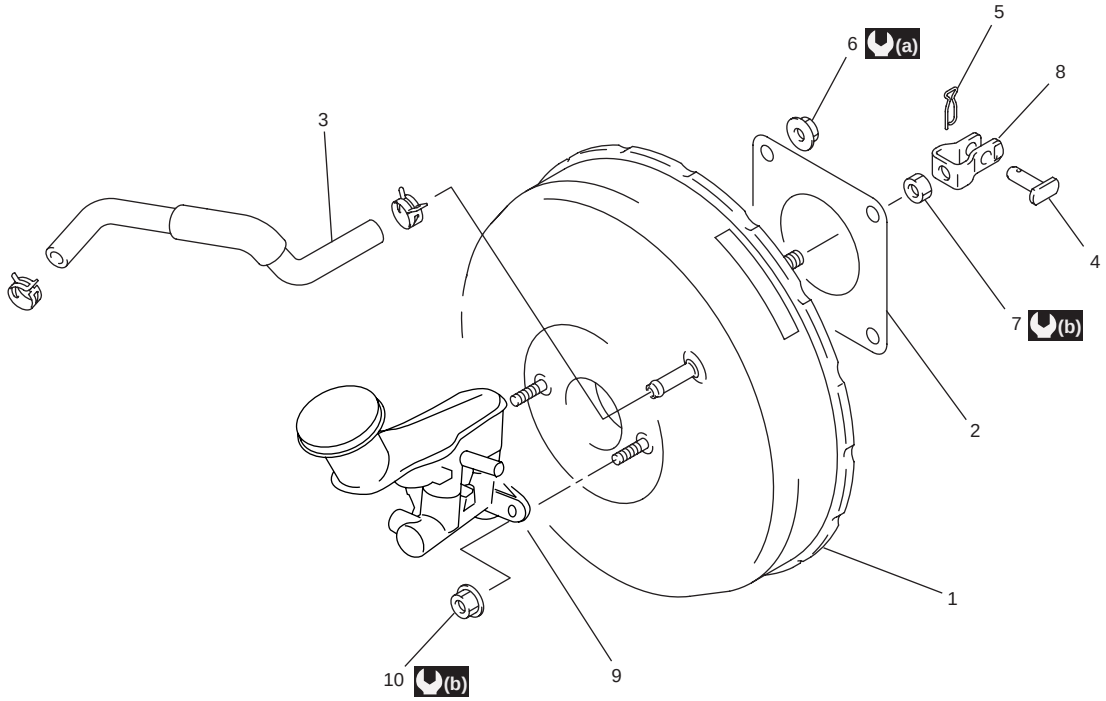
Rinse cylinder in clean brake fluid. Shake excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept from cylinder bore surfaces.

Brake Booster Components

S4RS0A4106015

CAUTION:

Never disassemble brake booster. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



I4RS0A410019-

1. Booster assembly	4. Clevis pin	7. Clevis pin lock nut	10. Master cylinder fixing nut
2. Gasket	5. Clip	8. Push rod clevis	(a) : Tighten 13 N·m (1.3 kg-m, 9.5 lb-ft) by the specified procedure.
3. Brake vacuum hose	6. Booster nut	9. Brake master cylinder	(b) : 15 N·m (1.5 kg-m, 11.0 lb-ft)

Booster Operation Inspection

S4RS0A4106016

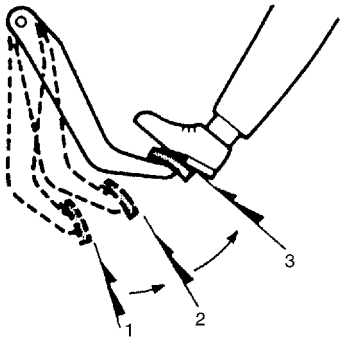
There are two ways to perform this inspection, with and without a tester. Ordinarily, it is possible to roughly determine its condition without using a tester.

NOTE:

For this check, make sure that no air is in hydraulic line.

Check Air Tightness

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.
3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.



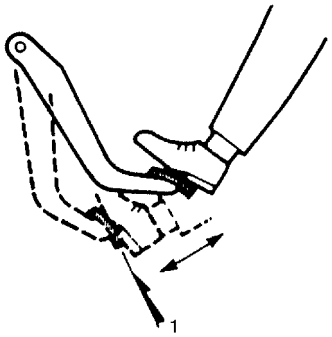
I2RH01410005-

1. 1st	2. 2nd	3. 3rd

4) If pedal travel doesn't change, air tightness isn't obtained.

NOTE:

If defective, inspect vacuum lines and sealing parts, and replace any faulty part. When this has been done, repeat the entire test.

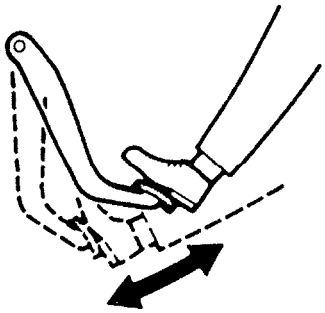


I2RH01410006-

1. 1st, 2nd, 3rd

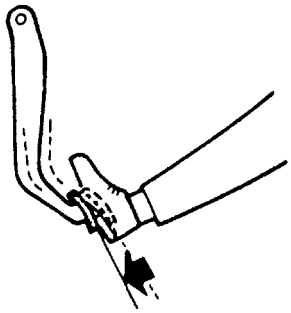
Check Operation

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.



I2RH01410007-

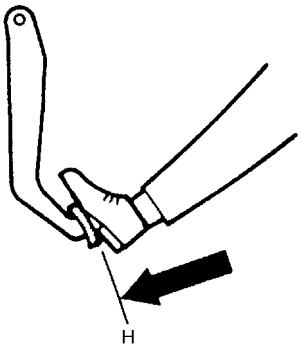
2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.



I2RH01410008-

Check Air Tightness Under Load

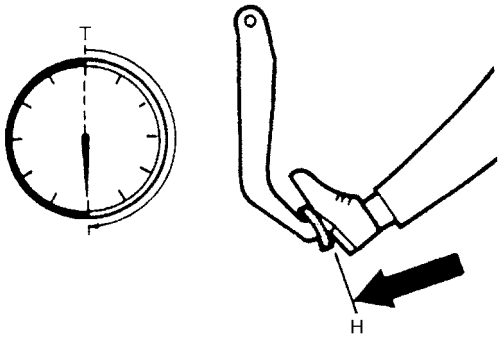
1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.



I2RH01410009-

H: Hold

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.



I2RH01410010-

H:	Hold
T:	30 seconds

Brake Booster Removal and Installation

S4RS0A4106017

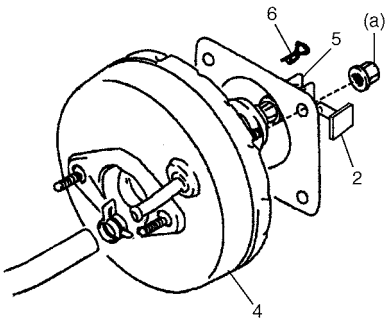
Removal

1) Recover refrigerant from A/C system by using recovery and recycling equipment referring to “Operation Procedure for Refrigerant Charge: in Section 7B”.
2) Remove master cylinder assembly from booster referring to “Master Cylinder Assembly Removal and Installation: ”.
3) Remove cowl top cover and cowl top panel referring to “Cowl Top Components: in Section 9K”.
4) Remove suction hose referring to “Major Components of A/C System: in Section 7B”.
5) Disconnect vacuum hose from booster referring to “Brake Booster Components: ”.
6) Remove push rod clevis pin and booster mounting nuts and then remove booster.

Installation

1) Loosen brake pedal bracket mounting bolt.
2) Check and adjust distance between booster installation surface (without including packing) and the center of clevis pin hole referring to “Brake Booster Inspection and Adjustment: ”.
3) Install booster (4) to dash panel. Then connect push rod clevis (5) to pedal arm with clevis pin (2) and clip (6).
4) Tighten booster mounting nuts (a) to specified torque.

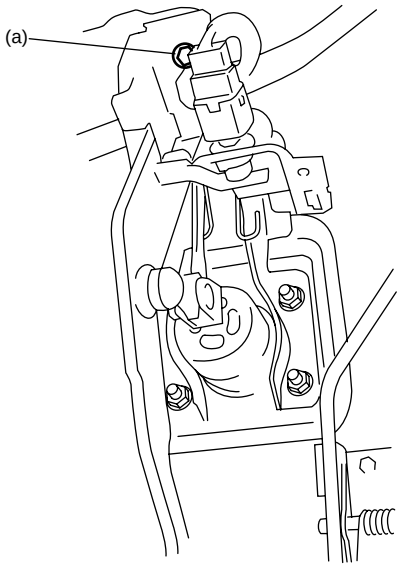
   Tightening torque
   Booster mounting nut (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I4RS0A410020-

5) Tighten brake pedal bracket mounting bolt.

   Tightening torque
   Brake pedal bracket mounting bolt (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I4RS0A410021-

6) Install suction hose referring to “Major Components of A/C System: in Section 7B”.
7) Install cowl top panel and cowl top cover referring to “Cowl Top Components: in Section 9K”.
8) Install master cylinder assembly to booster referring to “Master Cylinder Assembly Removal and Installation: ”.
9) Fill reservoir with specified fluid.
10) Bleed air from brake system.
11) Check pedal height and play referring to “Brake Pedal Free Height Inspection: ” and “Brake Pedal Play Inspection: ”.
12) Check each installed part for fluid leakage and perform brake test.
13) Evacuate and charge refrigerant by referring to “Evacuating of A/C System” and “Procedure of Charging” under “Operation Procedure for Refrigerant Charge: in Section 7B”.

Brake Booster Inspection and Adjustment

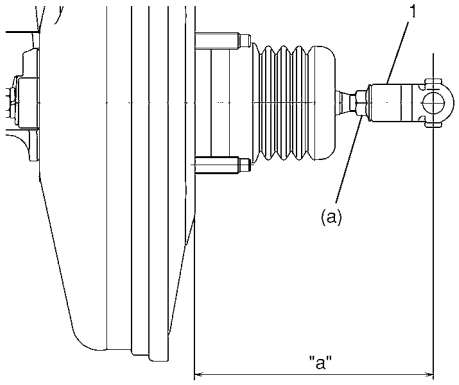
S4RS0A4106018

Installation Position of Push Rod

If push rod clevis (1) has been removed, adjust distance between booster installation surface (without including packing) and the center of clevis pin hole to standard value “a” and tighten nut (a) to specified torque.

Distance “a” between center of booster clevis pin hole and booster surface
Standard:
114.5 – 115.5 mm (4.51 – 4.54 in.)

Tightening torque
Clevis lock nut (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)



I4RS0A410022-

Specifications

Tightening Torque Specifications

S4RS0A4107001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Front brake caliper bleeder plug	8.0	0.8	6.0	☞
Rear wheel cylinder bleeder plug	7.5	0.75	5.5	☞
Reservoir bolt	2.5	0.25	2.0	☞
Master cylinder fixing nut	15	1.5	11.0	☞
Brake pipe flare nut	16	1.6	11.5	☞
Booster mounting nut	13	1.3	9.5	☞
Brake pedal bracket mounting bolt	13	1.3	9.5	☞
Clevis lock nut	15	1.5	11.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Brake Hose / Pipe Construction: ”
“Master Cylinder Components: ”
“Brake Booster Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A4108001

Material	SUZUKI recommended product or Specification		Note
Brake fluid	DOT 3	—	(DOT 3) ☞

NOTE:

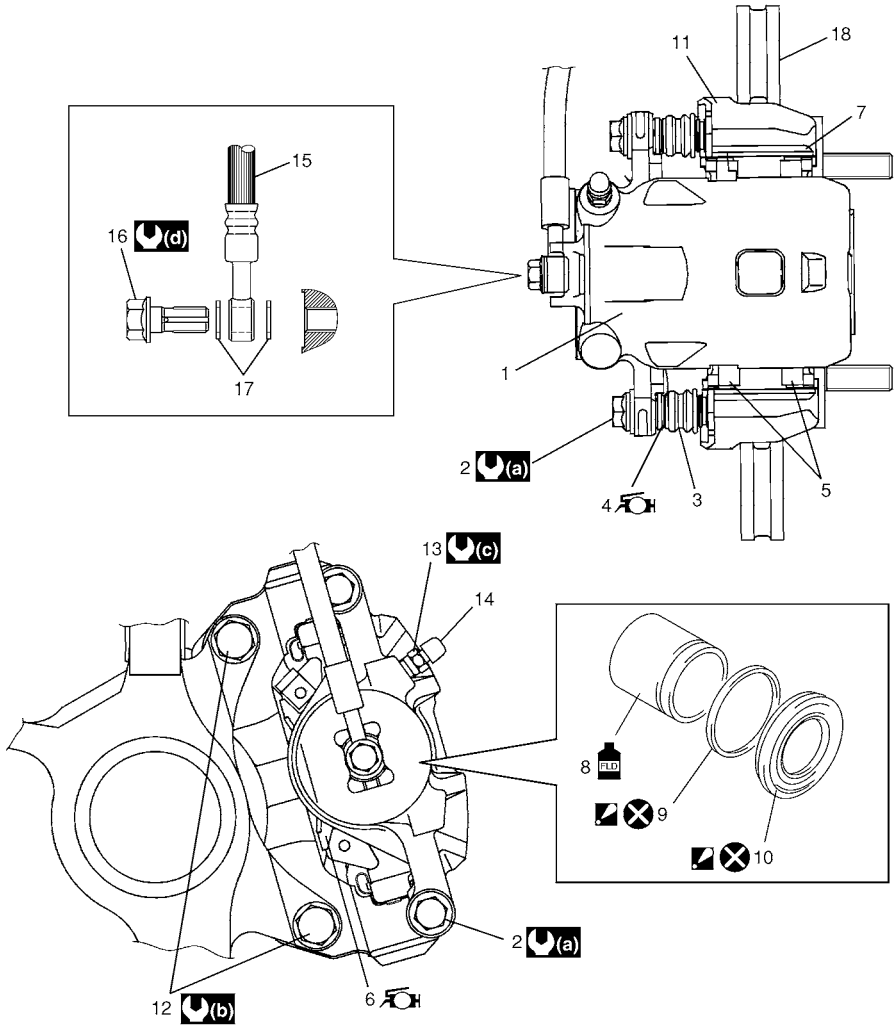
Required service material is also described in the following.
“Master Cylinder Components: ”

Front Brakes

Repair Instructions

Front Disc Brake Components

S4RS0A4206001



I4RS0A420001-

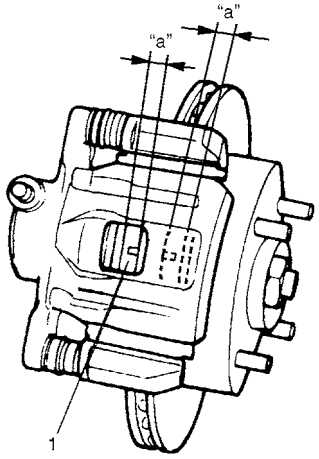
1. Caliper	9. Piston seal : Apply small amount of rubber grease (included in repair kit) to all around part of piston seal.	17. Hose washer
2. Caliper pin bolt	10. Cylinder boot : Apply small amount of rubber grease (included in repair kit).	18. Brake disk
3. Boot	11. Brake caliper carrier	(a) : 26 N·m (2.6 kg-m, 19.0 lb-ft)
4. Slide pin : Apply rubber grease (included in repair kit).	12. Caliper carrier bolt	(b) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
5. Brake pad	13. Front caliper bleeder plug	(c) : 8.0 N·m (0.8 kg-m, 6.0 lb-ft)
6. Pad shim : Apply small amount of pad grease (included in pad repair kit) to mating surfaces of brake pad and pad shim.	14. Bleeder plug cap	(d) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
7. Pad spring	15. Brake flexible hose	: Do not reuse.
8. Disk brake piston : Apply brake fluid to contact surface of cylinder.	16. Flexible hose joint bolt	

Front Disc Brake Pad On-Vehicle Inspection

S4RS0A4206002

Inspect pad linings (1) periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through each end (or hole) of caliper and check lining thickness of outside and inside pads.
If lining is worn and its thickness (“a” in figure) is less than limit, all pads must be replaced at the same time.

Front brake pad thickness “a” (lining thickness)
Standard: 10 mm (0.40 in.)
Limit: 2 mm (0.08 in.)



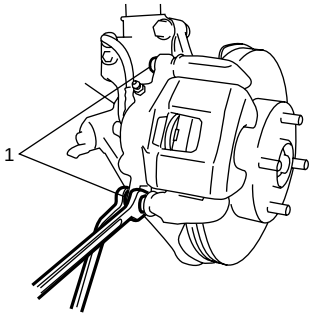
I2RH01420001-

Front Disc Brake Pad Removal and Installation

S4RS0A4206003

Removal

1) Loosen wheel nuts and with vehicle lifted up, remove wheels.
2) Remove caliper pin bolts (1).



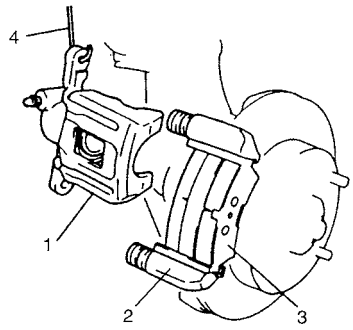
I2RH01420003-

3) Remove caliper (1) from caliper carrier (2).

NOTE:

Hang removed caliper (1) with a wire hook (4) or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don’t operate brake pedal with brake pads removed.

4) Remove brake pads (3).



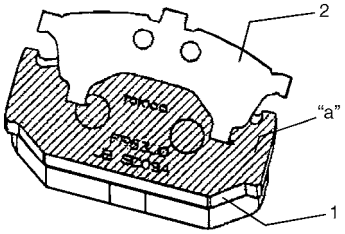
I2RH01420004-

Installation

1) Before installing brake pad shim, apply small amount of pad grease “a” (included in pad kit) to mating surfaces of brake pad (1) and pad shim (2).

WARNING:

Do not apply grease on pad lining surface.

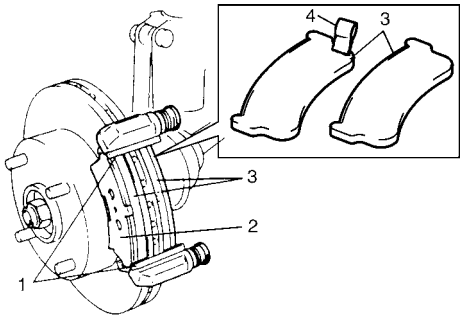


I4RS0A420005-

2) Set brake pad springs (1) and shim (2) and install brake pads (3).

NOTE:

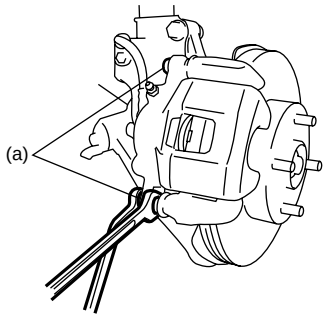
For right side brake, install pad with wear indicator (4) to vehicle center side.



I2RH01420006-

3) Install caliper and tighten caliper pin bolts (a) to specified torque.

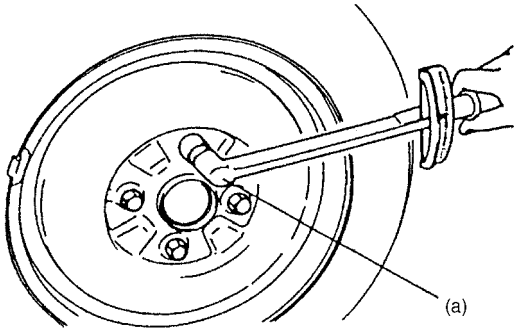
Tightening torque
Caliper pin bolt (a): 26 N·m (2.6 kg-m, 19.0 lb-ft)



I4RS0A420002-

4) Install wheel and lower lift.
5) Tighten wheel nuts to specified torque.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01420008-

6) After completion of installation, check for brake effectiveness.

Front Disc Brake Pad Inspection

S4RS0A4206004

Check pad lining for wear. When wear exceeds limit, replace with new one.

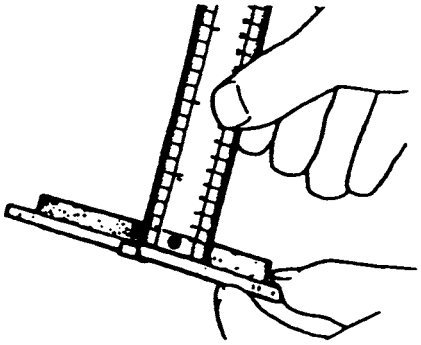
CAUTION:

Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Brake pad thickness (lining thickness)
Standard: 10 mm (0.40 in.)
Limit: 2 mm (0.08 in.)

NOTE:

When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.



I2RH01420005-

Front Disc Brake Caliper Removal and Installation

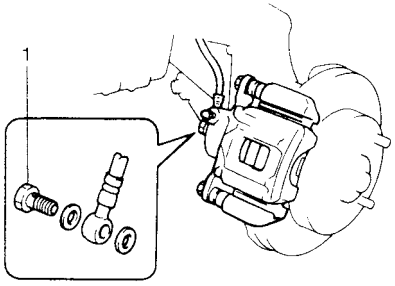
S4RS0A4206005

Removal

1) Hoist vehicle and remove wheel.
2) Loosen flexible hose joint bolt (1) a little at caliper.

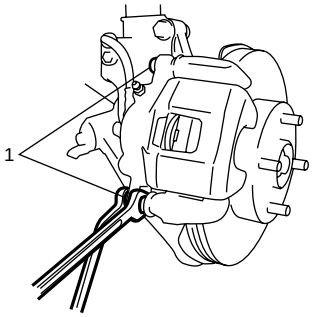
CAUTION:

Be careful not to twist flexible hose while loosening the bolt.



I2RH01420009-

3) Remove caliper pin bolts (1).



I2RH01420010-

4) Remove caliper from caliper carrier.
5) Disconnect flexible hose from caliper using care not to twist it. As this will allow brake fluid to flow out of flexible hose, have a container ready beforehand.

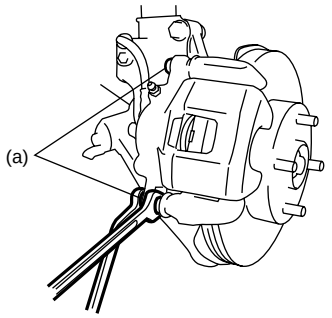
Installation

1) Apply grease to slide pin, then install caliper to caliper carrier.
2) Torque caliper pin bolts (a) to specification.

NOTE:

Make sure that boots are fit into groove securely.

Tightening torque
Caliper pin bolt (a): 26 N·m (2.6 kg-m, 19.0 lb-ft)



I4RS0A420003-

3) Connect caliper to flexible hose.
4) Torque flexible hose joint bolt to specification.

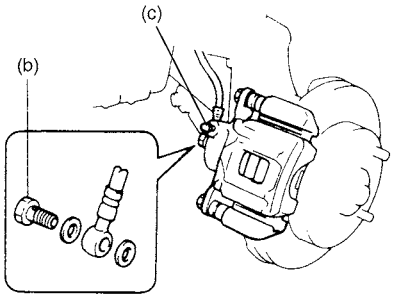
Tightening torque
Flexible hose joint bolt (b): 23 N·m (2.3 kg-m, 17.0 lb-ft)

WARNING:

Make sure that flexible hose is not twisted when tightening joint bolt. If it is twisted, reconnect it using care not to twist it.

5) Tighten bleeder plug to specified torque.

Tightening torque
Bleeder plug (c): 8.0 N·m (0.8 kg-m, 6.0 lb-ft)



I2RH01420023-

6) Lower hoist.
7) Torque wheel nuts to specifications.

Tightening torque
Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

8) After completing installation, fill reservoir with brake fluid and bleed air from brake system referring to “Air Bleeding of Brake System: in Section 4A”.
9) Check each installed part for fluid leakage.
10) Perform brake test and check fluid leakage.

Front Disc Brake Caliper Disassembly and Assembly

S4RS0A4206006

Disassembly

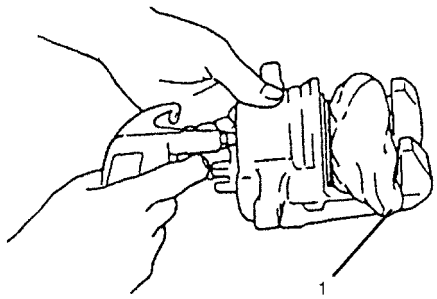
CAUTION:

Clean around caliper with brake fluid before disassembly.

1) Remove piston with air blown into flexible hose bolt installation hole.

WARNING:

Do not apply too highly compressed air which will cause piston to jump out of cylinder. Place a cloth (1) to prevent piston from damage. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.



I2RH01420011-

2) Remove cylinder boot (2).

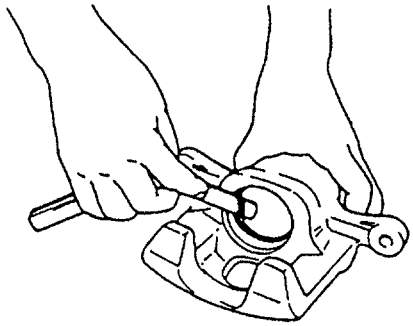
CAUTION:

Be careful not to damage inside (bore side) of cylinder.

3) Remove piston seal using a thin blade like a thickness gauge, etc.

CAUTION:

Be careful not to damage inside (bore side) of cylinder.



I2RH01420013-

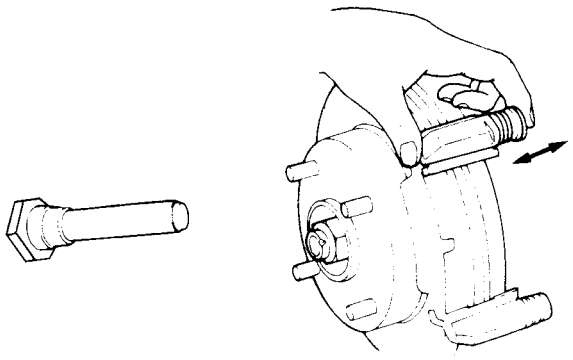
4) Remove bleeder plug and cap from caliper.

Assembly

Assemble parts in reverse order of disassembly, observing the following instructions.

CAUTION:

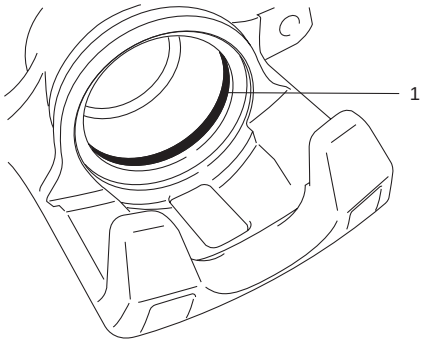
- **Wash each part cleanly before installation in the same fluid as the one used in master cylinder reservoir.**
- **Never use other fluid or thinner.**
- **Before installing piston seal or cylinder boot to cylinder, apply brake fluid to them.**
- **Install a new piston seal into groove in cylinder securely making sure that it is not twisted.**
- **Before installing caliper to carrier, install slide pin with grease applied into caliper carrier hole and check for its smooth movement in thrust direction.**
- **After reassembling brake lines, bleed air from them.**



I2RH01420016-

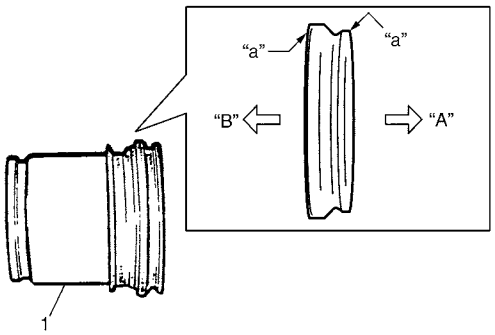
- Install piston seal, boot and piston to caliper referring to the following instructions.

1) Replace with a new piston seal (1) at every overhaul. After applying rubber grease (included in repair kit), fit piston seal (1) into groove in cylinder taking care not to twist it.



I2RH01420017-

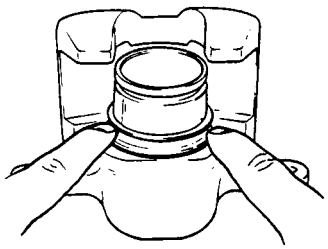
2) Before inserting piston (1) into cylinder, apply rubber grease (included in repair kit) to new boot “a” and install it onto piston as shown.



I4RS0A420006-

“A”:	1 grooved side directed cylinder side
“B”:	2 grooved side directed pad side

3) Fit boot as it is in figure into boot groove in cylinder with fingers.

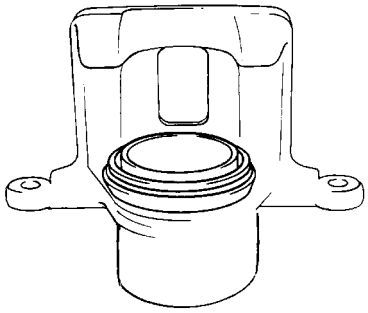


I2RH01420019-

4) Insert piston into cylinder by hand and fit boot in boot groove in piston.

NOTE:

Check that boot is fitted in boot groove securely all around piston and cylinder.



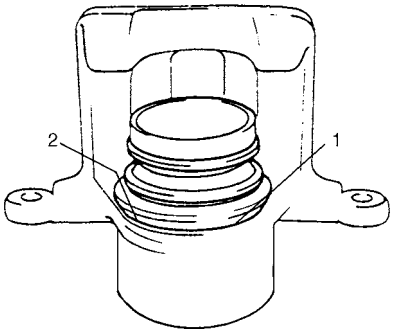
I2RH01420020-

5) To confirm that boot is fitted in its groove in cylinder properly, pull piston out of cylinder a little but do not take it all out.

NOTE:

Boot's face (1) should be at the same level from cylinder's face (2) all around.

6) Insert piston into cylinder by hand.



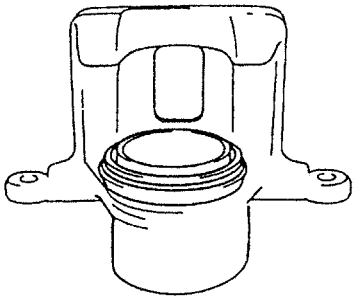
I4RS0A420004-

Front Disc Brake Caliper Inspection

S4RS0A4206007

Pin Boot and Cylinder Boot

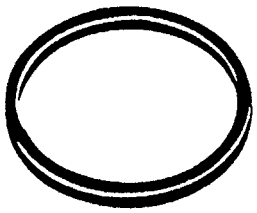
Check boots for breakage, crack and damage.
If defective, replace.



I2RH01420014-

Piston Seal

Excessive or uneven wear of pad lining may indicate unsmooth return of piston.
In such case, replace rubber seal.



I2RH01420015-

Front Brake Disc Removal and Installation

S4RS0A4206008

Removal

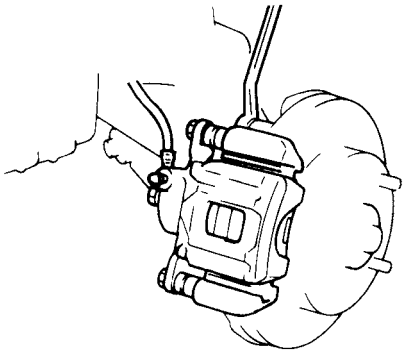
1) Hoist vehicle and remove wheel.
2) Remove caliper assembly by removing caliper carrier bolts (2 pcs)

CAUTION:

During removal, be careful not to damage brake flexible hose and not to depress brake pedal.

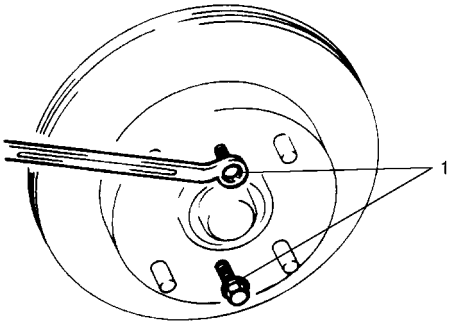
NOTE:

Hang removed caliper with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with brake pads removed.



I2RH01420024-

3) Pull brake disc off by using 8 mm bolts (1) (2 pcs).



I2RH01420025-

Installation

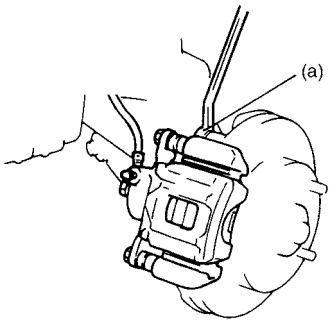
1) Install disc to wheel hub.
2) Install caliper assembly to steering knuckle.

CAUTION:

Make sure that flexible hose is not twisted when installing caliper assembly. If it is twisted, reinstall it using care not to twist it.

3) Torque caliper carrier bolts to specification.

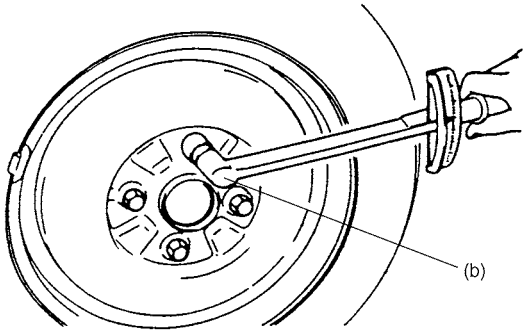
Tightening torque
Caliper carrier bolt (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01420028-

4) Torque front wheel nuts to specification.

Tightening torque
Wheel nut (b): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01420029-

5) Upon completion of installation, perform brake test.

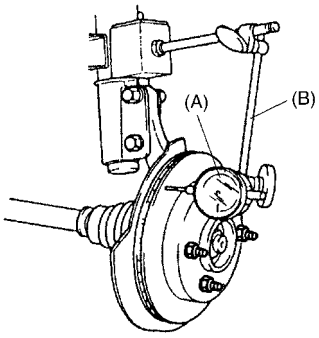
Front Brake Disc Inspection

S4RS0A4206009

- Install wheel nuts to hub bolts and fasten to fix the brake disc.
  Using magnetic stand and with dial gauge positioned at about 10 mm (0.39 in.) inward from periphery of disc, measure deflection of disc.
  If limit value is exceeded, replace correct or replace.

Disc deflection
Limit: 0.10 mm (0.004 in.) max.

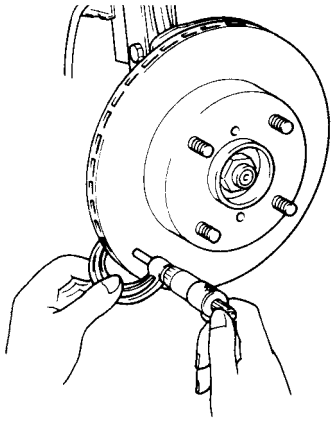
Special tool
(A): 09900–20607
(B): 09900-20701



I2RH01420026-

- Using micrometer, measure thickness of brake disc.
  If it is less than limit, replace brake disc.

Brake disc thickness
Standard: 20.0 mm (0.79 in.)
Limit: 18.0 mm (0.71 in.)



I2RH01420027-

Specifications

Tightening Torque Specifications

S4RS0A4207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Caliper pin bolt	26	2.6	19.0	☞ / ☞
Wheel nut	85	8.5	61.5	☞ / ☞ / ☞
Flexible hose joint bolt	23	2.3	17.0	☞
Bleeder plug	8.0	0.8	6.0	☞
Caliper carrier bolt	85	8.5	61.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Disc Brake Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

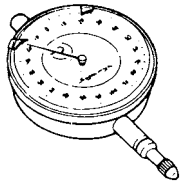
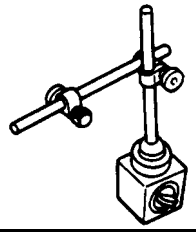
S4RS0A4208001

NOTE:

Required service material is also described in the following.
“Front Disc Brake Components: ”

Special Tool

S4RS0A4208002

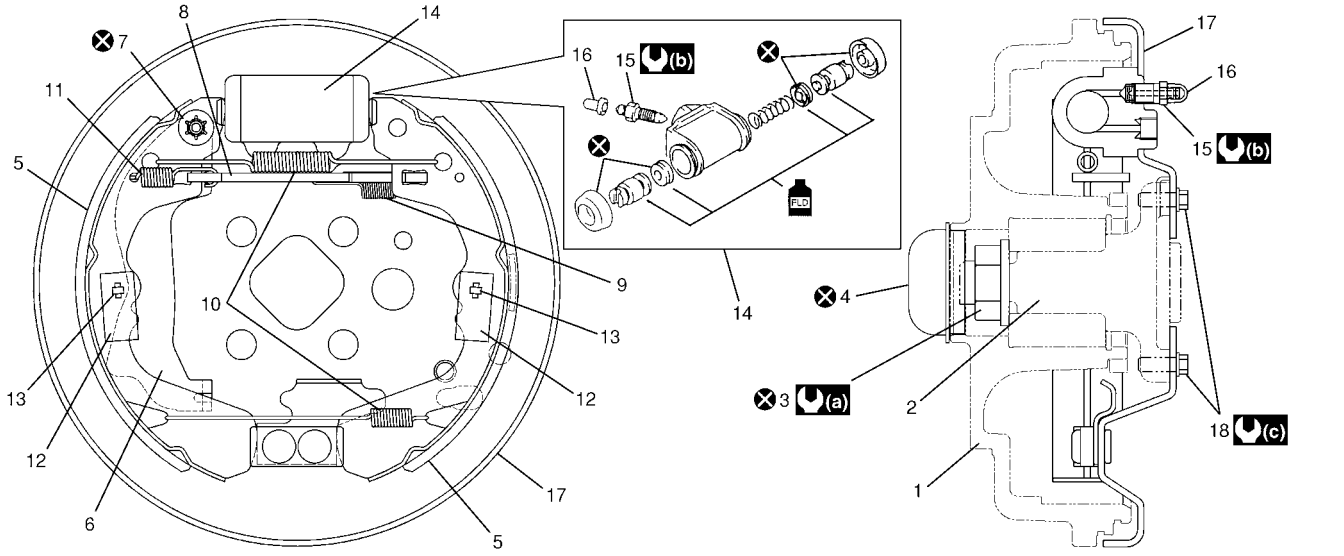
09900–20607 Dial gauge ☞		09900–20701 Magnetic stand ☞	

Rear Brakes

Repair Instructions

Rear Drum Brake Components

S4RS0A4306001



I4RS0A430001-

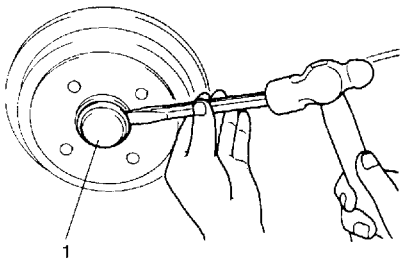
1. Rear brake drum	9. Quadrant spring	17. Brake back plate
2. Spindle	10. Shoe return spring	18. Spindle bolt
3. Spindle nut	11. Antirattle spring	(a) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
4. Spindle cap	12. Shoe hold down spring	(b) : 7.5 N·m (0.75 kg-m, 6.0 lb-ft)
5. Brake shoe	13. Shoe hold down pin	(c) : 73 N·m (7.3 kg-m, 53.0 lb-ft)
6. Parking brake shoe lever	14. Wheel cylinder : Apply brake fluid to piston cup.	: Do not reuse.
7. Push nut	15. Rear bleeder plug	
8. Brake strut	16. Bleeder plug cap	

Rear Brake Drum Removal and Installation

S4RS0A4306002

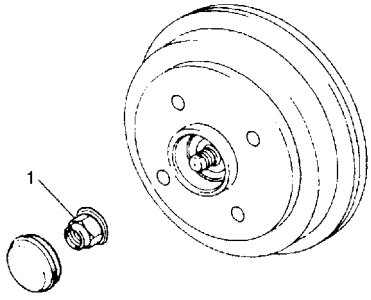
Removal

1) Hoist vehicle and remove wheel.
2) Remove spindle cap (1) as shown (by hammering lightly at 3 locations around it so as not to deform or cause damage to seating part of brake drum).



I4RS0A430002-

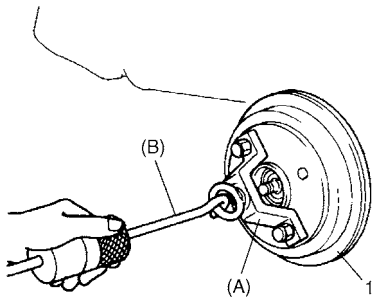
3) Uncaulk spindle nut and remove spindle nut (1).



I4RS0A430003-

4) Release parking brake lever.
5) Pull rear brake drum (1) off by using special tools.

Special tool
(A): 09943–17912
(B): 09942–15511

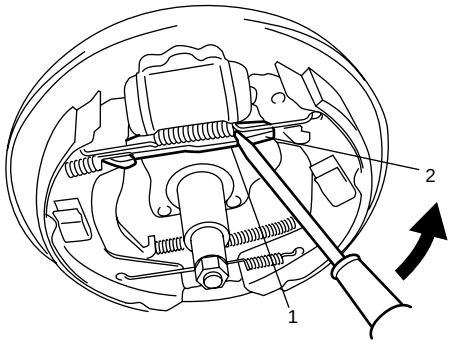


I4RS0A430004-

6) Remove wheel bearing from brake drum referring to "Wheel Bearing and Wheel Stud Bolt Removal and Installation: in Section 2C" if necessary.

Installation

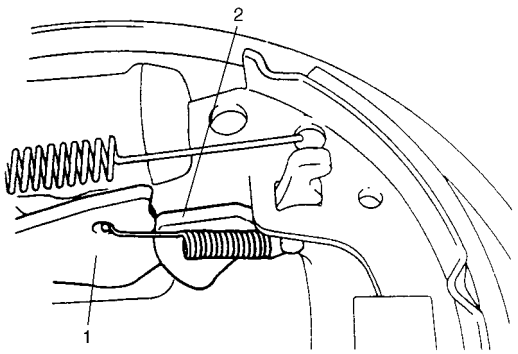
1) Install wheel bearing to brake drum referring to "Wheel Bearing and Wheel Stud Bolt Removal and Installation: in Section 2C", if removal.
2) Before installing brake drum, to maximize brake shoe-to-drum clearance, put screwdriver between rod (1) and ratchet (2) and push down ratchet as shown in figure.



I4RS0A430006-

NOTE:

The figure show ratchet position where brake shoe-to-drum clearance is maximum.

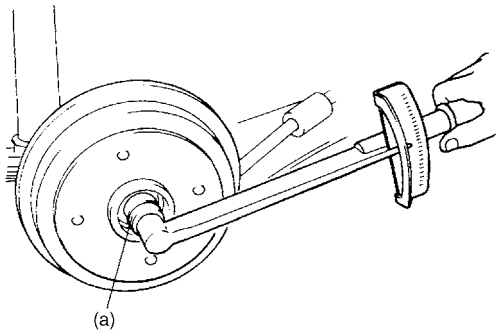


I2RH01430009-

1.	Rod
2.	Ratchet

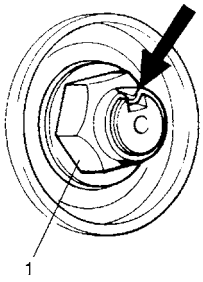
3) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.
4) Install new spindle nut (a).
5) Tighten spindle nut (a) to specified torque.

Tightening torque
Spindle nut (a): 175 N·m (17.5 kg-m, 126.5 lb-ft)



I4RS0A430005-

6) Calk spindle nut (1).



I4RS0A430007-

7) Install new spindle cap.

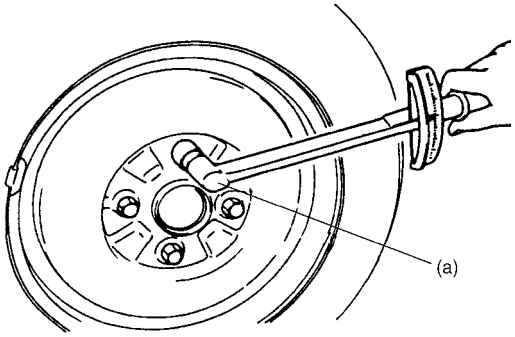
NOTE:

- **When installing spindle cap, hammer lightly several locations on the collar of cap until collar comes closely into contact with brake drum.**
- **If fitting part of cap is deformed or damaged or if it is fitted loosely, replace with new one.**

8) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable.

9) Install wheel and tighten wheel nuts to specified torque.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01430011-

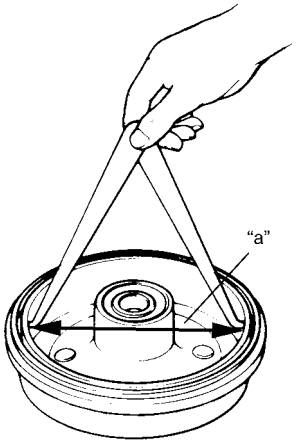
10) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).

Rear Brake Drum and Shoe Inspection

S4RS0A4306003

Brake Drum
Inspect brake drum for wear.
If limit value of drum inner diameter is exceeded or uneven or stepped wear is excessive, replace drum.

Drum inner diameter "a"
Standard: 200 mm (7.87 in.)
Limit: 202 mm (7.95 in.)



I4RS0A430008-

Cracked, Scored or Grooved Drum
A cracked drum is unsafe for further service and must be replaced. Do not attempt to weld a cracked drum.
Smooth up any slight scores. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to resurface drum braking surface.
If brake linings are slightly worn and drum is grooved, drum should be polished with fine emery cloth but should not be turned.

NOTE:

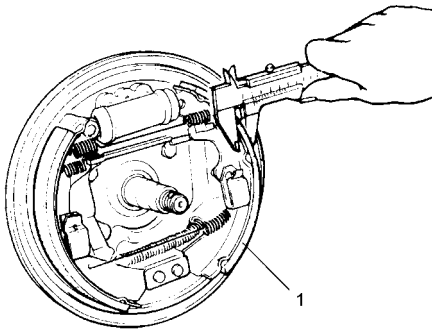
When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.

Brake Shoe
Measure thickness of brake shoe (1). Also, check surface of lining for hardening, excessive wear and oil.

Brake shoe thickness (lining + shoe rim)
Standard: 5.6 mm (0.22 in.)
Limit: 2.6 mm (0.10 in.)

CAUTION:

Never polish lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage drum. When it is required to correct lining, replace it with a new one.



I2RH01430007-

ABS Sensor Ring Removal and Installation (If Equipped)

S4RS0A4306009

CAUTION:

Do not reuse (reinstall) removed ABS sensor ring.

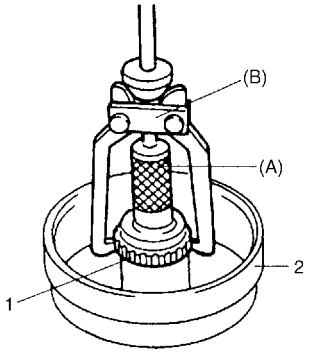
Removal

1) Remove brake drum referring to "Rear Brake Drum Removal and Installation: ".
2) Remove sensor ring (1) from brake drum (2) using special tools.

CAUTION:

Pull out sensor ring from brake drum gradually and evenly. Attempt to pull it out partially may cause it to be deformed.

Special tool
(A): 09913–75520
(B): 09913–65135



I4RS0A430009-

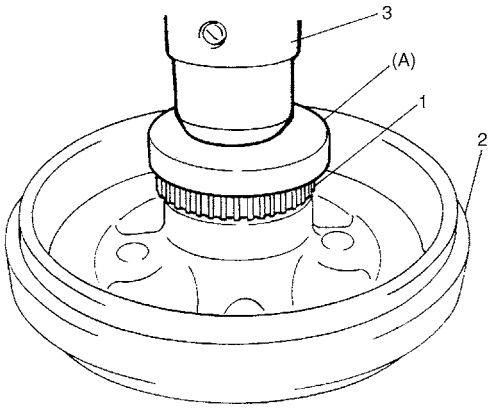
Installation

1) Install new sensor ring (1) to brake drum (2) by using special tool and hydraulic press (3).

CAUTION:

Used sensor ring can not be press-fitted securely.

Special tool
(A): 09926–68310



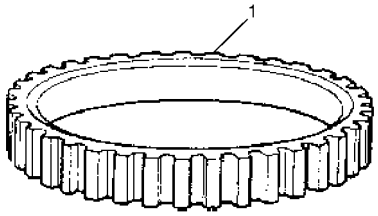
I4RS0A430010-

2) Install brake drum referring to “Rear Brake Drum Removal and Installation: ”.

ABS Sensor Ring Inspection

S4RS0A4306010

- Check ring serration (teeth) for being missing, damaged or deformed.
- Check sensor ring (1) for being deformed (warped).
- Check that no foreign material is attached
  If any malfunction is found, repair or replace.



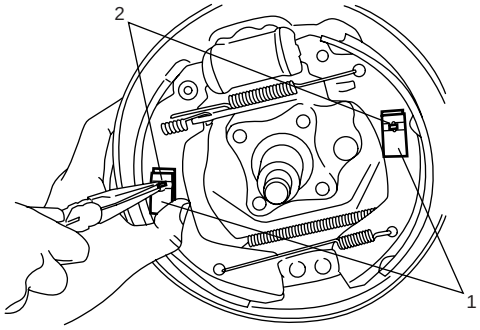
I4RS0A430011-

Rear Brake Shoe Removal and Installation

S4RS0A4306004

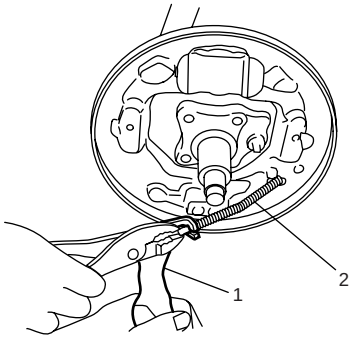
Removal

1) Remove brake drum referring to “Rear Brake Drum Removal and Installation: ”.
2) Remove shoe hold down springs (1) by turning shoe hold down pins (2).



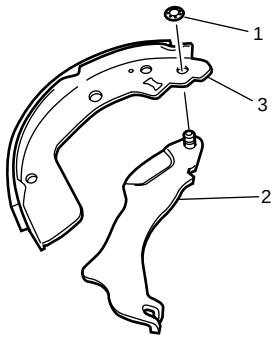
I4RS0A430012-

3) Remove return springs, brake shoes and strut.
4) Disconnect parking brake shoe lever (1) from parking brake cable (2).



I4RS0A430013-

5) Remove push nut (1).
6) Remove parking brake shoe lever (2) from shoe rim (3).

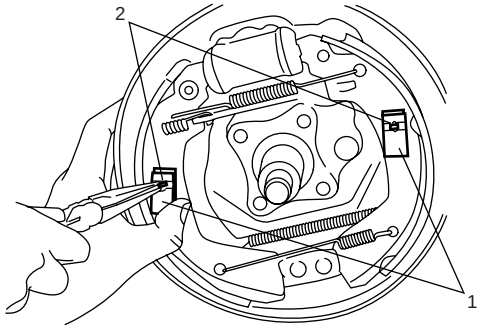


I4RS0A430014-

Installation

Install parts in reverse order of removal, noting the following.

- Install shoe hold down springs (1) by pushing them down in place and turning hold down pins (2).
- Install brake drum referring to step 2) to 10) of “Rear Brake Drum Removal and Installation: ”.



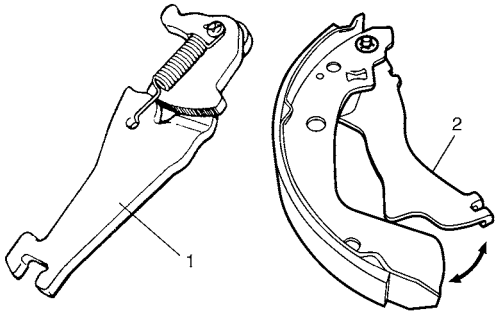
I4RS0A430012-

Rear Brake Shoe Inspection

S4RS0A4306005

- Check ratchet of brake strut (1) assembly for wear or damage.
- Check shoe return spring, antirattle spring and shoe hold down spring for damage, corrosion and weakening.
- Check for smooth movement of brake shoe lever (2) along shoe rim.

If any defective or malfunction is found, repair or replace.



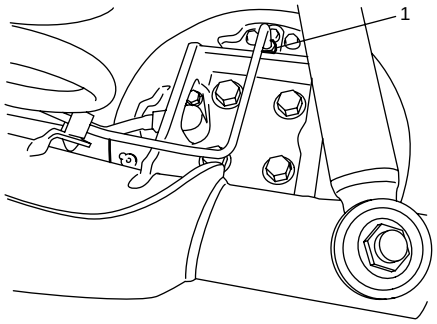
I4RS0A430016-

Wheel Cylinder Removal and Installation

S4RS0A4306006

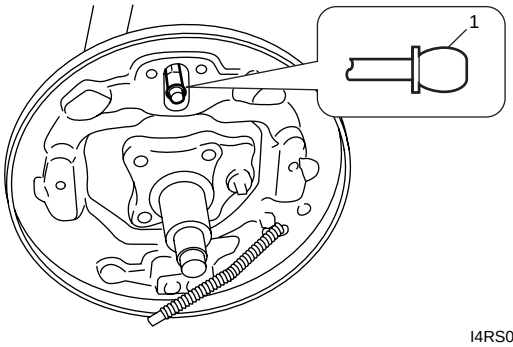
Removal

1) Remove brake drum referring to “Rear Brake Drum Removal and Installation: ”.
2) Remove brake shoe referring to “Rear Brake Shoe Removal and Installation: ”.
3) Loosen brake pipe flare nut (1) but only within the extent that fluid does not leak.



I4RS0A430015-

4) Remove wheel cylinder mounting bolts. Disconnect brake pipe from wheel cylinder and put bleeder plug cap (1) onto pipe to prevent fluid from spilling.



I4RS0A430017-

Installation

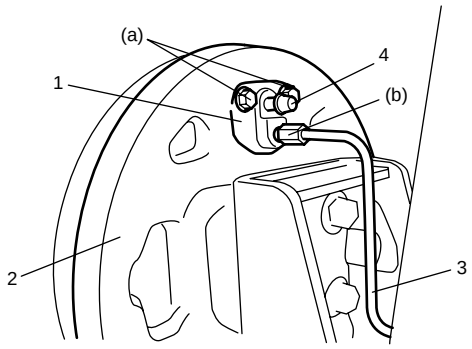
1) Take off bleeder plug cap from brake pipe and connect pipe to wheel cylinder (1) just enough to prevent fluid from leaking.
2) Install wheel cylinder (1) to brake back plate (2), and tighten wheel cylinder mounting bolts to specified torque.

   Tightening torque
   Wheel cylinder mounting bolt (a): 12 N·m (1.2 kg-m, 9.0 lb-ft)

3) Tighten flare nut of brake pipe (3) to specified torque.

   Tightening torque
   Rear brake pipe flare nut (b): 16 N·m (1.6 kg-m, 11.5 lb-ft)

4) Install bleeder plug cap (4) taken off from pipe back to bleeder plug.



I4RS0A430018-

5) Install brake shoes. Refer to “Rear Brake Shoe Removal and Installation: ”.
6) Install brake drum. Refer to “Rear Brake Drum Removal and Installation: ”.
7) Fill reservoir with brake fluid and bleed brake system. For bleeding operation refer to “Air Bleeding of Brake System: in Section 4A”.
8) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load 3 to 5 times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable.
9) Install wheel and tighten wheel nuts to specified torque.

Tightening torque
Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

10) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).
11) Check each installed part for fluid leakage.

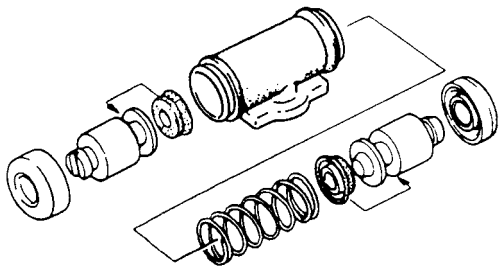
Wheel Cylinder Inspection

S4RS0A4306007

Inspect wheel cylinder disassembled parts for wear, cracks, corrosion or damage.

NOTE:

Clean wheel cylinder components with brake fluid.



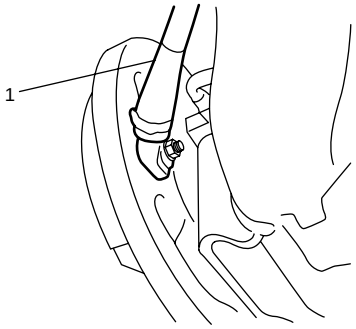
I4RS0A430019-

Brake Back Plate Removal and Installation

S4RS0A4306008

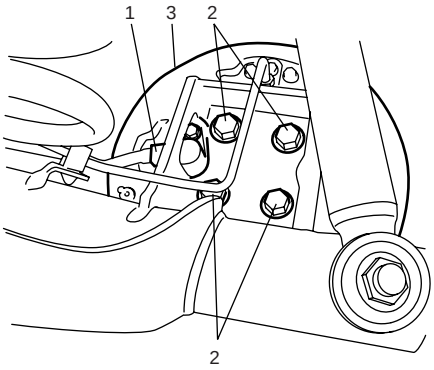
Removal

1) Remove brake drum referring to “Rear Brake Drum Removal and Installation: ”.
2) Remove brake shoe referring to “Rear Brake Shoe Removal and Installation: ”.
3) Remove wheel cylinder referring to “Wheel Cylinder Removal and Installation: ”.
4) Remove parking brake cable (1) from brake back plate.



I4RS0A430020-

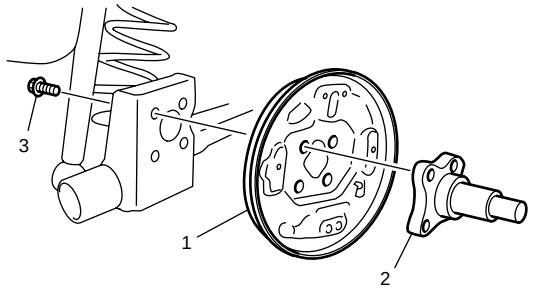
5) Remove rear wheel speed sensor (1) from brake back plate.
6) Remove spindle bolt (2), and remove brake back plate (3) and spindle.



I4RS0A430021-

Installation

1) Install brake back plate (1) and spindle (2), and tighten spindle bolts (3) by hand.



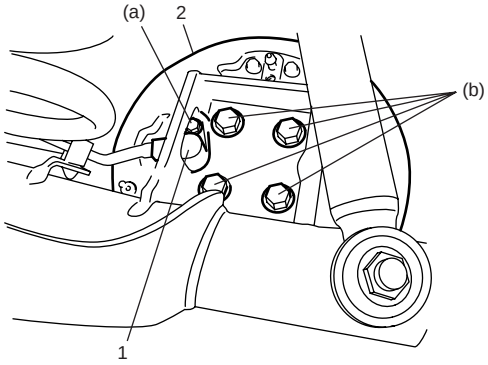
I4RS0A430022-

2) Install rear wheel speed sensor (1) to brake back plate (2).

Tightening torque
Rear wheel speed sensor bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

3) Tighten spindle bolts (b) to specified torque.

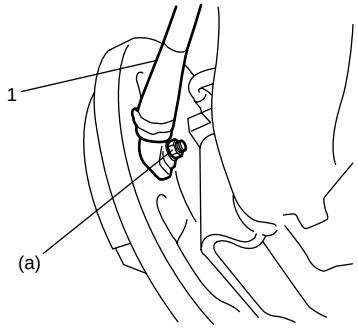
Tightening torque
Spindle bolt (b): 73 N·m (7.3 kg-m, 53.0 lb-ft)



I4RS0A430023-

4) Install parking brake cable (1) to brake back plate

Tightening torque
Parking cable cap nut (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A430024-

5) Install wheel cylinder and connect brake pipe flare nut, and then tighten wheel cylinder bolts and flare nut to specified torque referring to “Wheel Cylinder Removal and Installation: ”.
6) Install brake shoe referring to “Rear Brake Shoe Removal and Installation: ”.
7) Install brake drum referring to step 2) to 7) of “Rear Brake Drum Removal and Installation: ”.
8) Fill reservoir with brake fluid and bleed brake system. For bleeding operation refer to “Air Bleeding of Brake System: in Section 4A”.
9) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load 3 to 5 times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

10) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).
11) Check each installed part for fluid leakage.

Specifications

Tightening Torque Specifications

S4RS0A4307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Spindle nut	175	17.5	126.5	☞
Wheel nut	85	8.5	61.5	☞ / ☞ / ☞
Wheel cylinder mounting bolt	12	1.2	9.0	☞
Rear brake pipe flare nut	16	1.6	11.5	☞
Rear wheel speed sensor bolt	11	1.1	8.0	☞
Spindle bolt	73	7.3	53.0	☞
Parking cable cap nut	10	1.0	7.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Rear Drum Brake Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

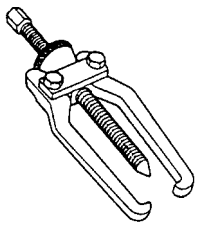
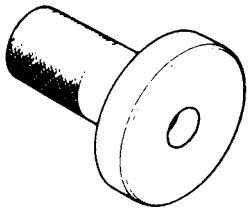
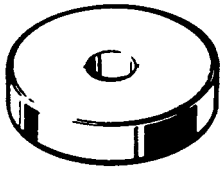
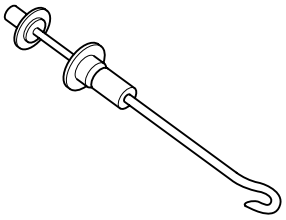
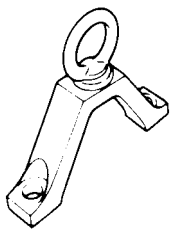
S4RS0A4308001

NOTE:

Required service material is also described in the following.
“Rear Drum Brake Components: ”

Special Tool

S4RS0A4308002

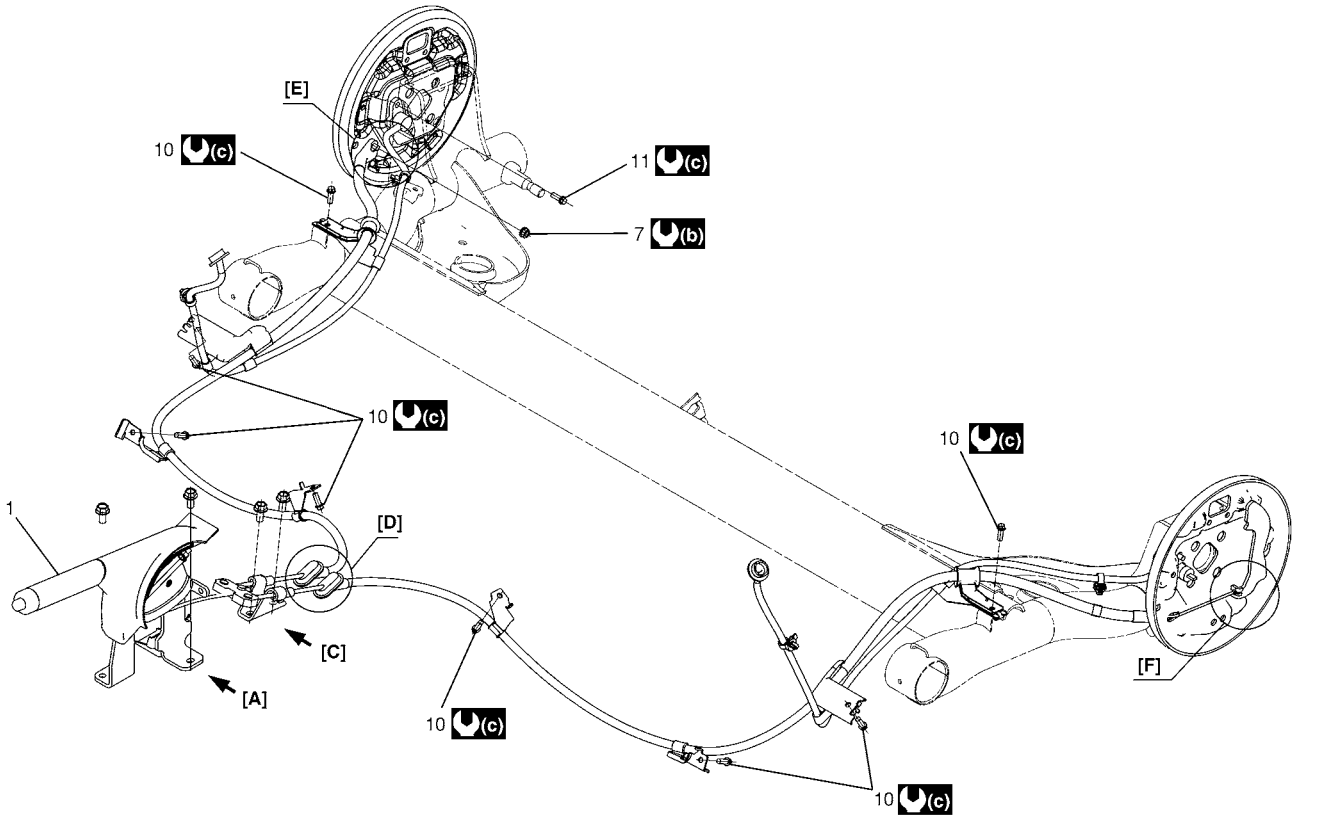
09913–65135 Bearing puller ☞		09913–75520 Bearing installer ☞	
09926–68310 Differential bevel pinion bearing installer ☞		09942–15511 Sliding hammer ☞	
09943–17912 Wheel hub remover ☞			

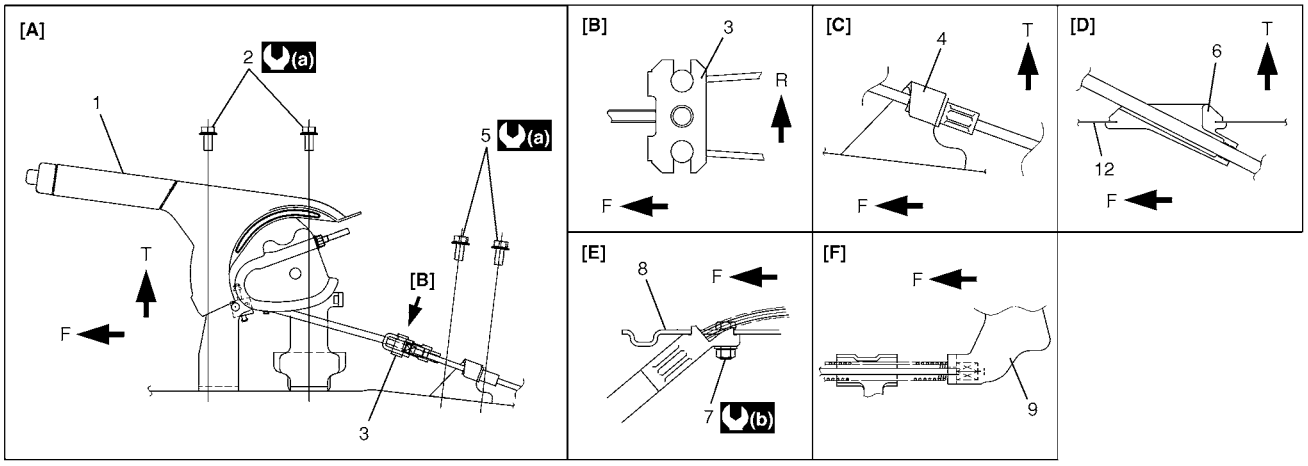
Parking Brake

General Description

Parking Brake Cable Construction

S4RS0A4401001





I4RS0A440001-

T: Top side	4. Parking cable bracket	10. Parking cable clamp bolt	[D]: View [D]
F: Front side	5. Parking cable bracket bolt	11. Rear wheel speed sensor bolt	[E]: View [E]
R: Right side	6. Grommet	12. Vehicle body	[F]: View [F]
1. Parking brake lever assembly	7. Parking cable cap nut	[A]: View [A]	(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
2. Parking brake lever bolt	8. Brake back plate	[B]: View [B]	(b): 10 N·m (1.0 kg-m, 7.5 lb-ft)
3. Equalizer	9. Parking brake shoe lever	[C]: View [C]	(c): 11 N·m (1.1 kg-m, 8.0 lb-ft)

Repair Instructions

Parking Brake Inspection and Adjustment

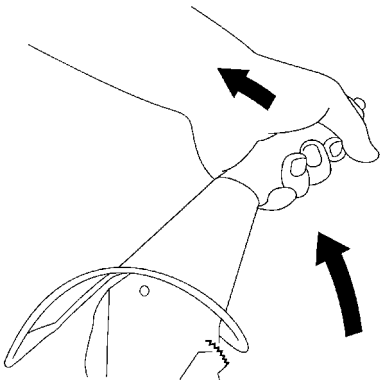
S4RS0A4406001

Inspection

Hold center of parking brake lever grip and pull it up with 200 N (20 kg, 44 lbs) force.
With parking brake lever pulled up as shown, count ratchet notches. There should be 4 to 9 notches.
Also, check if both right and left rear wheels are locked firmly.
To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake lever without pressing its button.
One click sound corresponds to one notch.
If number of notches is out of specification, adjust cable referring to adjustment procedure so as to obtain specified parking brake stroke.

NOTE:

Check tooth tip of each notch for damage or wear.
If any damage or wear is found, replace parking brake lever.



I4RS0A440002-

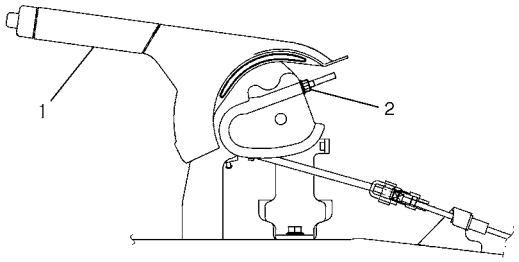
Adjustment

NOTE:

Make sure for the following conditions before cable adjustment.

- **No air is trapped in brake system.**
- **Brake pedal travel is proper.**
- **Brake pedal has been depressed a few times with about 300 N (30 kg, 66 lbs) load.**
- **Parking brake lever (1) has been pulled up a few times with about 200 N (20 kg, 44 lbs) load.**
  If parking brake cable is replaced with new one, pull up parking brake lever a few times with about 500 N·m (50 kg, 110 lbs) force.
- **Rear brake shoes are not worn beyond limit, and self adjusting mechanism operates properly.**

After confirming that the conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening adjust nut (2).



I4RS0A440003-

NOTE:

Check brake drum for dragging after adjustment.

Parking brake stroke (When lever is pulled up at 200 N (20 kg, 44 lbs)
4 to 9 notches

Parking Brake Cable Removal and Installation

S4RS0A4406002

Removal

NOTE:

When it is necessary to remove both right and left parking brake cables, repeat below steps 2) and 6) on right and left wheels.

1) Raise, suitably support vehicle.
2) Remove wheel.
3) Disconnect parking brake cable from equalizer (parking brake lever) and clamps.
4) Remove brake drum. Refer to “Rear Brake Drum Removal and Installation: in Section 4C”.
5) Disconnect parking brake cable from brake shoe lever referring to “Rear Brake Shoe Removal and Installation: in Section 4C”.
6) Remove parking brake cable and parking cable bracket.

Installation

Install it by reversing removal procedure, noting the following points.

- Install clamps properly referring to “Parking Brake Cable Construction: ”.
- Tighten bolts and nuts to specified torque referring to “Parking Brake Cable Construction: ”.

  Tightening torque
  Parking brake lever bolt: 25 N·m (2.5 kg-m, 18.0 lb-ft)
  Parking cable clamp bolt: 11 N·m (1.1 kg-m, 8.0 lb-ft)
  Parking cable bracket bolt: 25 N·m (2.5 kg-m, 18.0 lb-ft)

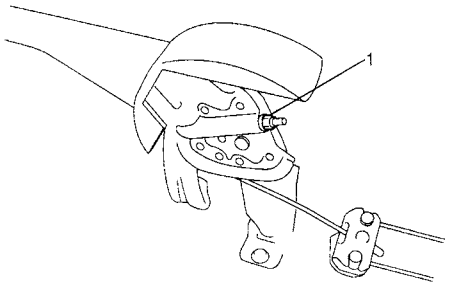
- Adjust parking brake cable. Refer to “Parking Brake Inspection and Adjustment: ”.
- Check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

Parking Brake Lever Removal and Installation

S4RS0A4406003

Removal

1) Disconnect negative (–) cable at battery.
2) Remove console box.
3) Block vehicle wheels and release parking brake lever.
4) Disconnect lead wire of parking brake switch at coupler.
5) Loosen parking brake cable adjusting nut (1).

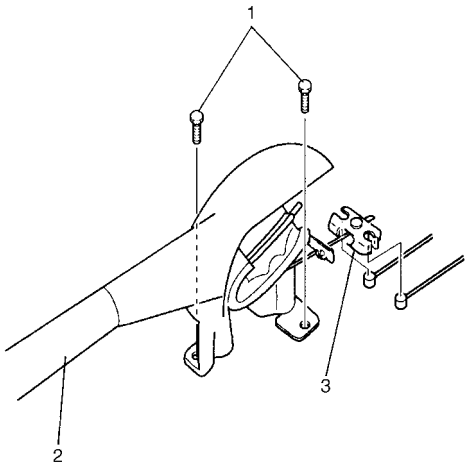


I4RS0A440004-

6) Remove parking brake lever bolts (1) and then remove parking brake lever assembly (2) with equalizer (3).

NOTE:

Don’t disassemble parking brake lever switch. It must be removed and installed as a complete switch assembly.

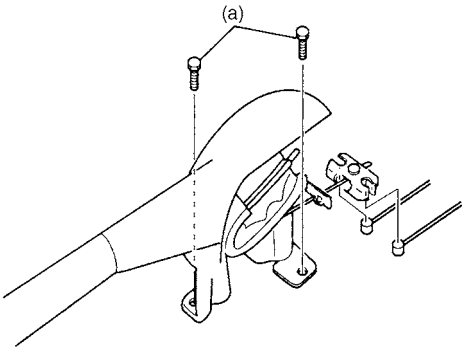


I4RS0A440005-

Installation

1) Install in reverse order of removal procedure. Check equalizer inclined angle.

   Tightening torque
   Parking brake lever bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I4RS0A440006-

2) After all parts are installed, parking brake lever needs to be adjusted. Refer to “Parking Brake Inspection and Adjustment: ”.
3) Check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

Specifications

Tightening Torque Specifications

S4RS0A4407001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Parking brake lever bolt	25	2.5	18.0	☞ / ☞
Parking cable clamp bolt	11	1.1	8.0	☞
Parking cable bracket bolt	25	2.5	18.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Parking Brake Cable Construction: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

ABS

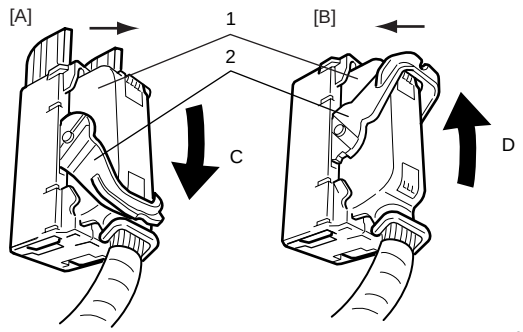
Precautions

Precautions in Diagnosing Troubles

S4RS0A4500001

To ensure that the trouble diagnosis is done accurately and smoothly, observe the following and follow “ABS Check: ”.

- If the vehicles was operated in any of the following ways, ABS warning lamp may light momentarily but this does not indicate anything abnormal in ABS.
  - The vehicle was driven with parking brake pulled.
  - The vehicle was driven with brake dragging.
  - The vehicle was stuck in mud, sand, etc.
  - Wheel spin occurred while driving.
  - Wheel(s) was rotated while the vehicle was jacked up.
- Be sure to read “Precautions for Electrical Circuit Service: in Section 00” before inspection and observe what is written there.
- Be sure to use the trouble diagnosis procedure as described in “ABS Check: ”. Failure to follow it may result in incorrect diagnosis. (Some other diagnosis trouble code may be stored by mistake in the memory of ABS control module during inspection.)
- When disconnecting ABS hydraulic unit / control module connector (1), pull down lock lever (2) of connector.
  When connecting, set the connector on ABS hydraulic unit / control module assembly and pull up the lock lever (2) until it locks.



I4RH01450001-

[A]: Disconnect	C: Pull down to disconnect
[B]: Connect	D: Pull up to connect

Precautions in On-Vehicle Service

S4RS0A4500002

When connector is connected to ABS hydraulic unit / control module assembly, do not disconnect connectors of sensors with ignition switch ON. Otherwise, DTC will be set in ABS control module.

General Description

ABS Description

S4RS0A4501001

The ABS (Antilock Brake System) controls the fluid pressure applied to the wheel cylinder of each brake from the master cylinder so that each wheel is not locked even when hard braking is applied.
This ABS has also the following function.
While braking is applied, but before ABS control becomes effective, braking force is distributed between the front and rear so as to prevent the rear wheels from being locked too early for better stability of the vehicle.
The main component parts of this ABS include the following parts in addition to those of the conventional brake system.

- Wheel speed sensor which senses revolution speed of each wheel and outputs its signal.
- ABS warning lamp which lights to inform abnormality when system fails to operate properly.
- ABS hydraulic unit / control module assembly is incorporated ABS control module, ABS hydraulic unit (actuator assembly), solenoid valve power supply driver (transistor), solenoid valve driver (transistor), pump motor driver (transistor).
  - ABS control module which sends operation signal to ABS hydraulic unit to control fluid pressure applied to each wheel cylinder based on signal from each wheel speed sensor so as to prevent wheel from locking.
  - ABS hydraulic unit which operates according to signal from ABS control module to control fluid pressure applied to wheel cylinder of each 4 wheels.
  - Solenoid valve power supply driver (transistor) which supplies power to solenoid valve in ABS hydraulic unit.
  - Solenoid valve driver (transistor) which controls each solenoid valves in ABS hydraulic unit.
  - Pump motor driver (transistor) which supplies power to pump motor in ABS hydraulic unit.

This ABS is equipped with Electronic Brake force Distribution (EBD) system that controls a fluid pressure of rear wheels to best condition, which is the same function as that of proportioning valve, by the signal from wheel sensor independently of change of load due to load capacity and so on. And if the EBD system fails to operate properly, the brake warning lamp lights to inform abnormality.

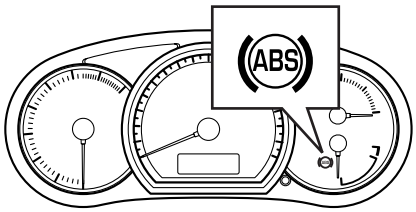
ABS Hydraulic Unit / Control Module Assembly Description

S4RS0A4501002

ABS control module is a component of ABS hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ABS control module diagnoses conditions of the system component parts (whether or not there is any abnormality) all the time and indicates the results (warning of abnormality occurrence and DTC) through the ABS warning lamp as described.



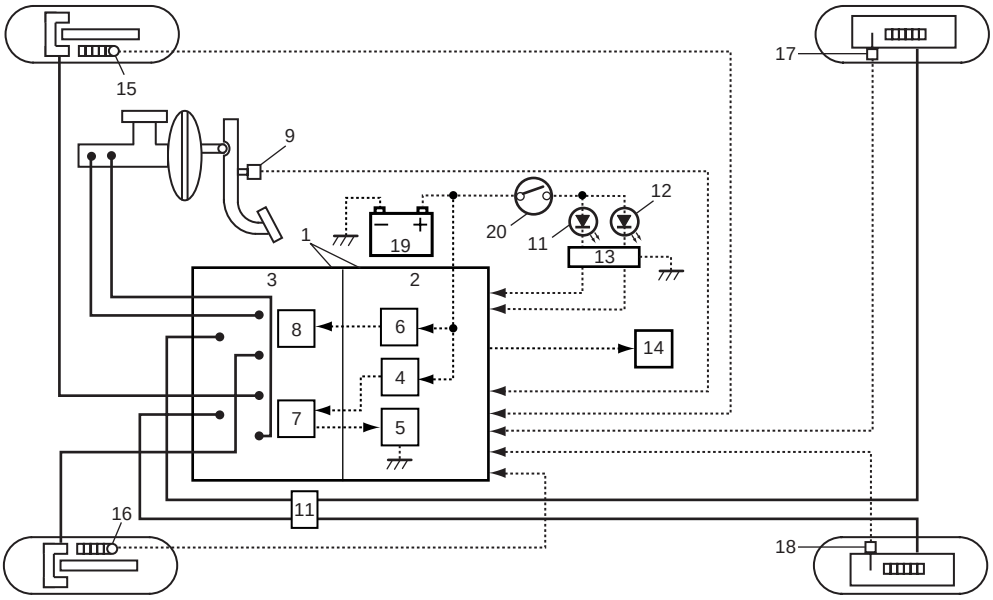
I4RS0A450001-

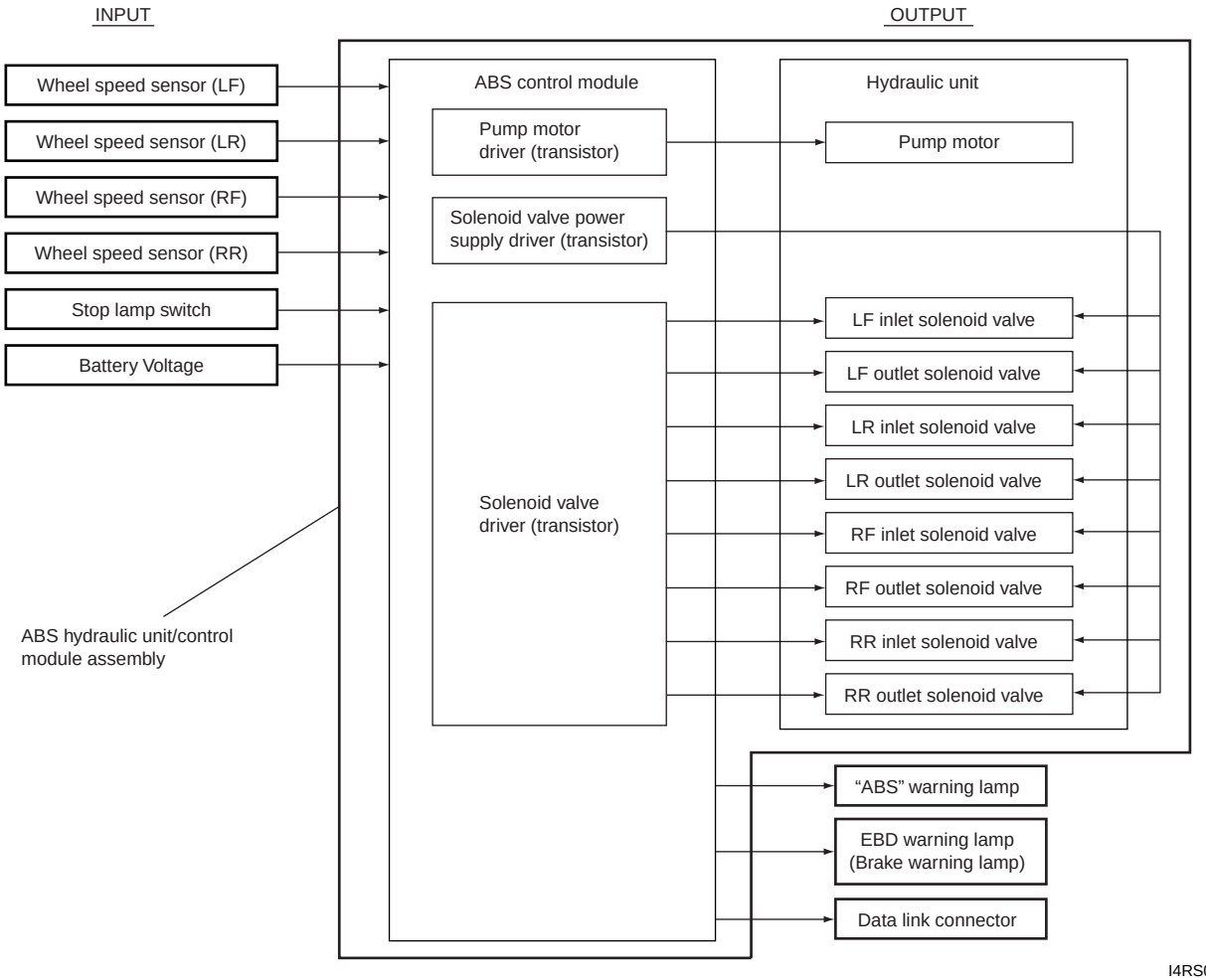
- When ignition switch is turned ON, ABS warning lamp lights for 2 seconds to check its circuit.
- When no abnormality has been detected (the system is in good condition), ABS warning lamp turns OFF after 2 seconds.
- When an abnormality in the system is detected, ABS warning lamp lights and the area where that abnormality lies is stored in the memory of EEPROM in ABS control module.

Schematic and Routing Diagram

ABS Schematic

S4RS0A4502001



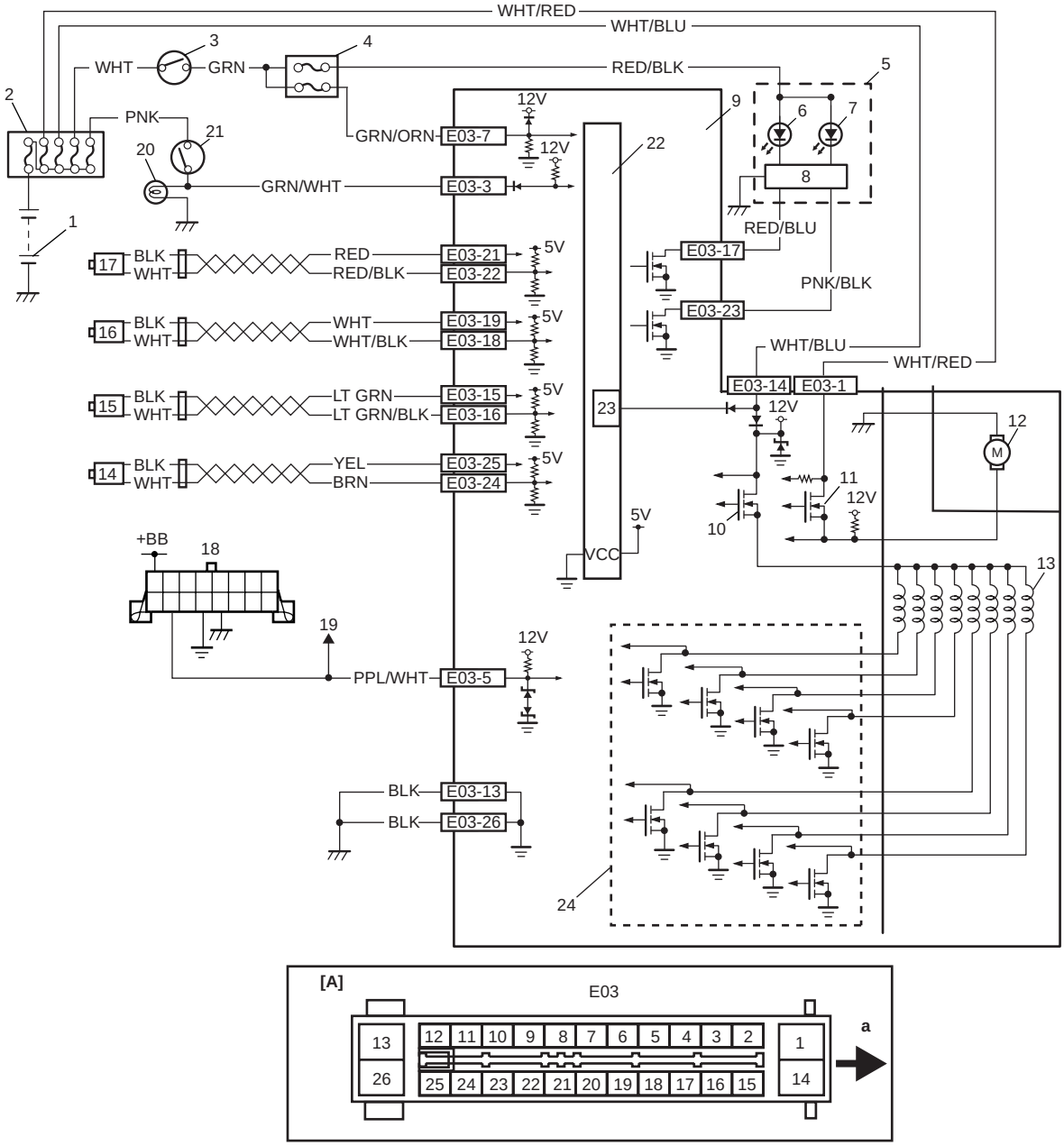


I4RS0A450002-

1. ABS hydraulic unit / control module assembly	8. Pump motor	15. Wheel speed sensor (Right-front)
2. ABS control module	9. Stop lamp switch	16. Wheel speed sensor (Left-front)
3. ABS hydraulic unit	10. ABS warning lamp	17. Wheel speed sensor (Right-rear)
4. Solenoid valve power supply driver (transistor)	11. EBD warning lamp (Brake warning lamp)	18. Wheel speed sensor (Left-rear)
5. Solenoid valve driver (transistor)	12. Lamp driver module	19. Battery
6. Pump motor driver (transistor)	13. 4 way joint	20. Ignition switch
7. Solenoid valve	14. Data link connector	

ABS Wiring Circuit Diagram

S4RS0A4502002



I4RS0A450003-

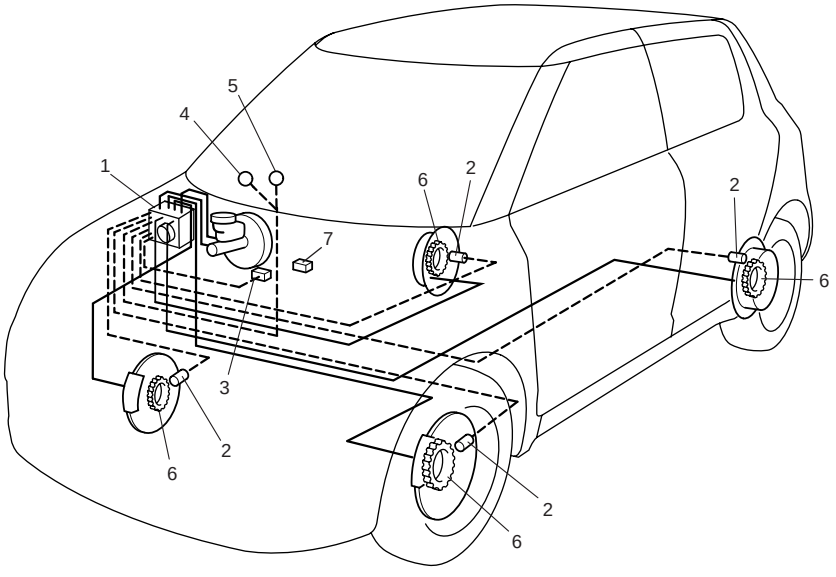
[A]: Terminal arrangement of ABS hydraulic unit / control module assembly	8. Lamp driver module	17. Left-front wheel speed sensor
a: Upside	9. ABS hydraulic unit / control module assembly	18. Data link connector
1. Battery	10. Solenoid valve power supply driver (transistor)	19. To ECM, TCM, SDM and BCM
2. Main fuse box	11. ABS pump motor driver (transistor)	20. Stop lamp
3. Ignition switch	12. Pump motor	21. Brake light switch
4. Circuit fuse box	13. Solenoid valves	22. Power control unit
5. Combination meter	14. Right-rear wheel speed sensor	23. Internal memory
6. ABS warning lamp	15. Left-rear wheel speed sensor	24. Solenoid valve driver (transistor)
7. EBD warning lamp (Brake warning lamp)	16. Right-front wheel speed sensor	

Terminal		Wire color	Circuit
E03	1	WHT/RED	ABS pump motor driver (Transistor)
	2	—	—
	3	GRN/WHT	Brake light switch
	4	—	—
	5	BLU	Dark link connector
	6	—	—
	7	GRN/ORN	Ignition switch
	8	—	—
	9	—	—
	10	—	—
	11	—	—
	12	—	—
	13	BLK	Ground
	14	WHT/BLU	Solenoid valve power supply driver (Transistor)
	15	LT GRN	Left–rear wheel speed sensor (+)
	16	LT GRN/BLK	Left–rear wheel speed sensor (–)
	17	RED/BLU	ABS warning lamp
	18	WHT/BLK	Right–front wheel speed sensor (–)
	19	WHT	Right–front wheel speed sensor (+)
	20	—	—
	21	RED	Left–front wheel speed sensor (+)
	22	RED/BLK	Left–front wheel speed sensor (–)
	23	PNK/BLK	EBD warning lamp (Brake warning lamp)
	24	BRN	Right–rear wheel speed sensor (–)
	25	YEL	Right–rear wheel speed sensor (+)
	26	BLK	Ground

Component Location

ABS Components Location

S4RS0A4503001

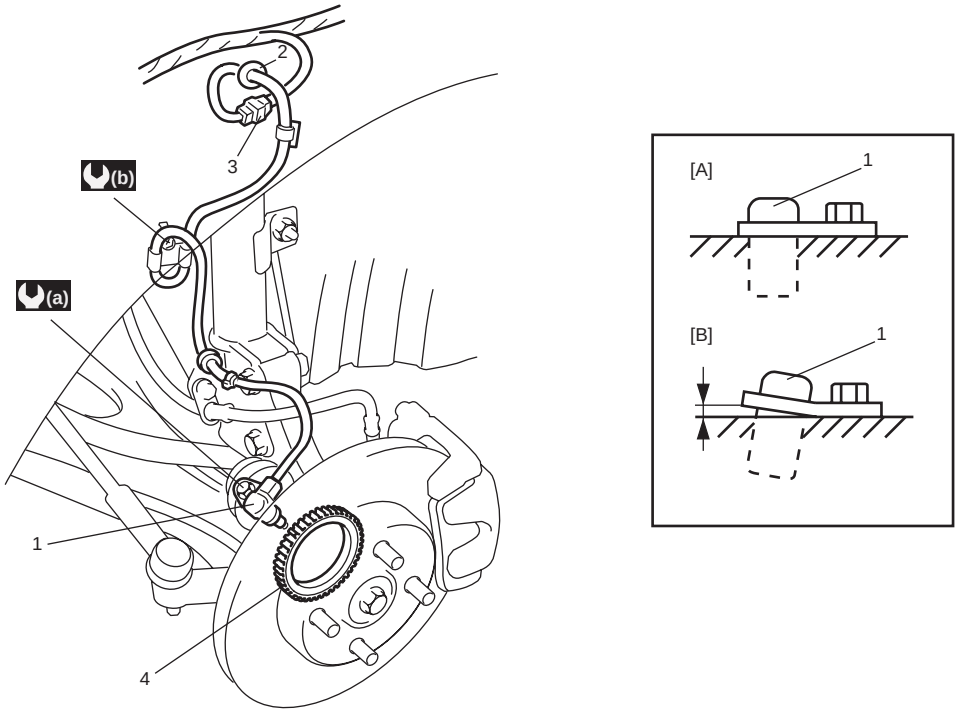


I4RS0A450004-

1. ABS hydraulic unit / control module assembly	5. EBD warning lamp (Brake warning lamp)
2. Wheel speed sensors	6. Wheel speed sensor rings
3. Stop lamp switch	7. Data link connector
4. ABS warning lamp	

Front Wheel Speed Sensor Components Location

S4RS0A4503002

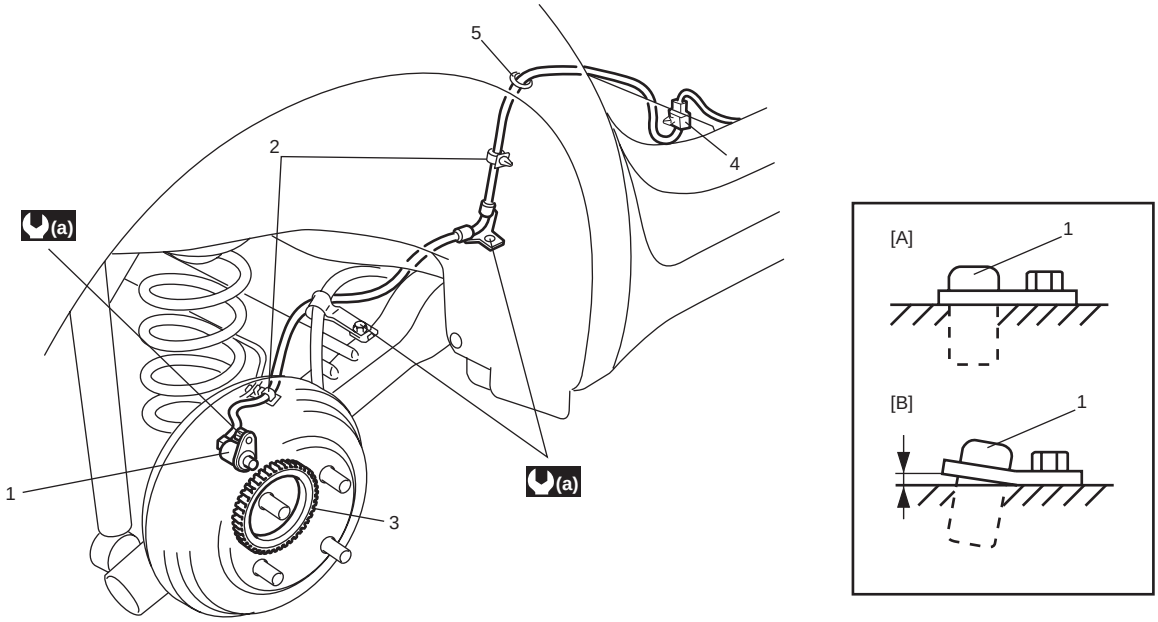


I4RS0A450005-

[A]: OK	1. Front wheel speed sensor	3. Connector	(a) 25 N·m (2.5 kg-m, 18.0 lb-ft)
[B]: NG	2. Grommet	4. Sensor ring	(b) 11 N·m (1.1 kg-m, 8.0 lb-ft)

Rear Wheel Speed Sensor Components Location

S4RS0A4503003



I4RS0A450006-

[A]: OK	1. Rear wheel speed sensor	3. Sensor ring	5. Grommet
[B]: NG	2. Clip	4. Connector	(a) 11 N·m (1.1 kg-m, 8.0 lb-ft)

Diagnostic Information and Procedures

ABS Check

S4RS0A4504001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ **Malfunction analysis** 1) Perform “Customer complaint analysis: ”. 2) Perform “Problem symptom confirmation: ”. 3) Perform “DTC check, record and clearance: ” and recheck DTC. *Is there any malfunction DTC?*	Go to Step 4.	Go to Step 2.
2	☞ **Driving test** 1) Perform “Step 2: Driving Test: ”. *Is trouble symptom identified?*	Go to Step 3.	Go to Step 6.
3	☞ **DTC check** 1) Perform “DTC Check: ”. *Is it malfunction code?*	Go to Step 4.	Go to Step 5.
4	☞ **ABS check** 1) Inspect and repair referring to applicable DTC flow. *Does trouble recur?*	Go to Step 5.	Go to Step 7.
5	☞ **Brakes diagnosis** 1) Inspect and repair referring to “Brakes Symptom Diagnosis: in Section 4A”. *Does trouble recur?*	Go to Step 3.	Go to Step 7.
6	☞ **Check for intermittent problem** 1) Check intermittent troubles referring to “Intermittent and Poor Connection Inspection: in Section 00” and related circuit of trouble code recorded in Step 1. *Does trouble recur?*	Go to Step 4.	Go to Step 7.
7	☞ **Final confirmation test** 1) Perform “Step 7: Final Confirmation Test: ”. *Does trouble recur?*	Go to Step 3.	End.

Step 1: Malfunction Analysis

Customer complaint analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer.
For this purpose, use of such a questionnaire form as shown in the following will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date of Reg:	Date of problem:	Mileage:

Problem Symptoms	● ABS warning lamp abnormal: fails to turn on/fails to go off/flashes ● Abnormal noise while vehicle is running: from motor, from valve, other_____ ● Wheel is locked at braking: ● Pump motor does not stop (running): ● Braking does not work: ● Other:
Frequency of occurrence	● Continuous/Intermittent (times a day, a month)/ other_____
Conditions for Occurrence of Problem	● Vehicle at stop & ignition switch ON: ● When starting: at initial start only/at every start/Other_____ ● Vehicle speed: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other_____ ● Road surface condition: Paved road/rough road/snow-covered road/ other_____ ● Chain equipment:
Environmental Condition	● Weather: fair/cloudy/rain/snow/other_____ ● Temperature: °F (°C)
Diagnostic Trouble Code	● First check: Normal code/malfunction code ( ) ● Second check after test drive: Normal code/malfunction code ( )

I2RH01450014-

Problem symptom confirmation

Check if what the customer claimed in "Customer Questionnaire" is actually found in the vehicle and if that symptom is found, whether it is identified as a failure. (This step should be shared with the customer if possible.) Check warning lamps related to brake system referring to "EBD Warning Lamp (Brake Warning Lamp) Check: " and "ABS Warning Lamp Check: ".

DTC check, record and clearance

Perform "DTC Check: " procedure, record it and then clear it referring to "DTC Clearance: ".
Recheck DTC referring to "DTC Check: ".
When DTC which is recorded at DTC check procedure is detected again after performing DTC clearance, go to "Step 4: ABS Check: " to proceed the diagnosis.
When DTC which is recorded at DTC check procedure is not indicated anymore after performing DTC clearance, ABS control module does not perform the system diagnosis, or temporary abnormality may occur, therefore go to "Step 2: Driving Test: " to proceed the diagnosis.

Step 2: Driving Test

Test drive the vehicle at 40 km/h for more than a minute and check if any trouble symptom (such as abnormal lighting of ABS warning light) exists.
If the malfunction DTC is confirmed again at ignition switch ON, driving test as described is not necessary. Proceed to Step 3.

Step 3: DTC Check
Recheck DTC referring to “DTC Check: ”.

Step 4: ABS Check
According to ABS Check for the DTC confirmation in Step 3, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator assembly or other part and repair or replace faulty parts.

Step 5: Brakes Diagnosis
Check the parts or system suspected as a possible cause referring to “Brakes Symptom Diagnosis: in Section 4A” and based on symptoms appearing on the vehicle (symptom obtained through Steps 1 and 2 and repair or replace faulty parts, if any).

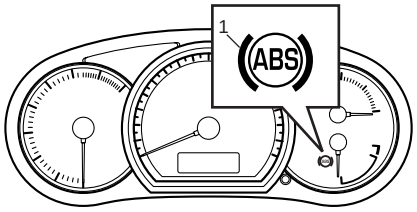
Step 6: Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection: in Section 00” and related circuit of trouble code recorded in Step 1 to 3.

Step 7: Final Confirmation Test
Confirm that the problem symptom has gone and the ABS is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once referring to “DTC Clearance: ” and perform test driving and confirm that no DTC is indicated.

ABS Warning Lamp Check

S4RS0A4504002

1) Turn ignition switch ON.
2) Check that ABS warning lamp (1) comes ON for about 2 seconds and then goes off.
   If any faulty condition is found, advance to “ABS Warning Lamp Does Not Come ON at Ignition Switch ON: ”, “ABS Warning Lamp Comes ON Steady: ” or “ABS Warning Lamp Flashes Continuously while Ignition Switch Is ON: ”.



I4RS0A450007-

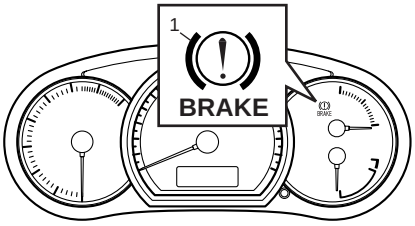
EBD Warning Lamp (Brake Warning Lamp) Check

S4RS0A4504003

NOTE:

Perform this check on a level place.

1) Turn ignition switch ON with parking brake applied.
2) Check that EBD warning lamp (brake warning lamp) (1) is turned ON.
3) Release parking brake with ignition switch ON and check that EBD warning lamp (brake warning lamp) goes off.
   If it doesn’t go off, go to “EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady: ”.



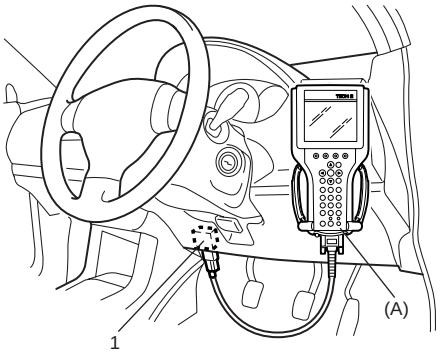
I4RS0A450008-

DTC Check

S4RS0A4504004

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (1).

   Special tool
   (A): SUZUKI scan tool



I4RS0A450009-

3) Turn ignition switch to ON position.
4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to SUZUKI scan tool operator’s manual for further details.

NOTE:

If SUZUKI scan tool can not communicate ABS hydraulic unit / control module, perform "Serial Data Link Circuit Check: ".

5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from DLC.

DTC Table

S4RS0A4504005

CAUTION:

Be sure to perform "ABS Check: " before starting diagnosis.

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	
NO DTC	Normal	
☞C1021	RF	Wheel speed sensor circuit
☞C1025	LF	
☞C1031	RR	
☞C1035	LR	
☞C1022	RF	Wheel speed sensor circuit or sensor ring
☞C1026	LF	
☞C1032	RR	
☞C1036	LR	
☞C1041	RF	Inlet solenoid valve circuit
☞C1042		Outlet solenoid valve circuit
☞C1045	LF	Inlet solenoid valve circuit
☞C1046		Outlet solenoid valve circuit
☞C1051	RR	Inlet solenoid valve circuit
☞C1052		Outlet solenoid valve circuit
☞C1055	LR	Inlet solenoid valve circuit
☞C1056		Outlet solenoid valve circuit
☞C1057	Power source	
☞C1061	ABS pump motor and/or motor driver circuit	
☞C1063	Solenoid valve power supply driver circuit	
☞C1071	ABS control module	

DTC Clearance

S4RS0A4504006

WARNING:

When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure or using SUZUKI scan tool.

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch to ON position.
3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further derails.

NOTE:

For DTC C 1021, C1022, C1025, C1026, C1031, C1032, C1035, C1036 and C1061, confirm that ABS warning lamp turns off after performing Step 2 of "Test Driving" under "ABS Check: ", and then clear the DTCs.

4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.
5) Perform "Driving Test" (Step 2 of "ABS Check: ") and "DTC Check: " and confirm that NO DTC is displayed on scan tool.

Scan Tool Data

S4RS0A4504007

The parameter data below are values measured with the scan tool when the normally operating vehicle is under the following conditions. When taking measurements for comparison by using the scan tool, be sure to check that the vehicle is under the following conditions.

- Apply parking brake and block wheels.
- Ignition switch ON.
- Turn OFF air conditioner (if equipped).
- Apply no load to power steering (if equipped). (Don't turn it)
- Turn OFF all electric loads (except ignition).
- No DTC.
- ABS is not operated. (Normal braking operation)

Scan Tool Data	Standards	Condition
Battery Voltage	10.0 – 16.0 V	—
Pump Motor Driver	0.0 V	—
RF Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
LF Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
RR Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
LR Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
Brake Switch	ON	Brake pedal depressed
	OFF	Brake pedal released

Scan Tool Data Definition

Battery Volt (V): Battery Voltage is an analog input signal read by the ABS control module. Certain ABS control module functions will be modified if the battery voltage falls below or rises above programmed thresholds.

Pump Motor Driver (V): This parameter indicates the operational condition of the pump motor driver (transistor).

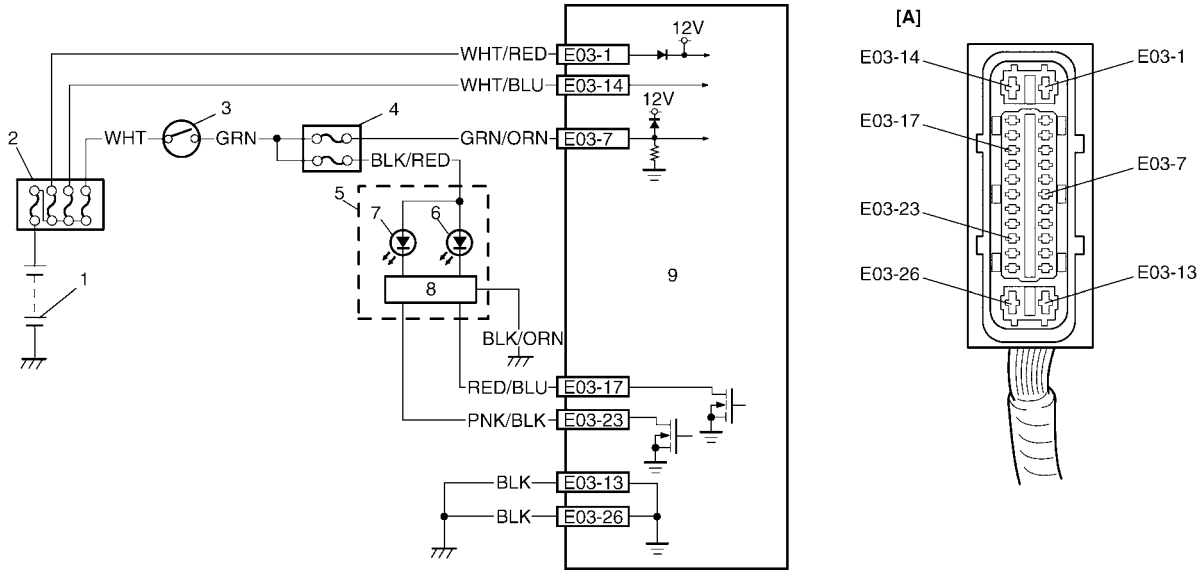
RF Wheel Speed, LF Wheel Speed, RR Wheel Speed and LF Wheel Speed (km/h, MPH): Wheel speed is an ABS control module internal parameter. It is computed by reference pulses from the wheel speed sensor.

Brake Switch (ON, OFF): This switch signal informs the ABS control module whether the brake is active or not.

ABS Warning Lamp Does Not Come ON at Ignition Switch ON

S4RS0A4504008

Wiring Diagram



I4RS0A450010-

[A]: ABS hydraulic unit / control module connector E03	4. Circuit fuse box	8. Lamp driver module
1. Battery	5. Combination meter	9. ABS hydraulic unit / control module assembly
2. Main fuse box	6. ABS warning lamp	
3. Ignition switch	7. EBD warning lamp (Brake warning lamp)	

Circuit Description

Operation (ON/OFF) of ABS warning lamp is controlled by ABS control module through lamp driver module in combination meter.

If the antilock brake system is in good condition, ABS control module turns ABS warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ABS warning lamp is turned ON continuously by ABS control module. Also, it is turned ON continuously by lamp driver module when the connector of ABS control module is disconnected.

Troubleshooting

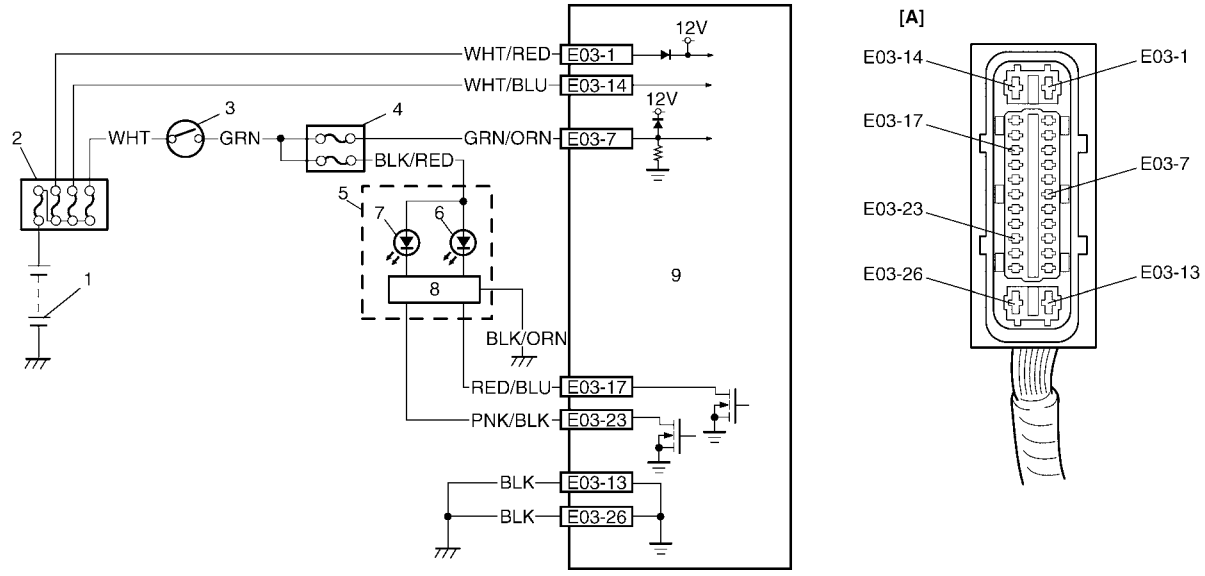
Step	Action	Yes	No
1	1) Turn ignition switch to ON position. *Do other warning lamps come ON?*	Go to Step 2.	Go to Step 4.
2	1) Turn OFF ignition switch. 2) Disconnect ABS hydraulic unit / control module connector. 3) Turn ON ignition switch. *Does ABS warning lamp light with ignition switch ON?*	Replace ABS hydraulic unit / control module assembly.	Go to Step 3.

Step	Action	Yes	No
3	1) Remove combination meter with ignition switch turned OFF. 2) Measure resistance between “RED/BLU” wire of combination meter connector and vehicle body ground. *Is it infinite (∞)?*	Go to Step 6.	“RED/BLU” circuit shorted to ground.
4	*Is Circuit fuse for combination meter in good condition?*	Go to Step 5.	Replace fuse and check for short circuit to ground.
5	1) Remove combination meter with ignition switch turned OFF. 2) Check for proper connection to “RED/BLK” wire of combination meter connector. 3) If OK, turn ON ignition switch and measure voltage at “RED/BLK” wire of combination meter connector. *Is it 10 – 14 V?*	Go to Step 6.	Repair power supply circuit for combination meter.
6	1) Measure resistance between “BLK/ORN” wire of combination meter connector and ground. *Is resistance below 5 Ω?*	Replace combination meter.	“BLK/ORN” circuit open or high resistance.

ABS Warning Lamp Comes ON Steady

S4RS0A4504009

Wiring Diagram



I4RS0A450010-

[A]: ABS hydraulic unit / control module connector E03	4. Circuit fuse box	8. Lamp driver module
1. Battery	5. Combination meter	9. ABS hydraulic unit / control module assembly
2. Main fuse box	6. ABS warning lamp	
3. Ignition switch	7. EBD warning lamp (Brake warning lamp)	

Circuit Description

Operation (ON/OFF) of ABS warning lamp is controlled by ABS control module through lamp driver module in combination meter.

If the Antilock brake system is in good condition, ABS control module turns ABS warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ABS warning lamp is turned ON continuously by ABS control module. Also, it is turned ON continuously by lamp driver module when the connector of ABS control module is disconnected.

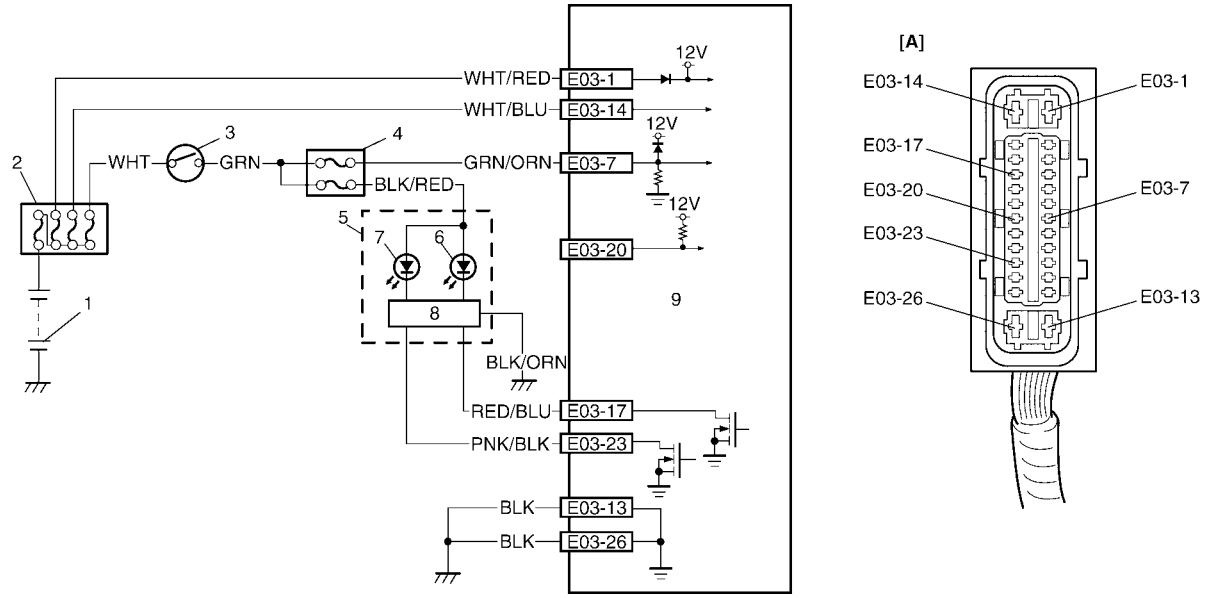
Troubleshooting

Step	Action	Yes	No
1	1) Perform diagnostic trouble code check. *Is there any DTC(s)?*	Go to Step 7 of "ABS Check: ".	Go to Step 2.
2	*Are main fuses for ABS pump motor and ABS solenoid in good condition?*	Go to Step 3.	Replace fuse and check circuit for short to ground.
3	1) Turn ignition switch to OFF. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-7", "E03-13" and "E03-17". 4) If OK then turn ignition switch to ON position and measure voltage between terminal "E03-7" and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	"GRN/ORN" circuit open.
4	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-1" and "E03-14". 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of "E03-1", "E03-14" and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	"WHT/RED" and/or "WHT/BLU" circuit open.
5	1) Turn ignition switch to ON and light the ABS warning lamp. 2) Connect terminal "E03-17" of disconnected ABS hydraulic unit / control module connector to vehicle body ground using service wire. *Does ABS warning lamp turn off?*	Go to Step 6.	"RED/BLU" circuit open. If wire and connection are OK, replace combination meter.
6	1) Turn ignition switch to OFF and measure resistance between each terminal of "E03-13", "E03-26" and vehicle body ground. *Is resistance less than 2 Ω?*	Substitute a known-good ABS hydraulic unite / control module assembly and recheck.	Ground circuit for ABS hydraulic unit / control module open or high resistance.

ABS Warning Lamp Flashes Continuously while Ignition Switch Is ON

S4RS0A4504010

Wiring Diagram



I4RS0A450011-

[A]: ABS hydraulic unit / control module connector E03	5. Combination meter
1. Battery	6. ABS warning lamp
2. Main fuse box	7. EBD warning lamp (brake warning lamp)
3. Ignition switch	8. Lamp driver module
4. Circuit fuse box	9. ABS hydraulic unit / control module assembly

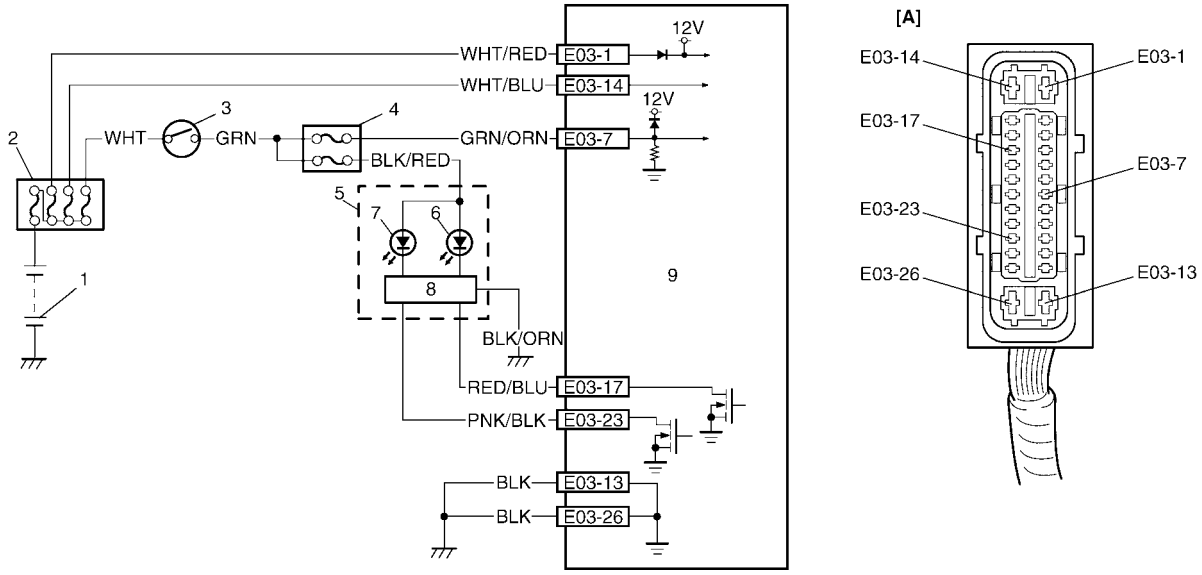
Troubleshooting

Step	Action	Yes	No
1	1) Check for proper connection to ABS control module at ABS hydraulic unit / control module connector. *Is it in good condition?*	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.	“E03-20” terminal shorted to ground.

EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady

S4RS0A4504012

Wiring Diagram



I4RS0A450010-

[A]: ABS hydraulic unit / control module connector E03	4. Circuit fuse box	8. Lamp driver module
1. Battery	5. Combination meter	9. ABS hydraulic unit / control module assembly
2. Main fuse box	6. ABS warning lamp	
3. Ignition switch	7. EBD warning lamp (Brake warning lamp)	

Circuit Description

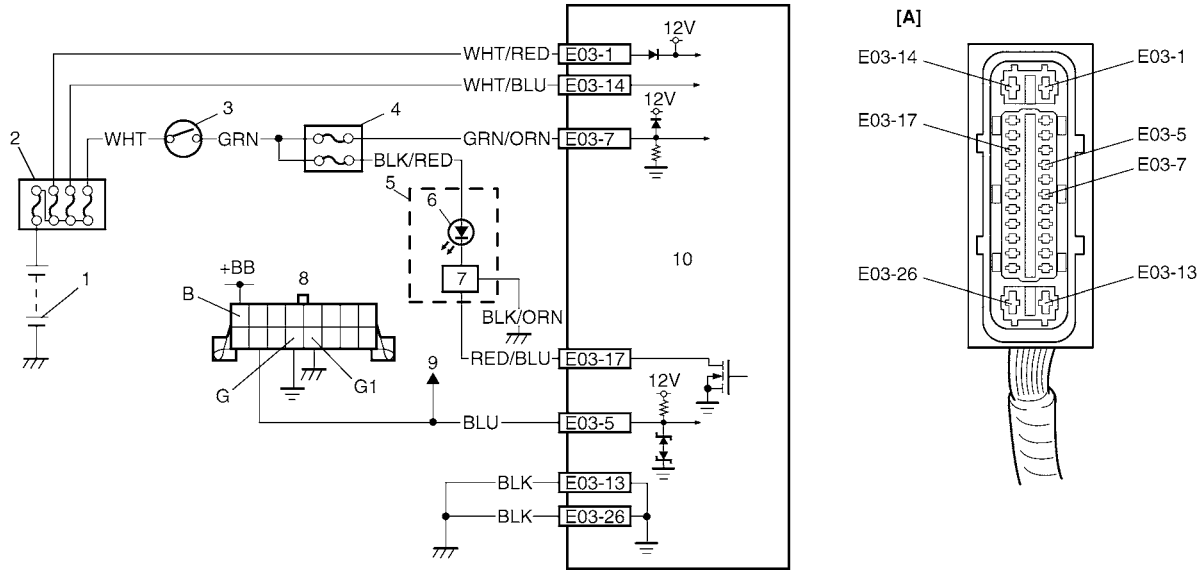
EBD warning lamp (brake warning lamp) is controlled by parking brake switch, brake fluid level switch and ABS hydraulic unit / control module assembly through lamp driver module in combination meter.

Troubleshooting

Step	Action	Yes	No
1	1) Make sure that: • Parking brake is completely released. • Brake fluid level is upper than the minimum level. *Are the check results OK?*	Go to Step 2.	Release parking brake completely and/or replenish brake fluid.
2	1) Turn ignition switch to ON position. *Does "ABS" warning lamp come on steady?*	Perform "ABS Warning Lamp Comes ON Steady: " previously outlined.	Go to Step 3.
3	1) Turn ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-23". 4) If OK, apply chocks to wheels and select gear in neutral position. 5) Keep brake pedal depressed and start engine. Release parking brake. 6) Connect terminal "E03-23" of disconnected ABS hydraulic unit / control module connector to ground using service wire. *Does brake warning lamp turn off?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	"PNK/BLK" circuit open. If wire and connection are OK, replace combination meter.

Serial Data Link Circuit Check

S4RS0A4504013

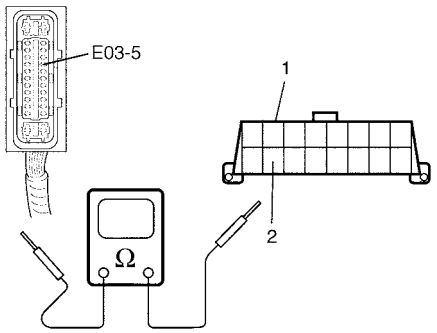


I4RS0A450012-

[A]: ABS hydraulic unit / control module connector E03			
1. Battery	4. Circuit fuse box	7. Lamp driver module	10. ABS hydraulic unit / control module assembly
2. Main fuse box	5. Combination meter	8. Data link connector (DLC)	
3. Ignition switch	6. ABS warning lamp	9. To ECM, TCM control module and SDM	

Inspection

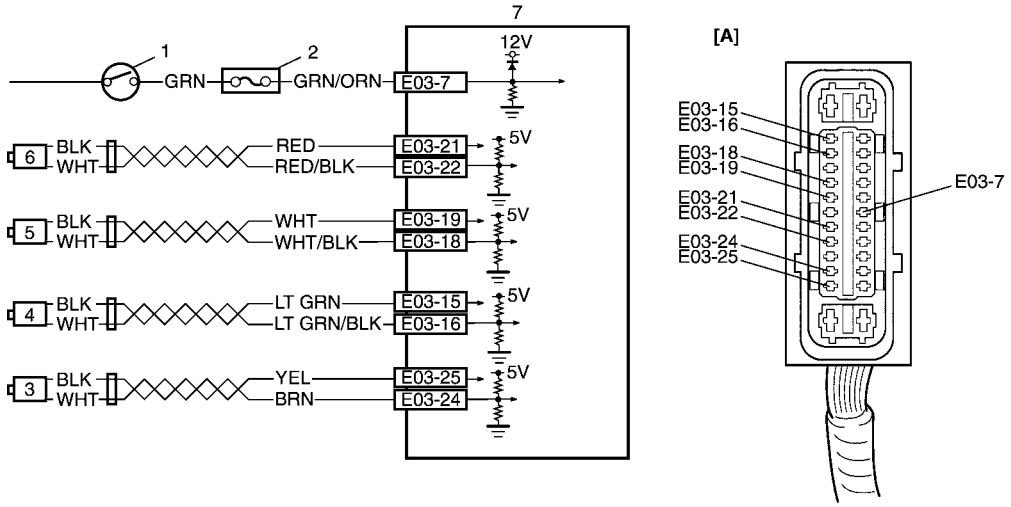
Step	Action	Yes	No
1	1) Turn ignition switch to ON position. *Does ABS warning lamp come ON?*	Go to Step 2.	Go to Step 6.
2	1) Turn ignition switch to OFF position. *Are main fuses for ABS pump motor and ABS solenoid in good condition?*	Go to Step 3.	Replace fuse and check for short.
3	1) Disconnect ABS hydraulic unit / control module connector. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminal “E03-7”. 3) If OK then turn ignition switch to ON position and measure voltage between terminal “E03-7” and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	“GRN/ORN” wire circuit open.
4	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-1” and “E03-14”. 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of “E03-1”, “E03-14” and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	“WHT/RED” and / or “WHT/BLU” wire circuit open.

Step	Action	Yes	No
5	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-13” and “E03-26”. 3) If OK, measure resistance between each terminal of “E03-13”, “E03-26” and vehicle body ground. *Are resistance less than 2 Ω?*	Go to Step 6.	Ground circuit for ABS hydraulic unit / control module open or high resistance.
6	1) Check if communication is possible by trying communication with other controller (ECM, TCM or SDM). *Is it possible to communicate with other controller?*	Go to Step 7.	Repair open in common section of serial data circuit (“PPL/WHT” wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit (“PPL/WHT” wire circuit).
7	1) Turn ignition switch to ON position. 2) Measure voltage between terminal B of data link connector and vehicle body ground. *Is voltage 10 – 12 V?*	Go to step 8.	Terminal B circuit open or shorted to ground.
8	1) Turn ignition switch to OFF position. 2) Measure resistance between the following terminals; • Terminal G of data link connector and vehicle body ground. • Terminal G1 of data link connector and vehicle body ground. *Is each resistance 1Ω or less?*	Go to step 9.	Terminal G and/or G1 circuit open or high resistance.
9	1) Turn ignition switch to OFF position. 2) Check proper connection at “E03-5” (“PPL/WHT” wire) terminal for serial data circuit. 3) If OK, then check resistance between “E03-5” (“PPL/WHT” wire) terminal and “PPL/WHT” wire terminal (2) for serial data circuit in DLC (1). *Is resistance 1 Ω or less?*  I4RS0A450013-	Substitute a known-good ABS hydraulic unit / control module and recheck.	Repair high resistance or open in “PPL/WHT” wire circuit for anti lock brake system.

DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Sensor Ring

S4RS0A4504015

Wiring Diagram



I4RS0A450014-

[A]: ABS hydraulic unit / control module connector E03	3. Right-rear wheel speed sensor	6. Left-front wheel speed sensor
1. Ignition switch	4. Left-rear wheel speed sensor	7. ABS hydraulic unit / control module assembly
2. Circuit fuse box	5. Right-front wheel speed sensor	

DTC Detecting Condition

The ABS control module monitors the voltage at the terminal of each sensor while the ignition switch is ON. When the voltage is not within the specified range, an applicable DTC will be set. Also, when no sensor signal is inputted at running, an applicable DTC will be set.

NOTE:

When the vehicle was operated in any of the following ways, one of these DTCs may be set even when the sensor is in good condition. If such possibility is suspected, clear DTC once referring to "DTC Clearance: " and then performing the driving test as described in Step 2 of "ABS Check: ", check whether or not any abnormality exists.

- **The vehicle was driven with parking brake pulled.**
- **Wheel spin occurred while driving.**
- **Wheel(s) was turned while the vehicle was jacked up.**
- **The vehicle was stuck.**

DTC Troubleshooting

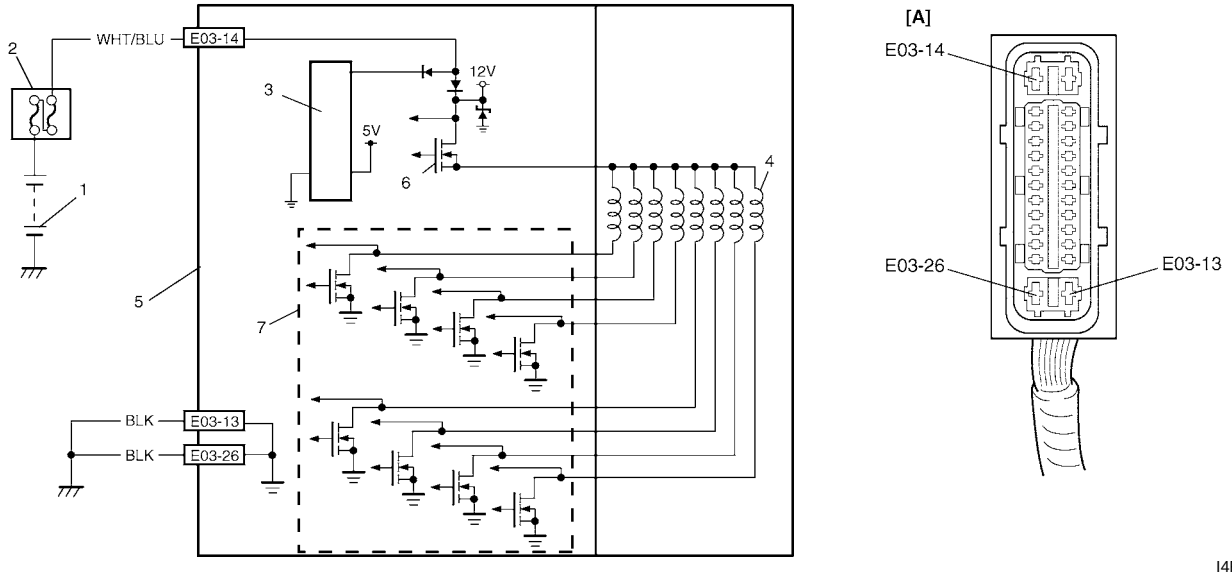
Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	1) Disconnect applicable ABS wheel speed sensor coupler with ignition switch OFF. 2) Measure resistance between terminals of ABS wheel speed sensor. Refer to "Front Wheel Speed Sensor Inspection: " and/or "Rear Wheel Speed Sensor Inspection: ". *Is measured resistance value as specified?*	Go to Step 3.	Replace ABS wheel speed sensor assembly.

Step	Action	Yes	No
3	1) Turn ignition switch OFF. 2) Connect applicable ABS wheel speed sensor coupler. 3) Disconnect ABS hydraulic unit / control module connector. 4) Check for proper connection to ABS control module at each sensor terminal. 5) If OK, then turn ignition switch ON and measure voltage between applicable sensor terminal of module connector and body ground. *Is it 0 V?*	Go to Step 4.	ABS wheel speed sensor circuit shorted to power.
4	1) Turn ignition switch OFF. 2) Measure resistance between the following points. • Both ABS hydraulic unit / control module connector terminals of the corresponding sensor. This check result should be the same as Step 2). • Either terminal of wheel speed sensor coupler and body ground. This check result should be no continuity. *Are both check results OK?*	Go to Step 5.	Circuit open or shorted to ground.
5	1) Remove applicable ABS wheel speed sensor. 2) Check sensor for damage or foreign material attached. *Is it in good condition?*	Go to Step 6.	Clean, repair or replace.
6	Check front and/or rear sensor ring for the following (remove rear drum as necessary): • Sensor ring serration (teeth) neither missing nor damaged • No foreign material being attached • Sensor ring not being eccentric • Wheel bearing free from excessive play *Are they in good condition?*	Go to Step 7.	Clean, repair or replace.
7	1) Install ABS wheel speed sensor to knuckle. 2) Tighten sensor bolt to specified torque and check that there is no clearance between sensor and knuckle. *Is it OK?*	Go to Step 8.	Replace ABS wheel speed sensor.
8	Refer to “Front Wheel Speed Sensor On-Vehicle Inspection: ” and/or “Rear Wheel Speed Sensor On-Vehicle Inspection: ”, check output voltage or waveform. *Is specified voltage and/or waveform obtained?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	Replace sensor and recheck.

DTC C1041 / C1045 / C1051 / C1055, DTC C1042 / C1046 / C1052 / C1056: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Circuit, Right-Front / Left-Front / Right-Rear / Left-Rear Outlet Solenoid Circuit

S4RS0A4504016

Wiring Diagram



I4RS0A450015-

[A]: ABS hydraulic unit / control module assembly connector E03	3. ABS power control module	6. Solenoid valve power supply driver (transistor)
1. Battery	4. Solenoid valve	7. Solenoid valve driver (transistor)
2. Main fuse box	5. ABS hydraulic unit / control module assembly	

DTC Detecting Condition

The ABS control module monitors the output from the valve.
When the output of each valve exceeds the specified value compared with the signal sent from ABS control module, this DTC is set.

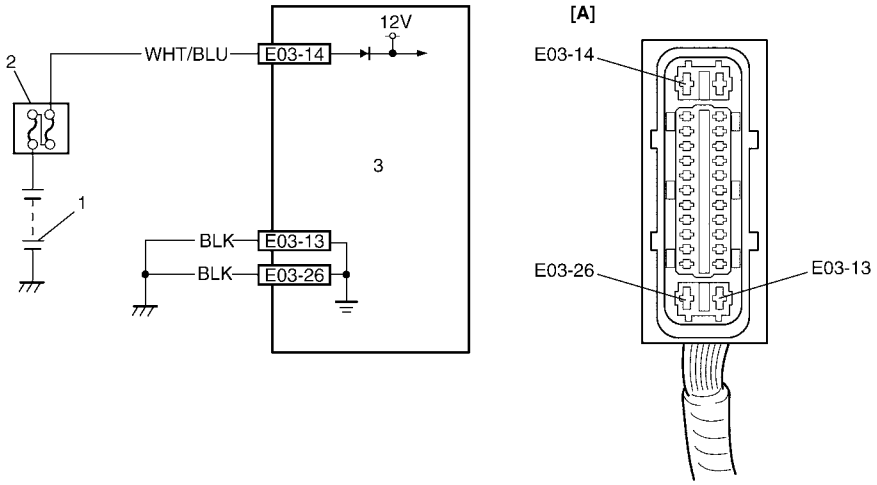
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	1) Turn ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminal "E03-14". 4) If OK, then measure voltage between terminal "E03-14" of module connector and "E03-26". *Is it 10 – 14 V?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	"WHT/BLU" or "BLK" circuit open.

DTC C1057: Power Source Circuit

S4RS0A4504017

Wiring Diagram



I4RS0A450016-

[A]: ABS hydraulic unit / control module connector E03	2. Main fuse box
1. Battery	3. ABS hydraulic unit / control module assembly

DTC Detecting Condition

The ABS control module monitors the power source voltage at terminal “E03-14”. When the power source voltage becomes extremely high or low while vehicle is running at more than 20 km/h (13 MPH), this DTC will be set. As soon as the power source voltage becomes normal, the ABS warning lamp will be turned off and the ABS control module will return to normal operation, but the set DTC will be remain.

DTC Troubleshooting

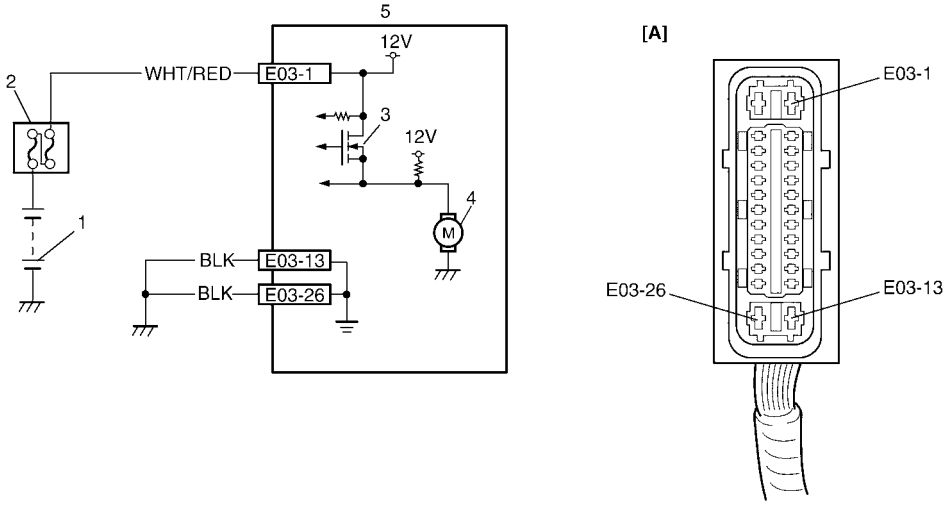
Step	Action	Yes	No
1	*Was “ABS Check” performed?*	Go to Step 2.	Go to “ABS Check: ”.
2	1) Disconnect ABS hydraulic unit / control module connector with ignition switch turned OFF. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-14” and “E03-13”. 3) If OK, then turn ignition switch to ON position and measure voltage between terminals “E03-14” and “E03-13”. *Is voltage 9.7 ± 0.3 V or more?*	Go to Step 5.	Go to Step 3.
3	1) Turn ignition switch to OFF. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-13” and “E03-26”. 3) If OK then turn ignition switch to ON and measure resistance between each terminal of “E03-13” and “E03-26” and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 4.	“BLK” wire circuit in open or high resistance.
4	1) Measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 9.7 ± 0.3 V or more?*	Imperfect short between “WHT/BLU” wire circuit and body ground.	Check charging system referring to “Generator Test (Undercharged Battery Check): in Section 1J”.

Step	Action	Yes	No
5	1) Measure voltage between terminals “E03-14” and “E03-13” with engine running. *Is voltage 18 ± 1.0 V or less?*	Poor connection of “E03-14” and/or “E03-13” terminals. If the terminals are in good condition, substitute a known-good ABS hydraulic unit / control module and recheck.	Check charging system referring to “Generator Test (Overcharged Battery Check): in Section 1J”.

DTC C1061: ABS Pump Motor and/or Motor Driver Circuit

S4RS0A4504018

Wiring Diagram



I4RS0A450017-

[A]: ABS hydraulic unit / control module connector E03	2. Main fuse box	4. ABS pump motor
1. Battery	3. Pump motor driver (transistor)	5. ABS hydraulic unit / control module assembly

DTC Detecting Condition

The ABS control module monitors the voltage at monitor terminal of pump motor circuit constantly with the ignition switch turned ON. It sets this DTC when the voltage at the monitor terminal does not become high / low according to ON/OFF commands to the motor driver (transistor) of the module (does not follow these commands).

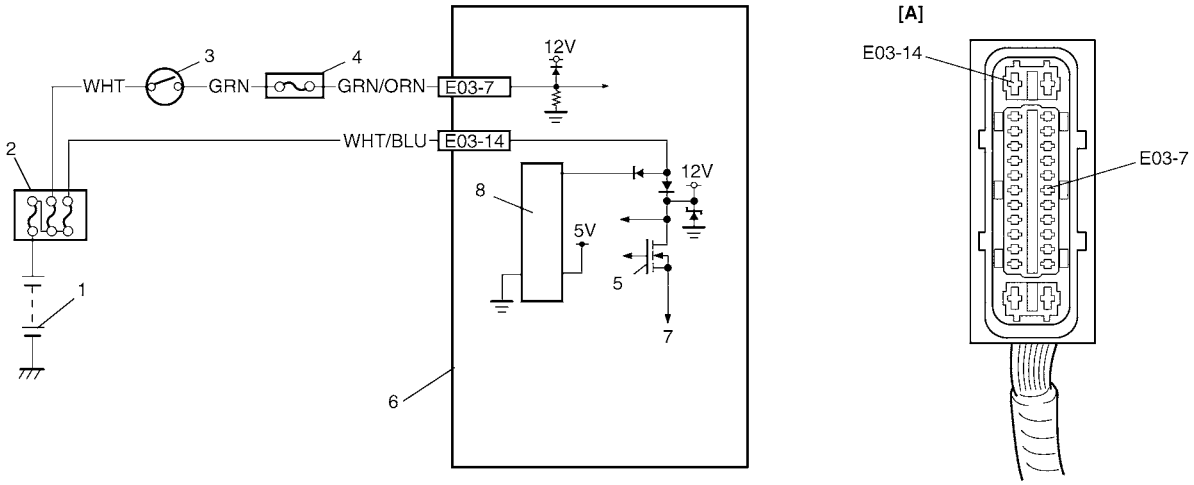
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “ABS Check” performed?*	Go to Step 2.	Go to “ABS Check: ”.
2	1) Turn Ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminal “E03-1”. 4) If OK, then measure voltage between terminal “E03-1” of module connector and body ground. *Is it 10 – 14 V?*	Go to Step 3.	“WHT/RED” circuit open.
3	Measure resistance between terminal “E03-13” and “E03-26” of ABS hydraulic unit / control module connector and body ground. *Is resistance less than 1 Ω?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	Ground circuit for ABS hydraulic unit / control module open or high resistance.

DTC C1063: Solenoid Valve Power Supply Driver Circuit

S4RS0A4504019

Wiring Diagram



I4RS0A450018-

[A]: ABS hydraulic unit / control module connector E03	5. Solenoid valve power supply driver (transistor)
1. Battery	6. ABS hydraulic unit / control module assembly
2. Main fuse box	7. To solenoid valve
3. Ignition switch	8. ABS power control module
4. Circuit fuse box	

DTC Detecting Condition

ABS control module monitors the voltage at the terminal of solenoid circuit constantly with ignition switch turned ON. Also, immediately after ignition switch is turned ON, perform initial check as follows.
Switch solenoid valve power supply driver (transistor) in the order of OFF → ON and check if voltage changes to Low → High. If anything faulty is found in the initial check and when the voltage is low with ignition switch turned ON, this DTC will be set.

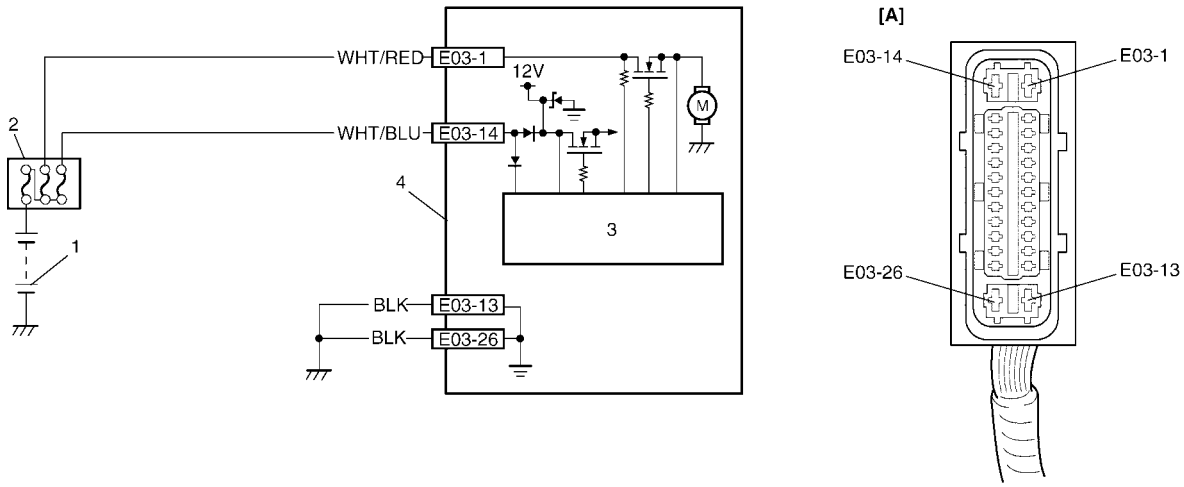
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	Check battery voltage. *Is it about 11 V or higher?*	Go to Step 3.	Check charging system referring to "Battery Inspection: in Section 1J" and "Generator Test (Undercharged Battery Check): in Section 1J".
3	Check main fuse for ABS solenoid and its terminal. *Is it in good condition?*	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	1) Turn ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module at terminal "E03-14". 4) If OK, then measure voltage between connector terminal "E03-14" and body ground. *Is it 10 – 14 V?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	"WHT/BLU" circuit imperfect short to ground.

DTC C1071: ABS Control Module

S4RS0A4504020

Wiring Diagram



I4RS0A450019-

[A]: ABS hydraulic unit / control module connector E03	2. Main fuse box	4. ABS hydraulic unit / control module assembly
1. Battery	3. ABS power control module	

DTC Detecting Condition

This DTC will be set when an internal malfunction is detected in the ABS control module.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	Clear all DTCs and check DTC. *Is it DTC C1071?*	Go to Step 3.	Could be a temporary malfunction of the ABS control module.
3	1) Check for proper connection of ABS hydraulic unit / control module connector. 2) If OK, disconnect ABS hydraulic unit / control module connector and check the following. • Voltage "E03-1" terminal: 10 – 14 V • Voltage "E03-14" terminal: 10 – 14 V • Resistance between "E03-13" and body ground: Continuity • Resistance between "E03-26" and body ground: Continuity *Are the check result as specified?*	Replace ABS hydraulic unit / control module assembly.	Repair "WHT/RED", "WHT/BLU" and/or "BLK" circuit and recheck.

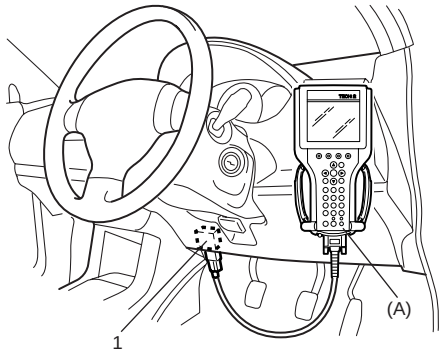
Repair Instructions

ABS Hydraulic Unit Operation Check

S4RS0A4506001

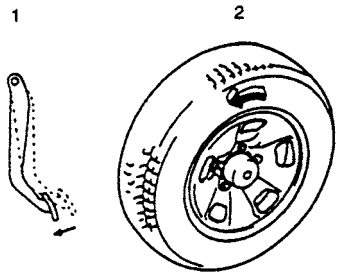
1) Check that basic brake system other than ABS is in good condition.
2) Check that battery voltage is 11 V or higher.
3) Lift up vehicle.
4) Set transmission to neutral and release parking brake.
5) Turn each wheel gradually by hand to check if brake dragging occurs. If it does, correct.
6) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

   Special tool
   (A): SUZUKI scan tool



I4RS0A450020-

7) Turn ignition switch to ON position and select menu to “HYDRAULIC CONTROL TEST” under “miscellaneous test” (“MISC. TEST”) mode of SUZUKI scan tool.
8) Perform the following checks with help of another person.
   Brake pedal (1) should be depressed and then select testing wheel by SUZUKI scan tool and the wheel (2) should be turned by another person’s hand. At this time, check that:
   - Operation sound of solenoid is heard and the wheel turns only about 0.5 sec. (Brake force is depressurized).
   - Operation sound of pump motor is heard and pulsation is felt at brake pedal.



I4RH01450021-

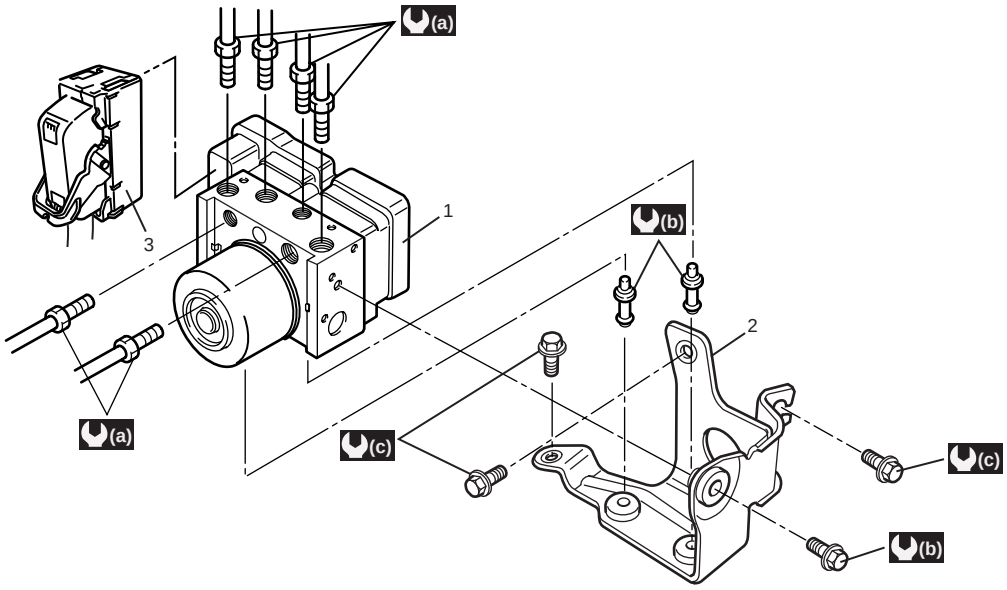
9) Check for all 4-wheels condition respectively. If a faulty condition is found, replace hydraulic unit / control module assembly.
10) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

ABS Hydraulic Unit / Control Module Assembly Components

S4RS0A4506002

CAUTION:

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit / control module assembly.



I4RS0A450021-

1. ABS hydraulic unit / control module assembly	3. Connector	(b) 9 N·m (0.9 kg-m, 6.5 lb-ft)
2. Bracket	(a) 16 N·m (1.6 kg-m, 11.5 lb-ft)	(c) 25 N·m (2.5 kg-m, 18.0 lb-ft)

ABS Hydraulic Unit / Control Module Assembly On-Vehicle Inspection

S4RS0A4506003

CAUTION:

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit / control module assembly.

Check hydraulic unit for fluid leakage.
If any, repair or replace.

ABS Hydraulic Unit / Control Module Assembly Removal and Installation

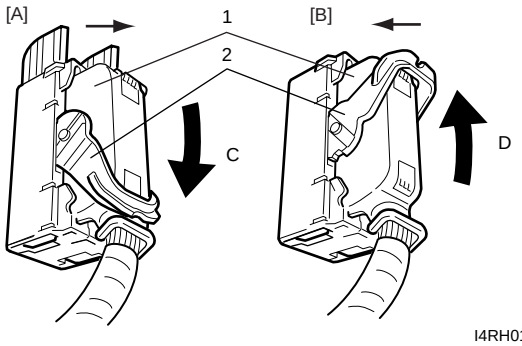
S4RS0A4506004

CAUTION:

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit / control module assembly.

Removal

1) Disconnect negative cable from battery.
2) Disconnect ABS hydraulic unit / control module assembly connector (1) by pull down the lock (2).



I4RH01450001-

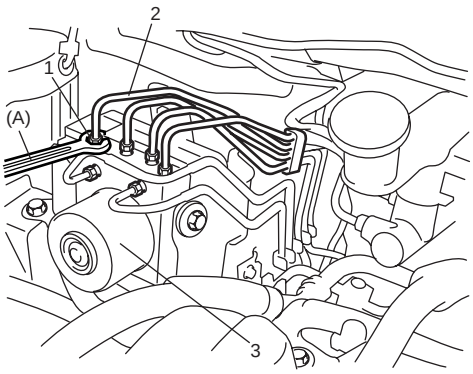
[A]: Disconnect	C: Pull down to disconnect
[B]: Connect	D: Pull up to connect

3) Using special tool, loosen flare nuts (1) and disconnect brake pipes (2) from ABS hydraulic unit / control module assembly (3).

Special tool
(A): 09950-78220

NOTE:

Put bleeder plug cap or the like onto pipe to prevent fluid from spilling. Do not allow brake fluid to get on painted surfaces.



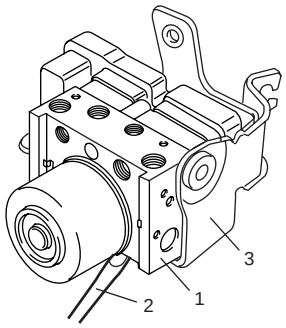
I4RS0A450022-

4) Remove ABS hydraulic unit / control module with bracket from vehicle by removing three bracket bolts.

5) Remove bolt and pull out ABS hydraulic unit / control module assembly (1) from bracket (3) using flat end rod or the like (2).

CAUTION:

- **Do not give an impact to hydraulic unit.**
- **Use care not to allow dust to enter hydraulic unit.**
- **Do not place hydraulic unit on its side or upside down. Handling it in inappropriate way will affect its original performance.**

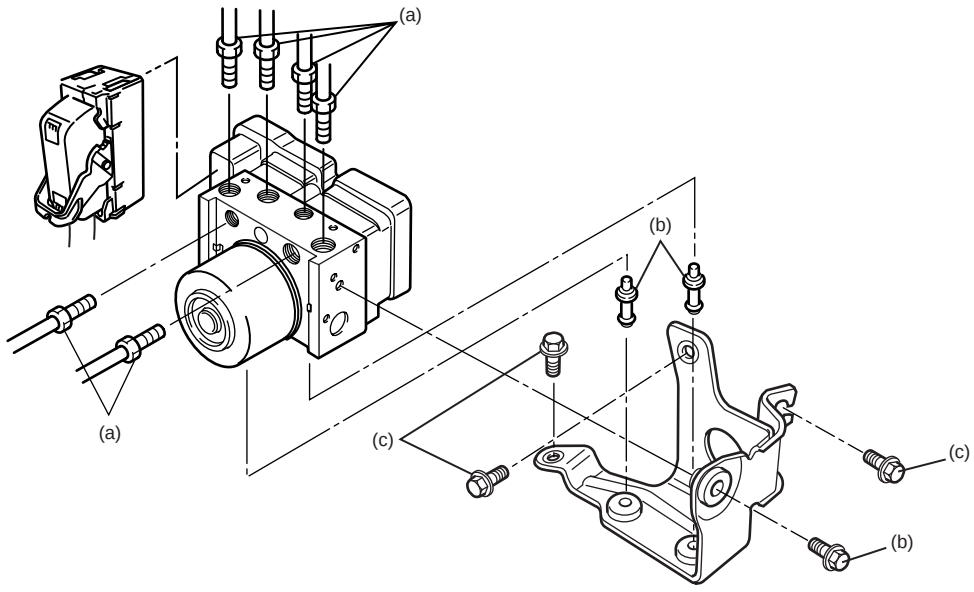


I4RS0A450023-

Installation

1) Install hydraulic unit / control module assembly by reversing removal procedure.

Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)
ABS hydraulic unit / control module assembly bolt (b): 9 N·m (0.9 kg-m, 6.5 lb-ft)
ABS hydraulic unit / control module assembly bracket bolt (c): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I4RS0A450024-

2) Bleed air from brake system referring to “Air Bleeding of Brake System: in Section 4A”.
3) Check each installed part for fluid leakage and perform “ABS Hydraulic Unit Operation Check: ”.

NOTE:

For new ABS hydraulic unit / control module assembly, if “ABS Hydraulic Unit Operation Check: ” has not been performed, ABS warning lamp may flash when ignition switch is turned ON position.
Accordingly preform “ABS Hydraulic Unit Operation Check: ” to stop flashing of ABS warning lamp.

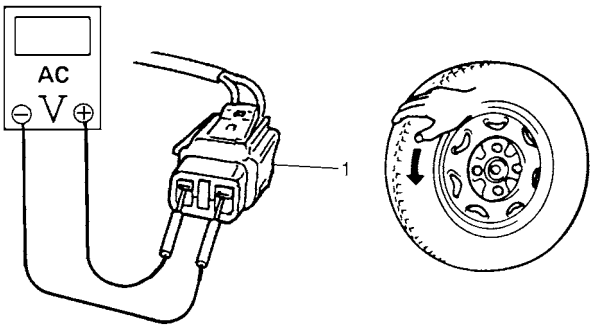
Front Wheel Speed Sensor On-Vehicle Inspection

S4RS0A4506005

Output Voltage Inspection

1) Disconnect negative cable from battery.
2) Hoist vehicle a little.
3) Disconnect wheel speed sensor connector.
4) Disconnect wheel speed grommet from vehicle body.
5) Connect voltmeter between connector (1) terminals.
6) While turning wheel by hand at a speed of approximately 3/4 rotation to 1 1/4 rotation per second, check AC voltage of sensor.

Output AC voltage at 3/4 to 1 1/4 rotation per second
53 mV or more

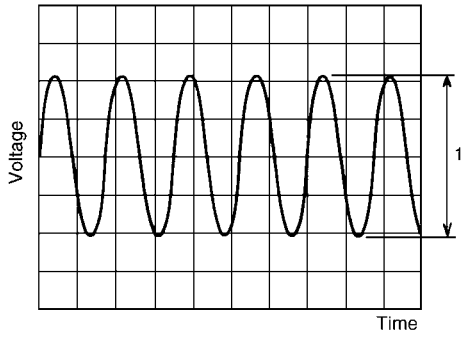


I2RH01450049-

7) If measured voltage is not as specified, check sensor, ring and their installation conditions.

Reference
When using oscilloscope for this check, check if peak-to-peak voltage (1) meets specification and waveform is complete.

Peak-to-peak voltage at 1/2 to 1 rotation per second
140 mV or more at 15 Hz



I2RH01450050-

Front Wheel Speed Sensor Removal and Installation

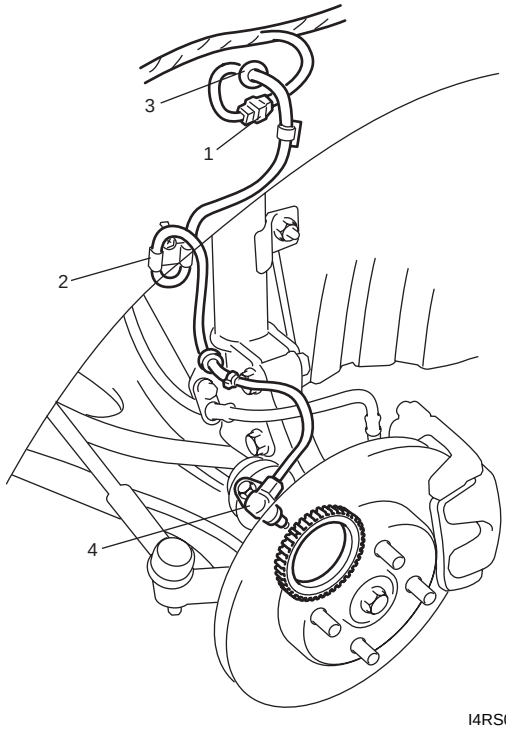
S4RS0A4506006

Removal

1) Disconnect negative cable from battery.
2) Disconnect front wheel speed sensor coupler (1).
3) Hoist vehicle and remove wheel.
4) Remove harness clamp, clamp bolt (2) and grommet (3).
5) Remove front wheel speed sensor (4) from knuckle.

CAUTION:

- **Do not pull wire harness when removing front wheel speed sensor.**
- **Do not cause damage to surface of front wheel speed sensor and do not allow dust, etc. to enter its installation hole.**



I4RS0A450025-

Installation

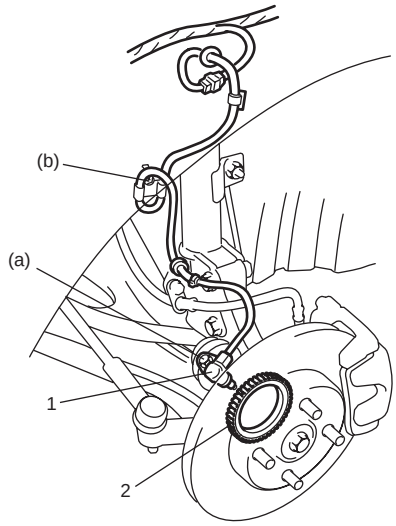
1) Check that no foreign material is attached to sensor (1) and sensor ring (2).
2) Install it by reversing removal procedure.

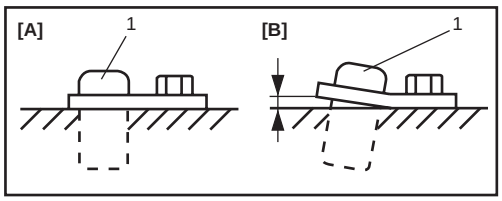
Tightening torque
Front wheel speed sensor bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
Front wheel speed sensor harness clamp bolt (b): 11 N·m (1.1 kg-m, 8.0 lb-ft)

CAUTION:

Do not pull or twist wire harness more than necessary when installing front wheel speed sensor.

3) Check that there is no clearance between sensor and knuckle.





I4RS0A450026-

[A]: OK
[B]: NG

Front Wheel Speed Sensor Inspection

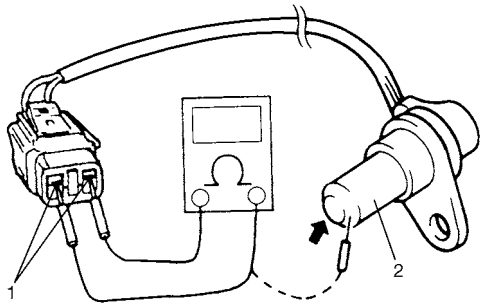
S4RS0A4506007

- Check sensor for damage.
- Measure resistance of sensor.

Between both terminals (1) of sensor
1.2 – 1.6 kΩ at 20 °C (68 °F)

Between sensor terminal (1) and sensor body (2)
Infinity (∞)

If the check result is not as specified and any malcondition is found, replace.



I2RH01450052-

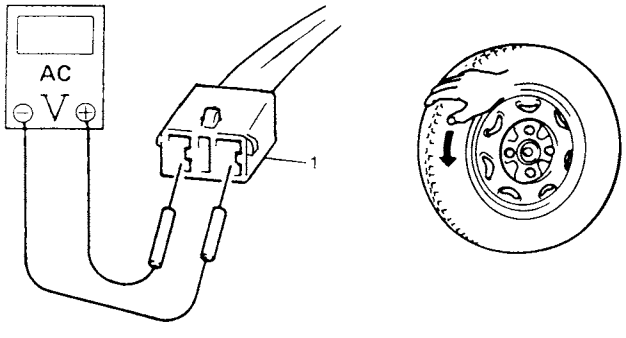
Rear Wheel Speed Sensor On-Vehicle Inspection

S4RS0A4506008

Output Voltage Inspection

1) Disconnect connector from rear wheel speed sensor referring to Step 1) to 4) of “Rear Wheel Speed Sensor Removal and Installation: ”.
2) Hoist vehicle.
3) Connect voltmeter between connector (1) terminals.
4) While turning wheel at a speed of approximately 3/4 to 1 1/4 rotation per second, check AC voltage of sensor.

Output AC voltage at 3/4 to 1 1/4 rotation per second
53 mV or more

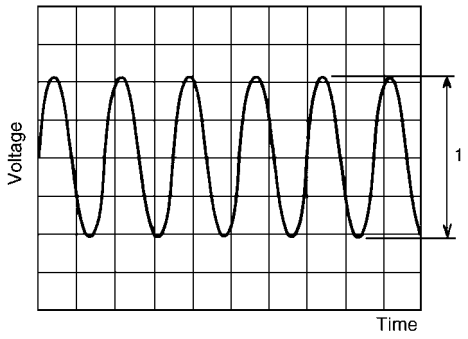


I3RH01450049-

5) If measured voltage is not as specified, check sensor, ring and their installation conditions.

Reference
When using oscilloscope for this check, check if peak-to-peak voltage (1) meets specification and waveform is complete.

Peak-to-peak voltage at 1/2 to 1 rotation per second
140 mV or more at 15 Hz



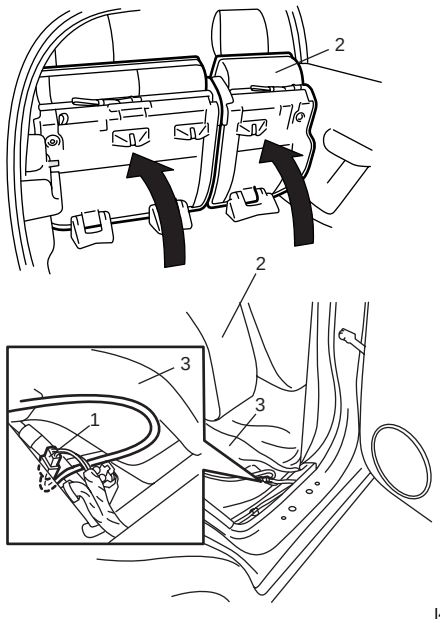
I2RH01450050-

Rear Wheel Speed Sensor Removal and Installation

S4RS0A4506009

Removal

1) Disconnect negative cable from battery.
2) Remove rear side sill scuff.
3) Fold rear seat (2) up as shown, and then turn over floor carpet (3).
4) Disconnect rear wheel speed sensor coupler (1).
5) Hoist vehicle.



I4RS0A450028-

6) Detach ABS wheel sensor wire harness (1).

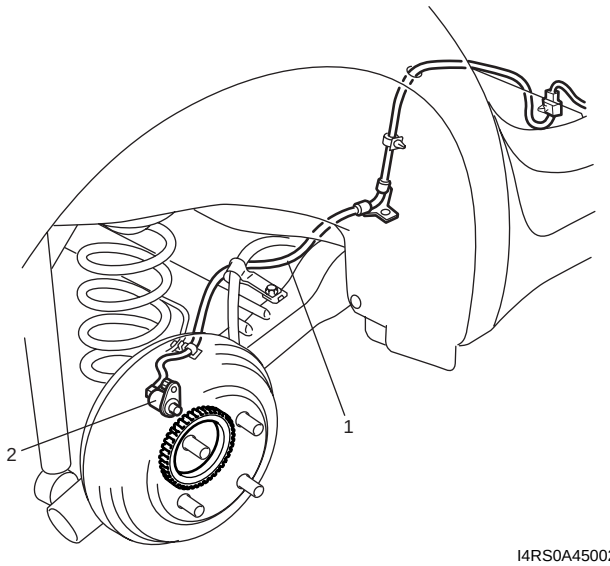
NOTE:

Do not detach clip of rear wheel speed sensor connector from vehicle body unless replacement is necessary.

7) Remove rear wheel speed sensor (2) from knuckle.

CAUTION:

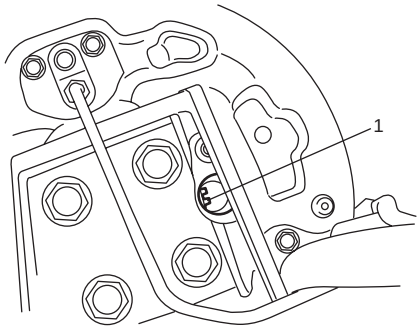
- **Do not pull wire harness when removing rear wheel speed sensor.**
- **Do not cause damage to surface of rear wheel speed sensor and do not allow dust, etc. to enter its installation hole.**



I4RS0A450029-

Installation
Reverse removal procedure for installation noting the following.

- Check that no foreign material is attached to sensor and ring (1).



I4RS0A450030-

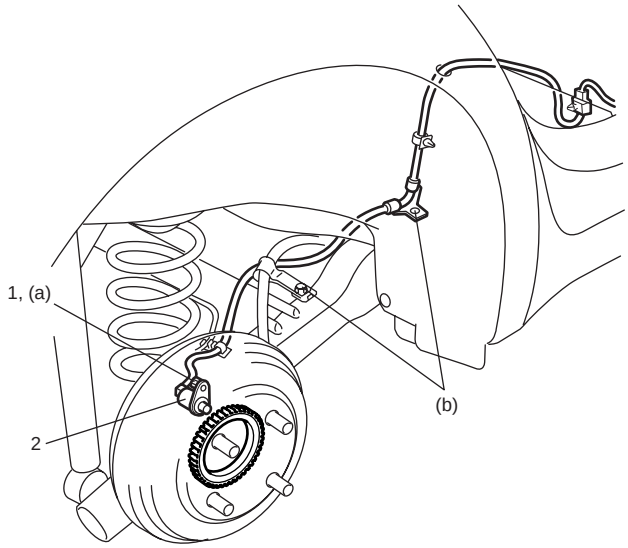
- Be sure to install wheel speed sensor (2) and its bolt at the correct (upper) position as shown in figure. Tighten sensor bolt (1) and harness clamp bolts to specified torque.

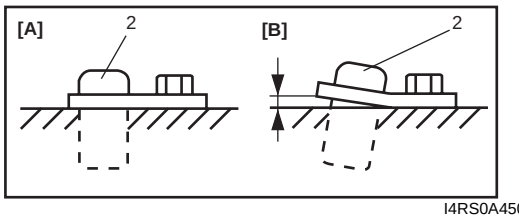
  Tightening torque
  Rear wheel speed sensor bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)
  Rear wheel speed sensor harness clamp bolt (b): 11 N·m (1.1 kg-m, 8.0 lb-ft)

  CAUTION:

  Do not pull or twist wire harness more than necessary when installing rear wheel speed sensor.

- Check that there is no clearance between sensor and knuckle.





I4RS0A450031-

[A]: OK	[B]: NG

Rear Wheel Speed Sensor Inspection

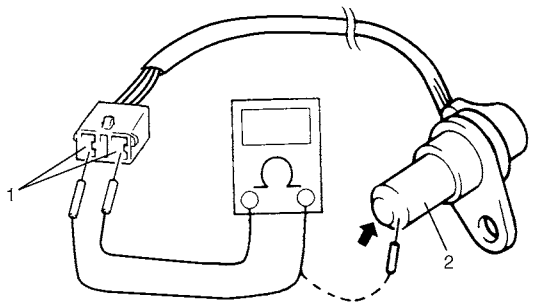
S4RS0A4506010

- Check sensor for damage.
- Measure resistance of sensor.

  Between both terminals (1) of sensor
  1.2 – 1.6 kΩ at 20 °C (68 °F)

  Between sensor terminal (1) and sensor body (2)
  Infinity (∞)

  If the check result is not as specified and any malcondition is found, replace.



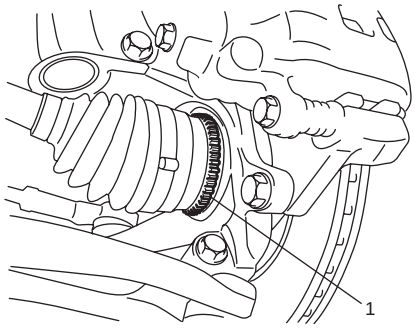
I3RH01450052-

Front Wheel Speed Sensor Ring On-Vehicle Inspection

S4RS0A4506011

- Check ring (1) for being missing, damaged or deformed.
- Turn drive shaft and check if ring rotation is free from eccentricity and looseness.
- Check that no foreign material is attached.

If any faulty is found, repair or replace. Refer to “Front Drive Shaft Disassembly and Assembly: in Section 3A”.



I4RS0A450032-

Front Wheel Speed Sensor Ring Removal and Installation

S4RS0A4506012

NOTE:

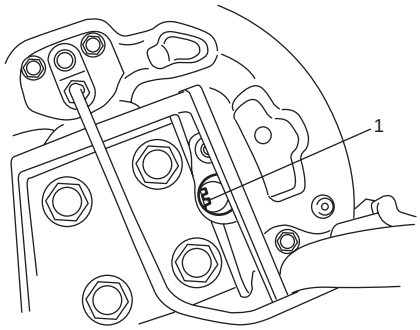
The front wheel sensor ring can not be removed or replaced alone. If front wheel sensor ring needs to be replaced, replace it as a wheel side joint assembly of drive shaft.

For removal and installation of wheel side joint assembly of drive shaft, referring to “Front Drive Shaft Disassembly and Assembly: in Section 3A”.

Rear Wheel Speed Sensor Ring On-Vehicle Inspection

S4RS0A4506013

- Check ring serration (teeth) (1) for being missing, damaged or deformed.
- Turn wheel and check if ring rotation is free from eccentricity and looseness.
- Check that no foreign material is attached. If any faulty is found, repair or replace.



I4RS0A450033-

Rear Wheel Speed Sensor Ring Removal and Installation

S4RS0A4506014

For removal and installation of rear wheel speed sensor ring, refer to “ABS Sensor Ring Removal and Installation (If Equipped): in Section 4C”.

Specifications

Tightening Torque Specifications

S4RS0A4507001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Brake pipe flare nut	16	1.6	11.5	☞
ABS hydraulic unit / control module assembly bolt	9	0.9	6.5	☞
ABS hydraulic unit / control module assembly bracket bolt	25	2.5	18.0	☞
Front wheel speed sensor bolt	25	2.5	18.0	☞
Front wheel speed sensor harness clamp bolt	11	1.1	8.0	☞
Rear wheel speed sensor bolt	11	1.1	8.0	☞
Rear wheel speed sensor harness clamp bolt	11	1.1	8.0	☞

NOTE:

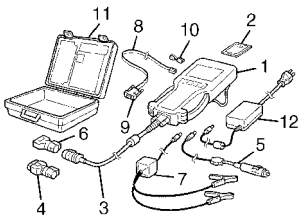
The specified tightening torque is also described in the following.
“Front Wheel Speed Sensor Components Location: ”
“Rear Wheel Speed Sensor Components Location: ”
“ABS Hydraulic Unit / Control Module Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A4508001

09950–78220 Flare nut wrench (10 mm) ☞ 	SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞ 

Section 5

Transmission / Transaxle

CONTENTS

Precautions 5-1
Precautions 5-1
Precautions on Transmission / Transaxle 5-1

Automatic Transmission 5A-1
Precautions 5A-1
Precautions in Diagnosing Trouble 5A-1
Precautions for Disassembly and Reassembly 5A-1
General Description 5A-3
A/T Description 5A-3
Clutch / Brake / Planetary Gear Function of Automatic Transaxle 5A-6
Table of Component Operation 5A-6
A/T Diagnosis General Description 5A-7
On-Board Diagnostic System Description 5A-7
CAN Communication System Description 5A-8
Schematic and Routing Diagram 5A-9
Transmission Control Module (TCM) Wiring Diagram 5A-9
Automatic Gear Shift Table 5A-11
Component Location 5A-12
Electronic Shift Control System Components Location 5A-12
Diagnostic Information and Procedures 5A-14
A/T System Check 5A-14
Visual Inspection 5A-17
Malfunction Indicator Lamp (MIL) Check 5A-17
DTC Table 5A-17
DTC Check 5A-19
DTC Clearance 5A-19
Fail-Safe Table 5A-20
Scan Tool Data 5A-22
A/T Basic Check 5A-25
Road Test 5A-26
Manual Road Test 5A-28
Engine Brake Test 5A-29
Stall Test 5A-29
Time Lag Test 5A-31
Line Pressure Test 5A-32
“P” Range Test 5A-33
A/T Symptom Diagnosis 5A-33
No Gear Shift to 4th gear 5A-41
No Lock-Up Occurs 5A-42
DTC P0705: Transmission Range Sensor Circuit Malfunction 5A-43
DTC P0707: Transmission Range Sensor Circuit Low 5A-45
DTC P0712: Transmission Fluid Temperature Sensor Circuit Low 5A-47
DTC P0713: Transmission Fluid Temperature Sensor Circuit High 5A-48
DTC P0717: Input / Turbine Speed Sensor Circuit Malfunction 5A-49
DTC P0722: Output Speed Sensor (VSS) Circuit No Signal 5A-51
DTC P0741 / P0742: TCC Circuit Performance or Stuck OFF / TCC Circuit Stuck ON 5A-53
DTC P0751 / P0752 / P0756 / P0757: Shift Solenoid Malfunction 5A-54
DTC P0787: Shift / Timing Solenoid Control Circuit Low 5A-55
DTC P0788: Shift / Timing Solenoid Control Circuit High 5A-57
DTC P0962: Pressure Control Solenoid Control Circuit Low 5A-59
DTC P0963: Pressure Control Solenoid Control Circuit High 5A-61
DTC P0973 / P0976: Shift Solenoid-A (No.1) Control Circuit Low / Shift Solenoid-B (No.2) Control Circuit Low 5A-63
DTC P0974 / P0977: Shift Solenoid-A (No.1) / Shift Solenoid-B (No.2) Control Circuit High 5A-65
DTC P1702: Internal Control Module Memory Check Sum Error 5A-67
DTC P1703: Can Invalid Data - TCM 5A-67
DTC P1723: Range Select Switch Malfunction 5A-68
DTC P1774: Control Module Communication Bus Off 5A-69
DTC P1775: High Speed CAN Communication Bus Off (Transmission Error) 5A-72
DTC P1777: TCM Lost Communication with ECM (Reception Error) 5A-75
DTC P1778: TCM Lost Communication with BCM (Reception Error) 5A-78
DTC P1878: Torque Converter Clutch Shudder 5A-81
DTC P2763: Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit High 5A-82
DTC P2764: Torque Converter Clutch (TCC) Circuit Pressure Control Solenoid Control Circuit Low 5A-84

Inspection of TCM and Its Circuits 5A-86
TCM Power and Ground Circuit Check 5A-90
Brake Interlock System Inspection 5A-91
Repair Instructions 5A-92
Learning Control Initialization 5A-92
A/T Fluid Level Check 5A-92
A/T Fluid Change 5A-93
Selector Lever Components 5A-93
Select Lever Assembly Installation 5A-94
Select Lever Knob Installation 5A-94
Selector Lever Inspection 5A-94
Select Cable Components 5A-94
Select Cable Removal and Installation 5A-95
Select Cable Adjustment 5A-95
Transmission Range Sensor (Shift Switch) Inspection and Adjustment 5A-96
Output Shaft Speed Sensor (VSS) Removal and Installation 5A-96
Output Shaft Speed Sensor (VSS) Inspection 5A-97
Input Shaft Speed Sensor Removal and Installation 5A-97
Input Shaft Speed Sensor Inspection 5A-97
Transmission Fluid Temperature Sensor Removal and Installation 5A-98
Transmission Fluid Temperature Sensor Inspection 5A-98
“3” Position Switch Inspection 5A-99
Solenoid Valves (Shift Solenoid Valves and Timing Solenoid Valve) Removal and Installation 5A-99
Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection 5A-100
Pressure Control Solenoid Valves (Pressure Control Solenoid and TCC Pressure Control Solenoid) Removal and Installation 5A-102
Pressure Control Solenoid Valve Inspection 5A-102
Transmission Control Module (TCM) Removal and Installation 5A-103
A/T Relay Inspection 5A-104
Differential Side Oil Seal Replacement 5A-104
Shift Lock Solenoid Inspection 5A-105
Shift Lock Solenoid Replacement 5A-105
Key Interlock Cable Removal and Installation 5A-106
A/T Fluid Cooler Hoses Replacement 5A-107
Automatic Transaxle Unit Components 5A-107
Automatic Transaxle Unit Dismounting and Remounting 5A-108
Automatic Transaxle Assembly Components 5A-110
Automatic Transaxle Unit Disassembly 5A-112
Oil Pump Assembly Components 5A-123
Oil Pump Assembly Disassembly and Reassembly 5A-124
Oil Pump Assembly Inspection 5A-124
Direct Clutch Assembly Components 5A-126
Direct Clutch Assembly Preliminary Check 5A-126
Direct Clutch Assembly Disassembly and Reassembly 5A-127
Direct Clutch Assembly Inspection 5A-129
Forward and Reverse Clutch Assembly Components 5A-130
Forward and Reverse Clutch Assembly Preliminary Check 5A-130
Forward and Reverse Clutch Assembly Disassembly and Reassembly 5A-131
Forward and Reverse Clutch Assembly Inspection 5A-134
2nd Brake Piston Assembly Components 5A-135
2nd Brake Piston Assembly Disassembly and Reassembly 5A-135
Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components 5A-136
Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Disassembly and Reassembly 5A-137
Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Inspection 5A-138
Countershaft Assembly Components 5A-139
Countershaft Assembly Disassembly and Reassembly 5A-139
Valve Body Assembly Components 5A-140
Valve Body Assembly Disassembly and Reassembly 5A-141
Differential Assembly Components 5A-142
Differential Assembly Disassembly and Reassembly 5A-143
Differential Assembly Inspection 5A-144
Torque Converter Housing Disassembly and Reassembly 5A-145
Transaxle Case Disassembly and Reassembly 5A-147
Automatic Transaxle Unit Inspection and Adjustment 5A-148
Automatic Transaxle Unit Assembly 5A-150
Specifications 5A-166
Tightening Torque Specifications 5A-166
Special Tools and Equipment 5A-167
Recommended Service Material 5A-167
Special Tool 5A-167

Manual Transmission 5B-1
General Description 5B-1
Manual Transaxle Construction and Servicing 5B-1
Diagnostic Information and Procedures 5B-3
Manual Transaxle Symptom Diagnosis 5B-3
Repair Instructions 5B-3
Manual Transaxle Oil Change 5B-3
Differential Side Oil Seal Replacement 5B-4
Gear Shift Control Lever and Cable Components 5B-5
Gear Shift Control Lever and Cable Removal and Installation 5B-6
Gear Select Control Cable Adjustment 5B-6

Vehicle Speed Sensor (VSS) Removal and Installation....5B-7
Back Up Lamp Switch Removal and Installation....5B-7
Back Up Lamp Switch Inspection....5B-8
Manual Transaxle Unit Components....5B-8
Manual Transaxle Unit Dismounting and Remounting....5B-9
Gear Shift and Select Shaft Assembly Components....5B-11
Gear Shift and Select Shaft Assembly Removal and Installation....5B-11
Gear Shift and Select Shaft Disassembly and Assembly....5B-12
Manual Transaxle Assembly Components....5B-13
Fifth Gear Disassembly and Assembly....5B-14
Manual Transaxle Assembly Disassembly and Reassembly....5B-17
Transaxle Right Case Disassembly and Assembly....5B-22
Transaxle Left Case Disassembly and Assembly....5B-23
Input Shaft and Countershaft Components....5B-24
Input Shaft Assembly Disassembly and Reassembly....5B-25
Countershaft Assembly Disassembly and Reassembly....5B-27
Synchronizer Parts Inspection....5B-30
Gear Shift Shaft Components....5B-30
5th and Reverse Gear Shift Shafts Disassembly and Assembly....5B-31
Gear Shift Shaft and Fork Inspection....5B-31
Differential Components....5B-32
Differential Disassembly and Assembly....5B-32
Specifications....5B-34
Tightening Torque Specifications....5B-34
Special Tools and Equipment....5B-35
Recommended Service Material....5B-35
Special Tool....5B-35

Clutch....5C-1
General Description....5C-1
Clutch Construction....5C-1
Diagnostic Information and Procedures....5C-2
Clutch System Symptom Diagnosis....5C-2
Repair Instructions....5C-3
Clutch Pedal Inspection....5C-3
Clutch Fluid Level Inspection....5C-4
Air Bleeding of Clutch System....5C-4
Clutch Fluid Pipe and Hose Components....5C-5
Clutch Fluid Pipe Removal and Installation....5C-5
Clutch Fluid Pipe Inspection....5C-6
Clutch Master Cylinder Removal and Installation....5C-6
Clutch Operating Cylinder Removal and Installation....5C-6
Clutch Pedal and Clutch Pedal Bracket Components....5C-7
Clutch Cover, Clutch Disc and Flywheel Components....5C-8
Clutch Cover, Clutch Disc and Flywheel Removal and Installation....5C-8
Clutch Cover, Clutch Disc and Flywheel Inspection....5C-10
Clutch Release System Removal and Installation....5C-10
Clutch Release System Inspection....5C-12
Specifications....5C-12
Tightening Torque Specifications....5C-12
Special Tools and Equipment....5C-13
Recommended Service Material....5C-13
Special Tool....5C-13

Precautions

Precautions

Precautions on Transmission / Transaxle

S4RS0A5000001

Air Bag Warning

Refer to “Air Bag System Service Warning: in Section 00”.

Automatic Transmission

Precautions

Precautions in Diagnosing Trouble

S4RS0A5100001

- Do not disconnect couplers from TCM, battery cable from battery, TCM ground wire harness from engine or main fuse before checking the diagnostic information (DTC, freeze frame data, etc.) stored in TCM memory. Such disconnection will clear memorized information in TCM memory.
- Diagnostic information stored in TCM memory can be cleared as well as checked by using SUZUKI scan tool or generic scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
  It is indistinguishable which module turns on MIL because not only ECM but also TCM turns on MIL. Therefore, check both ECM and TCM for DTC when MIL lights on.
  When checking TCM for DTC, keep in mind that DTC is displayed on the scan tool as follows depending on the scan tool used.
  - SUZUKI scan tool displays DTC detected by TCM.
  - Generic scan tool displays DTC detected by each of ECM and TCM simultaneously.
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00" before inspection and observe what is written there.
- TCM and/or ECM replacement
  - When substituting a known-good TCM and/or ECM, check that all relays and actuators have resistance of specified value.
    Neglecting this check may result in damage to good TCM and/or ECM.
- Communication of ECUs, ECM, TCM and BCM is established by CAN (Controller Area Network). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System: in Section 00".

Precautions for Disassembly and Reassembly

S4RS0A5100002

When repairing automatic transaxle, it is necessary to conduct the on-vehicle test to investigate where the cause of the trouble lies first.
Then whether overhaul should be done or not is determined. If the transaxle is disassembled without such preliminary procedure, not only the cause of the trouble would be unknown, but also a secondary trouble may occur and often time would be wasted.
As the automatic transaxle consists of high precision component, the following cautions should be strictly observed when handling its parts in disassembly and reassembly.

- Disassembling valve body assembly is prohibited essentially. However, a few parts can be disassembled. When disassembling valve body component parts, confirm whether their parts are allowed to disassemble or not referring to "Valve Body Assembly Disassembly and Reassembly: ".
- When component part of forward clutch, direct clutch, 2nd brake and/or O/D and 2nd coast brake, namely clutch disc, brake disc, retaining plate and/or separator plate, have been replaced, all learned contents, which have been stored in TCM memory by executing learning control, should be initialized referring to "Learning Control Initialization: ".
- Make sure to wash dirt off from the transaxle so that no such dirt will enter the transaxle during dismounting and remounting.
- Select a clean place free from dust and dirt for overhauling.
- Place a rubber mat on the work bench to protect parts from damage.
- Work gloves or shop cloth should not be used. (Use a nylon cloth or a paper towel.)
- When separating the case joint, do not pry with a screwdriver or such but tap with a plastic hammer lightly.
- Make sure to wash dirt off from the transaxle so that no such dirt will enter the transaxle during disassembly and reassembly.
- Wash the disassembled parts in ATF (Automatic Transaxle Fluid) or kerosene (using care not to allow ATF or kerosene to get on your face, etc.) and confirm that each fluid passage is not clogged by blowing air into it. But use kerosene to wash the discs, resin washers and rubber parts.
- Replace each gasket, oil seal and O-ring with a new one.
- Apply ATF to sliding or rotating parts before reassembly.

CAUTION:

- **Keep component parts in group for each subassembly and avoid mixing them up.**
- **Clean all parts with cleaning solvent thoroughly and air dry them.**
- **Use kerosene or automatic transaxle fluid as cleaning solvent.**
- **Do not use wiping cloths or rags to clean or dry parts.**
- **All oil passages should be blown out and checked to make sure that they are not obstructed.**
- **Keep face and eyes away from solvent spray while air blowing parts.**
- **Check mating surface for irregularities and remove them, if any, and clean it again.**
- **Soak new clutch discs and brake discs in transaxle fluid for at least 2 hours before assembly.**
- **Replace all gaskets and O-ring with new ones.**
- **Apply automatic transaxle fluid to all O-rings.**
- **When installing seal ring, be careful so that it is not expanded excessively, extruded or caught.**
- **Replace oil seals that are removed and apply grease to their lips.**
- **Before installing, be sure to apply automatic transaxle fluid to sliding, rolling and thrusting surface of all component part. Also after installation, make sure to check each part for proper operation.**
- **Always use torque wrench when tightening bolts.**

- A new discs should be soaked in ATF at least 2 hours before use.

Part Inspection and Correction Table

Part	Inspect for	Correction
Casted part, machined part	Small flaw, burr	Remove with oil stone.
	Deep or grooved flaw	Replace part.
	Clogged fluid passage	Clean with air or wire.
	Flaw on installing surface, residual gasket	Remove with oil stone or replace part.
	Crack	Replace part.
Bearing	Unsmooth rotation	Replace.
	Streak, pitting, flaw, crack	Replace.
Bushing, thrust washer	Flaw, burr, wear, burning	Replace.
Oil seal, gasket	Flawed or hardened seal ring	Replace.
	Worn seal ring on its periphery or side	Replace.
	Piston seal ring, oil seal, gasket, etc.	Replace.
Gear	Flaw, burr	Replace.
	Worn gear tooth	Replace.
Splined part	Burr, flaw, torsion	Correct with oil stone or replace.
Snap ring	Wear, flaw, distortion	Replace.
	No interference	Replace.
Thread	Burr	Replace.
	Damage	Replace.
Spring	Settling, sign of burning	Replace.
Friction plate	Wear, burning, distortion, damaged claw	Replace.
Separator plate, retaining plate	Wear, burning, distortion, damaged claw	Replace.
Sealing surface (where lip contacts)	Flaw, rough surface, stepped wear, foreign material	Replace.

General Description

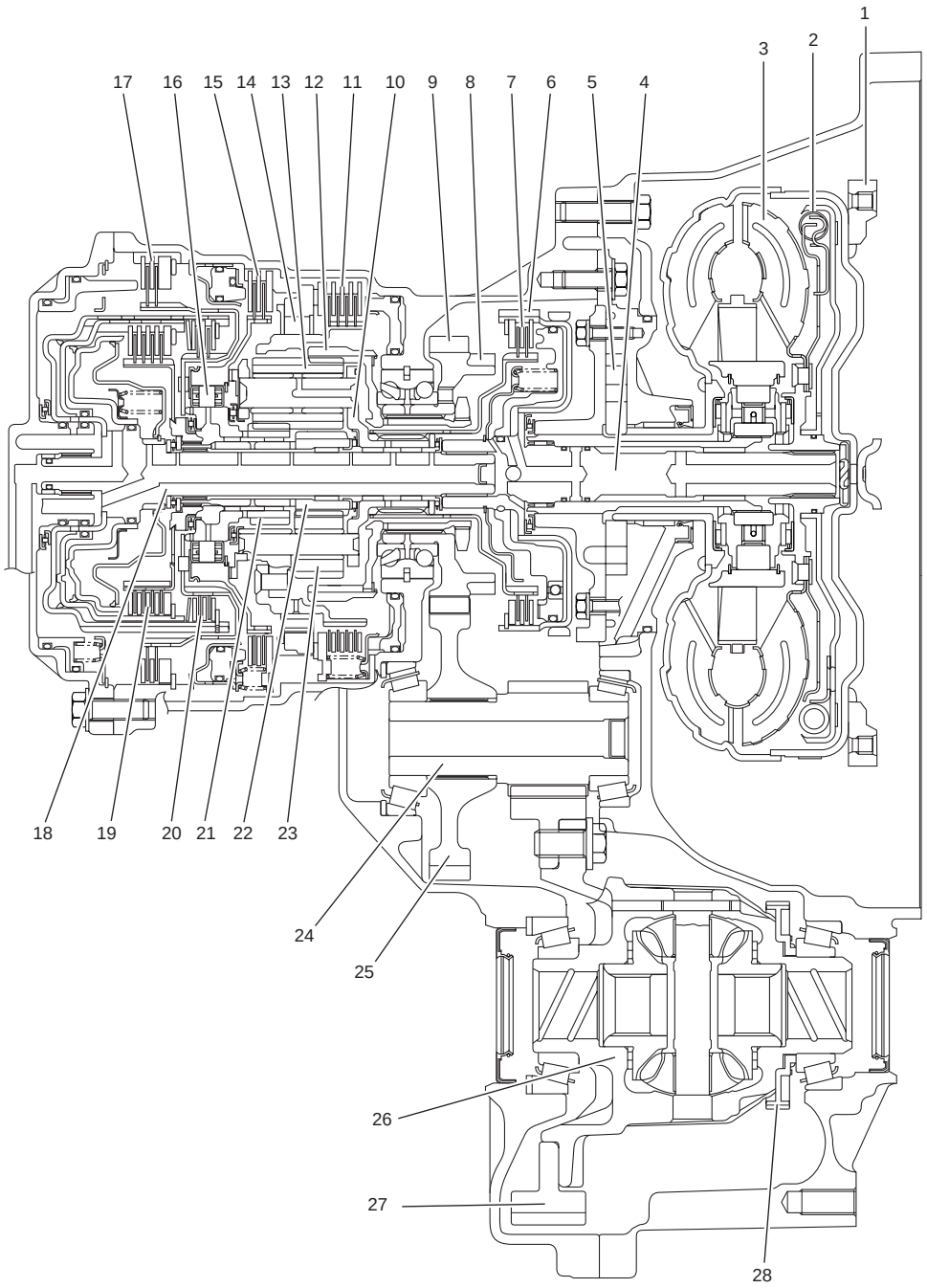
A/T Description

S4RS0A5101001

This automatic transaxle is electronic control full automatic transaxle with forward 3-speed plus overdrive (O/D) and reverse 1-speed.
The torque converter is a 3-element, 1-step and 2-phase type and is equipped with an automatically controlled lock-up mechanism.
The gear change device consists of a ravigneau type planetary gear unit, 3 multiple disc type clutches, 3 multiple disc type brakes and 2 one-way clutches.
The hydraulic pressure control device consists of a valve body assembly, pressure control solenoid valve (linear solenoid), 2 shift solenoid valves, TCC pressure control solenoid valve (linear solenoid) and a timing solenoid valve.
Optimum line pressure complying with engine torque is produced by the pressure control solenoid valve in dependence upon control signal from transmission control module (TCM). This makes it possible to control the line pressure with high accuracy in accordance with the engine power and running conditions to achieve smooth shifting characteristics and high efficiency.
A clutch-to-clutch control system is provided for shifting between 3rd gear and 4th gear. This clutch-to-clutch control system is made to function optimally, so that hydraulic pressure controls such as shown below are conducted.

- When upshifting from 3rd gear to 4th gear, to adjust the drain hydraulic pressure at releasing the forward clutch, a timing solenoid valve is used to switch a hydraulic passage with an orifice to another during shifting.
- When downshifting from 4th gear to 3rd gear, to adjust the line pressure applied to the forward clutch at engaging the forward clutch, a timing solenoid valve is used to switch a hydraulic passage with an orifice to another during shifting.
- When upshifting from 3rd gear to 4th gear with engine throttle opened, to optimize the line pressure applied to the forward clutch at releasing the forward clutch, the learning control is processed to compensate the switching timing of the timing solenoid at every shifting.
- When downshifting from 4th gear to 3rd gear with engine throttle opened, to optimize the line pressure applied to the forward clutch at engaging the forward clutch, the learning control is processed to compensate the line pressure at every shifting.

Employing the ravigneau type planetary gear unit and this clutch-to-clutch control system greatly simplifies the construction to make possible a lightweight and compact transaxle.
A line pressure learning control is conducted to provide optimum shifting time at every upshifting with engine throttle opened. If long upshifting time is detected, the subsequent line pressure applied during upshifting is intensified. On the contrary, if short upshifting time is detected, the subsequent line pressure applied during upshifting is weakened.
Slip controlled lock-up function
Even at a lower speed than when the TCC gets engaged completely, control over the TCC pressure control solenoid works to cause the TCC to slip (be engaged slightly), thereby improving the transmission efficiency. While such slip control is being executed, the oil pressure applied to the TCC is controlled by the TCC pressure control solenoid so that the difference between the engine speed and the input shaft speed becomes close to the specified value.
Also, during deceleration, the TCC is made to slip (be engaged slightly) to raise the engine speed and enlarge the fuel cut operation range so that better fuel consumption is achieved.
Due to this reason, it is absolutely necessary for the automatic transmission to use ATF suitable for slip control. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.



I3RM0B510001-

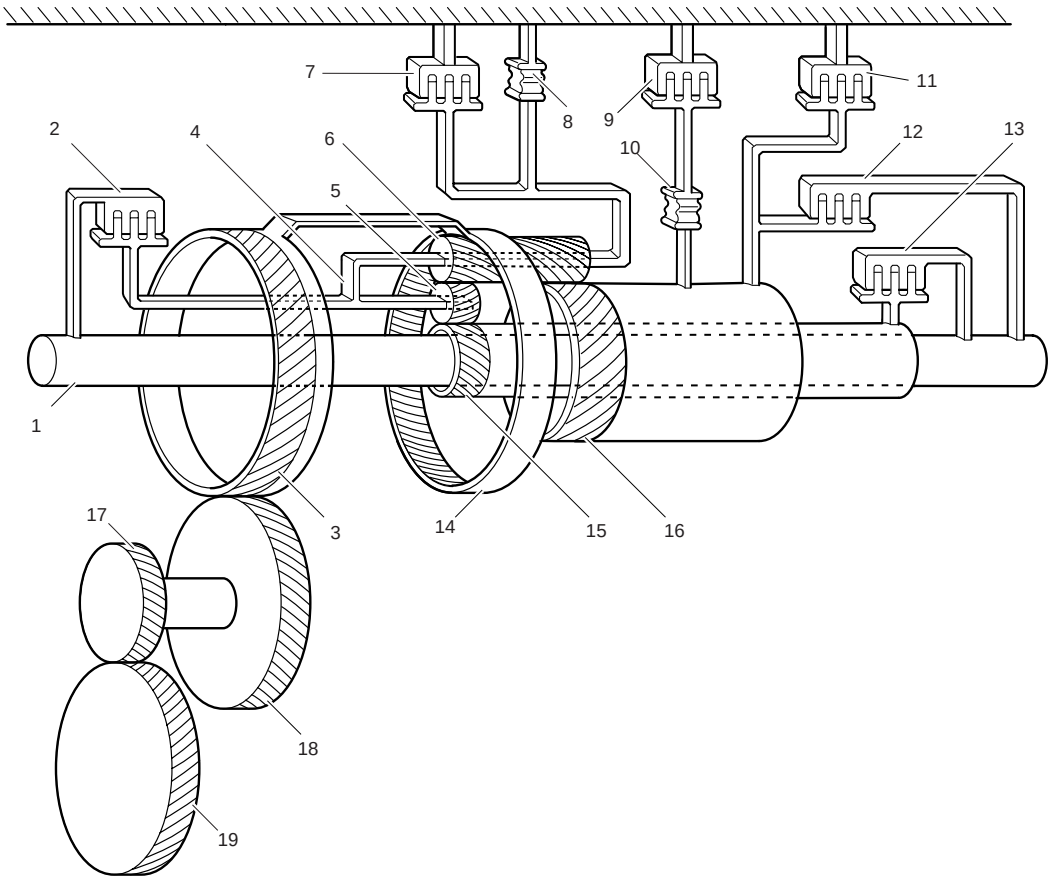
1. Drive plate	11. 1st and reverse brake	21. Rear sun gear
2. Torque converter clutch (TCC)	12. Ring gear	22. Front sun gear
3. Torque converter	13. Long planet pinion	23. Short planet pinion
4. Input shaft	14. One-way No.2 clutch	24. Countershaft
5. Oil pump	15. 2nd brake	25. Reduction driven gear
6. Direct clutch drum (double as sensor rotor for input shaft speed sensor)	16. One-way No.1 clutch	26. Differential case assembly
7. Direct clutch	17. O/D and 2nd coast brake	27. Final gear
8. Parking lock gear	18. Intermediate shaft	28. Output shaft speed sensor (VSS) drive gear
9. Reduction drive gear	19. Forward clutch	
10. Planet carrier	20. Reverse clutch	

Specifications

Item			Specifications	
Torque converter	Type Stall torque ratio		3-element, 1-step, 2-phase type (with TCC (lock-up) mechanism) 1.9 – 2.1	
Oil pump	Type Drive system		Internal involute gear type oil pump (non crescent type) Engine driven	
Gear change device	Type		Forward 4-step, reverse 1-step planetary gear type	
	Shift position		“P” range	Gear in neutral, output shaft fixed, engine start
			“R” range	Reverse
			“N” range	Gear in neutral, engine start
			“D” range	Forward 1st ↔ 2nd ↔ 3rd ↔ 4th automatic gear change
			“3” range	Forward 1st ↔ 2nd ↔ 3rd ← 4th automatic gear change
			“2” range	Forward 1st ↔ 2nd ← 3rd automatic gear change
			“L” range	Forward 1st ← 2nd ← 3rd reduction, and fixed at 1st gear
	Gear ratio	1st	2.875	Number of teeth Front sun gear: 24 Rear sun gear: 30 Long planet pinion: 20 Short planet pinion: 19 Ring gear: 69
		2nd	1.568	
		3rd	1.000	
		4th (overdrive gear)	0.697	
		Reverse (reverse gear)	2.300	
	Control elements		Wet type multiple-disc clutch... 3 sets Wet type multiple-disc brake... 3 sets One-way clutch... 2 sets	
	Reduction gear ratio		1.023	
	Final gear reduction ratio		4.052	
Lubrication	Lubrication system		Force feed system by oil pump	
Cooling	Cooling system		Radiator assisted cooling (water-cooled)	
Fluid used			SUZUKI ATF 3317 or Mobil ATF 3309	

Clutch / Brake / Planetary Gear Function of Automatic Transaxle

S4RS0A5101002



I4RS0A510001-

1. Input shaft and intermediate shaft	8: One-way No.2 clutch	15. Front sun gear
2: Direct clutch	9: 2nd brake	16. Rear sun gear
3. Reduction drive gear	10: One-way No.1 clutch	17. Final drive gear
4. Planet carrier	11: O/D and 2nd coast brake	18. Reduction driven gear
5. Short planet pinion	12: Reverse clutch	19. Final driven gear
6. Long planet pinion	13: Forward clutch	
7: 1st and reverse brake	14. Ring gear	

Functions

Part name	Function
Forward clutch	Meshes intermediate shaft and front sun gear
Direct clutch	Meshes input shaft and planet carrier
Reverse clutch	Meshes intermediate shaft and rear sun gear
O/D and 2nd coast brake	Fixes rear sun gear
2nd brake	Fixes rear sun gear
1st and reverse brake	Fixes planet carrier
One-way No.1 clutch	Prevents rear sun gear from turning counterclockwise
One-way No.2 clutch	Prevents planet carrier from turning counterclockwise

Table of Component Operation

S4RS0A5101003

Selector position	Gear position	Part					
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No.2)	TCC solenoid valve	Forward clutch	Direct clutch	Reverse clutch
P	Parking	○	○	×	×	×	×
R	Reverse	○	○	×	×	×	○
N	Neutral	○	○	×	×	×	×

Selector position	Gear position	Part					
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No.2)	TCC solenoid valve	Forward clutch	Direct clutch	Reverse clutch
D	1st	○	○	×	○	×	×
	2nd	○	×	×	○	×	×
	3rd	×	×	△	○	○	×
	4th	×	○	△	×	○	×
2	1st	○	○	×	○	×	×
	2nd	○	×	×	○	×	×
L	1st	○	○	×	○	×	×

Selector position	Gear position	Part				
		O/D and 2nd coast brake	2nd brake	1st and reverse brake	One-way No.1 clutch	One-way No.2 clutch
P	Parking	×	×	×	×	×
R	Reverse	×	×	○	×	×
N	Neutral	×	×	×	×	×
D	1st	×	×	×	×	○
	2nd	×	○	×	○	×
	3rd	×	○	×	×	×
	4th	○	○	×	×	×
2	1st	×	×	×	×	○
	2nd	○	○	×	○	×
L	1st	×	×	○	×	○

○: ON
×: OFF
△: ON only when TCC is operating

A/T Diagnosis General Description

S4RS0A5101005

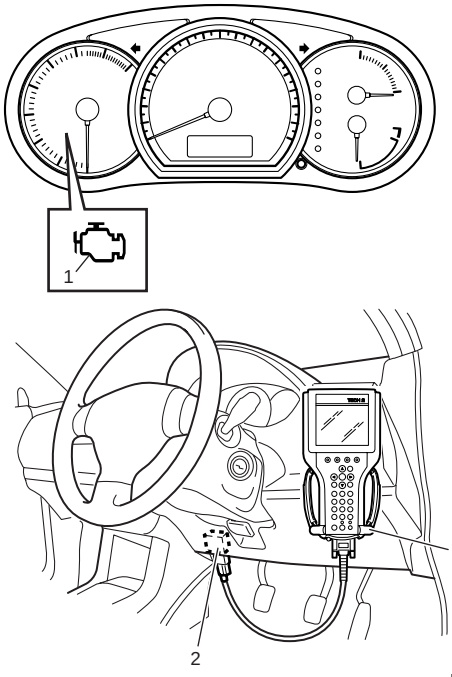
This vehicle is equipped with an electronic transaxle control system, which controls the automatic shift up and shift down timing, TCC operation, etc. suitably to vehicle driving conditions.
TCM has an On-Board Diagnosis System which detects a malfunction in this system.
When diagnosing a trouble in transaxle including this system, be sure to have full understanding of the outline of “On-Board Diagnostic System Description: ” and each item in “Precautions in Diagnosing Trouble: ” and execute diagnosis according to “A/T System Check: ” to obtain correct result smoothly.

On-Board Diagnostic System Description

S4RS0A5101006

For automatic transaxle control system, TCM has the following functions.

- When TCM detects a malfunction in A/T control system, TCM desire turning on malfunction indicator lamp (MIL) (1) and stores malfunction DTC in TCM memory.
- It is possible to communicate with TCM through data link connector (DLC) (2) by using scan tool (3). (Diagnostic information can be checked and erased by using scan tool.)



I4RS0A510002-

Warm-Up Cycle

A warm-up cycle means sufficient vehicle operation such that the coolant temperature has risen by at least 22 °C (40 °F) from engine starting and reaches a minimum temperature of 70 °C (160 °F).

Driving Cycle
A “Driving Cycle” consists of engine startup, driving mode where a malfunction would be detected if present, and engine shutoff.

2 Driving Cycles Detection Logic
The malfunction detected in the first driving cycle is stored in TCM memory (in the form of pending DTC and freeze frame data) but the malfunction indicator lamp (MIL) does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

Pending DTC
Pending DTC means a DTC detected and stored temporarily at 1 driving cycle of the DTC which is detected in the 2 driving cycle detection logic.

CAN Communication System Description

S4RS0A5101007

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a functionality to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. Communication of ECM, TCM, BCM and combination meter, is established by CAN. But, in communication between TCM and combination meter, data is transmitted only from TCM to combination meter. (Combination meter does not transmit data to TCM.) TCM transmission data is as follows.

TCM Transmission Data

				ECM	BCM	Combination Meter
TCM	Transmit	DATA	Torque down igintion delay request	○		
			Coast slip control signal	○		
			Vehicle speed pulse	○		
			TCM data validity	○		
			Transmission emissions related malfunction active			○
			Transmission gear selector position	○	○	○
			Transmission actual gear	○		

I4RS0A510003-

TCM Reception Data

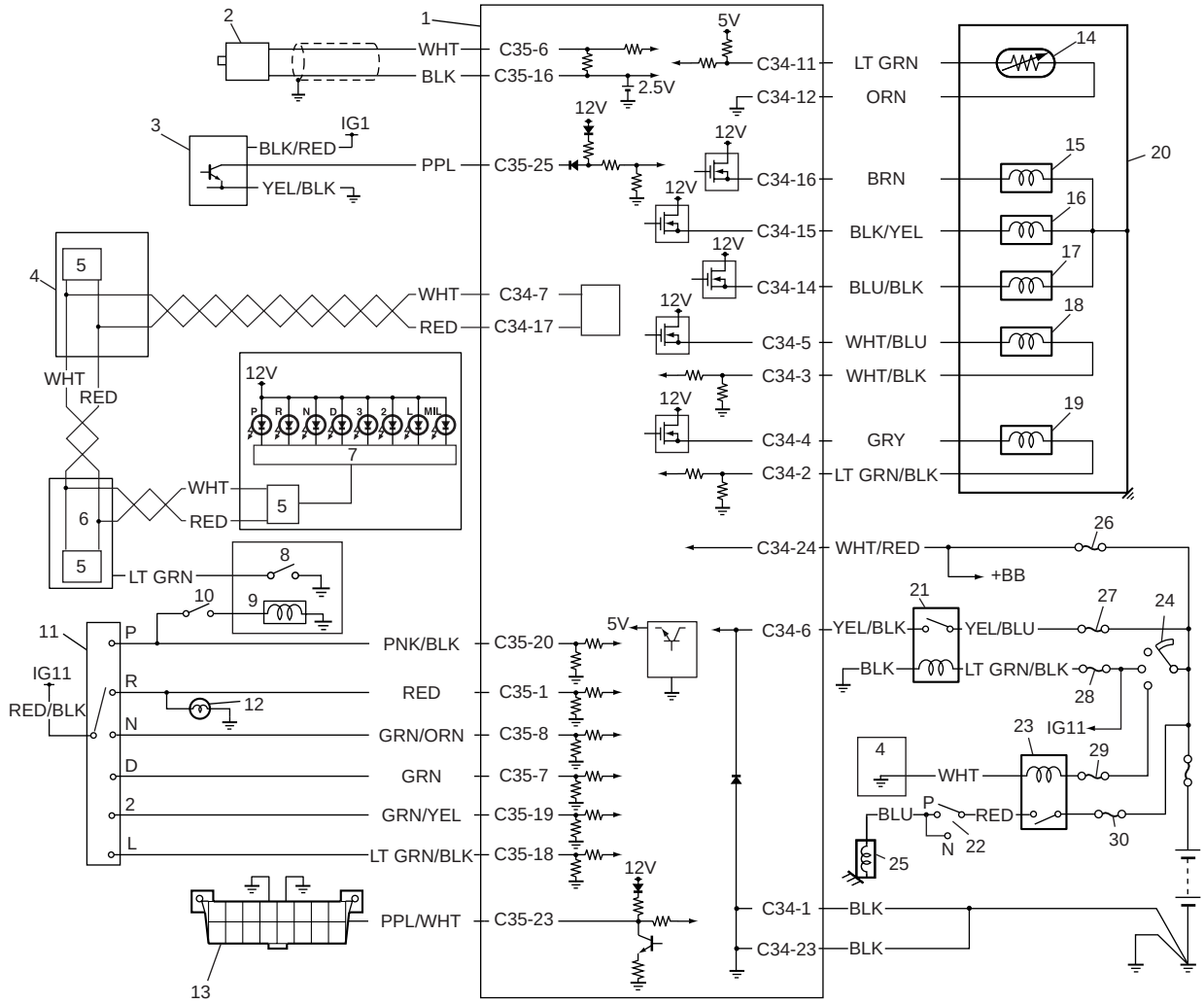
				ECM	BCM
TCM	Receive	DATA	Engine torque driver request	○	
			Engine speed	○	
			4th gear inhibit	○	
			Torque converter clutch control inhibit	○	
			Lock up/ slip control inhibit signal	○	
			Throttle position	○	
			Engine coolant temperature	○	
			Brake pedal switch active	○	
			"3" position switch active		○
			Stand by to engage air conditioning compressor clutch	○	

I4RS0A510004-

Schematic and Routing Diagram

Transmission Control Module (TCM) Wiring Diagram

S4RS0A5102001



I4RS0A510005-

1. TCM	12. Backup lamp	23. Starter motor relay
2. Input shaft speed sensor	13. Data link connector DLC	24. Ignition switch
3. Output shaft speed sensor / VSS	14. Transmission fluid temperature sensor	25. Starter motor
4. ECM	15. Shift solenoid valve-A (No.1)	26. “DOME” fuse
5. CAN driver	16. Shift solenoid valve-B (No.2)	27. “AT ETM” fuse
6. BCM	17. Timing solenoid valve	28. “IG SIG” fuse
7. Meter driver	18. TCC lock-up pressure control solenoid valve	29. “ST SIG” fuse
8. “3” position switch	19. Pressure control solenoid valve	30. “ST MOT” fuse
9. Shift lock solenoid	20. A/T	[A]: Terminal arrangement of TCM connector (viewed from harness side)
10. Brake light switch	21. AT relay	
11. Transmission range sensor	22. Inhibitor switch (including transmission range sensor)	

Operation of Shift Solenoid Valves, Timing Solenoid Valve and TCC Solenoid Valve

Selector position	Gear position	Solenoid				Condition
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No. 2)	Timing solenoid valve	TCC solenoid valve	
P	Parking	○	○	×	×	
R	Reverse	○	○	×	×	When vehicle is traveling forwards in less than 9 km/h, 6 mile/h vehicle speed
		○	○	○	×	When vehicle is traveling forwards in 9 km/h, 6 mile/h or more vehicle speed
	(Reverse)	×	×	×	×	When fail-safe function is operating
N	Neutral	○	○	×	×	
D	Neutral → 1st	—	—	○	—	Timing solenoid is turned ON for about 0.5 sec. while on gear shifting
	1st	○	○	×	×	
	2nd	○	×	×	×	
	3rd	×	×	×	△	
	3rd ↔ 4th	—	—	○	—	Timing solenoid is turned ON for about 0.5 sec. while on gear shifting
	4th	×	○	×	△	
	(3rd)	×	×	×	×	When fail-safe function is operating
2	1st	○	○	×	×	
	2nd	○	×	×	×	
	(3rd)	×	×	×	×	When fail-safe function is operating
L	1st	○	○	×	×	
	(3rd)	×	×	×	×	When fail-safe function is operating

○: ON (Turn power ON)
×: OFF (Turn power OFF)
△: ON only when TCC is operating

	Valve status	
	Turn power ON	Turn power OFF
Shift solenoid valve-A (No.1)	Close	Open
Shift solenoid valve-B (No.2)	Close	Open
Timing solenoid	Open	Close
TCC (lock-up) pressure control solenoid	Close	Open

Automatic Gear Shift Table

S4RS0A5102002

Automatic gear shift schedule is shown in the following table. Test-drive the vehicle on a flat road in the D position.

1.Shift Point in D, 3 and/or 2 position

	Throttle opening (%)	Shift	Vehicle speed km/h (mph)	Remark
UP shift	Over 85%	1st → 2nd	47 – 52 (29 – 32)	
		2nd → 3rd	95 – 100 (59 – 62)	
		3rd → 4th	152 – 157 (94 – 98)	
	50%	1st → 2nd	15 – 20 (9 – 12)	
		2nd → 3rd	46 – 51 (29 – 32)	
		3rd → 4th	80 – 85 (50 – 53)	
	10%	1st → 2nd	10 – 15 (6 – 9)	
		2nd → 3rd	29 – 34 (18 – 21)	
		3rd → 4th	43 – 48 (27 – 30)	
DOWN shift	Over 90%	4th → 3rd	137 – 142 (85 – 88)	
		3rd → 2nd	76 – 81 (47 – 50)	
		2nd → 1st	33 – 38 (21 – 24)	
	50%	4th → 3rd	64 – 69 (40 – 43)	
		3rd → 2nd	31 – 36 (19 – 22)	
		2nd → 1st	8 – 13 (5 – 8)	
	0%	4th → 3rd	28 – 33 (17 – 21)	
		3rd → 2nd	17 – 22 (11 – 14)	
		2nd → 1st	8 – 13 (5 – 8)	

2. Lock-up point in D and/or 3 position

	Lock-up clutch status	Throttle opening (%)	Vehicle speed km/h (mph)	Remark
3rd gear lock-up	ON	Over 80%	152 – 157 (94 – 98)	
		50%	80 – 85 (50 – 53)	
	OFF	Over 90%	108 – 113 (67 – 70)	
		50%	55 – 60 (34 – 37)	
4th gear lock-up	ON	Over 80%	255 (158)	Except throttle opening shift from low to high at vehicle speed 148 km/h (92 mph) or more with Lock-up ON condition.
		55%	152 – 157 (94 – 98)	
	OFF	Over 80%	146 – 151 (91 – 94)	
		55%	96 – 101 (60 – 63)	

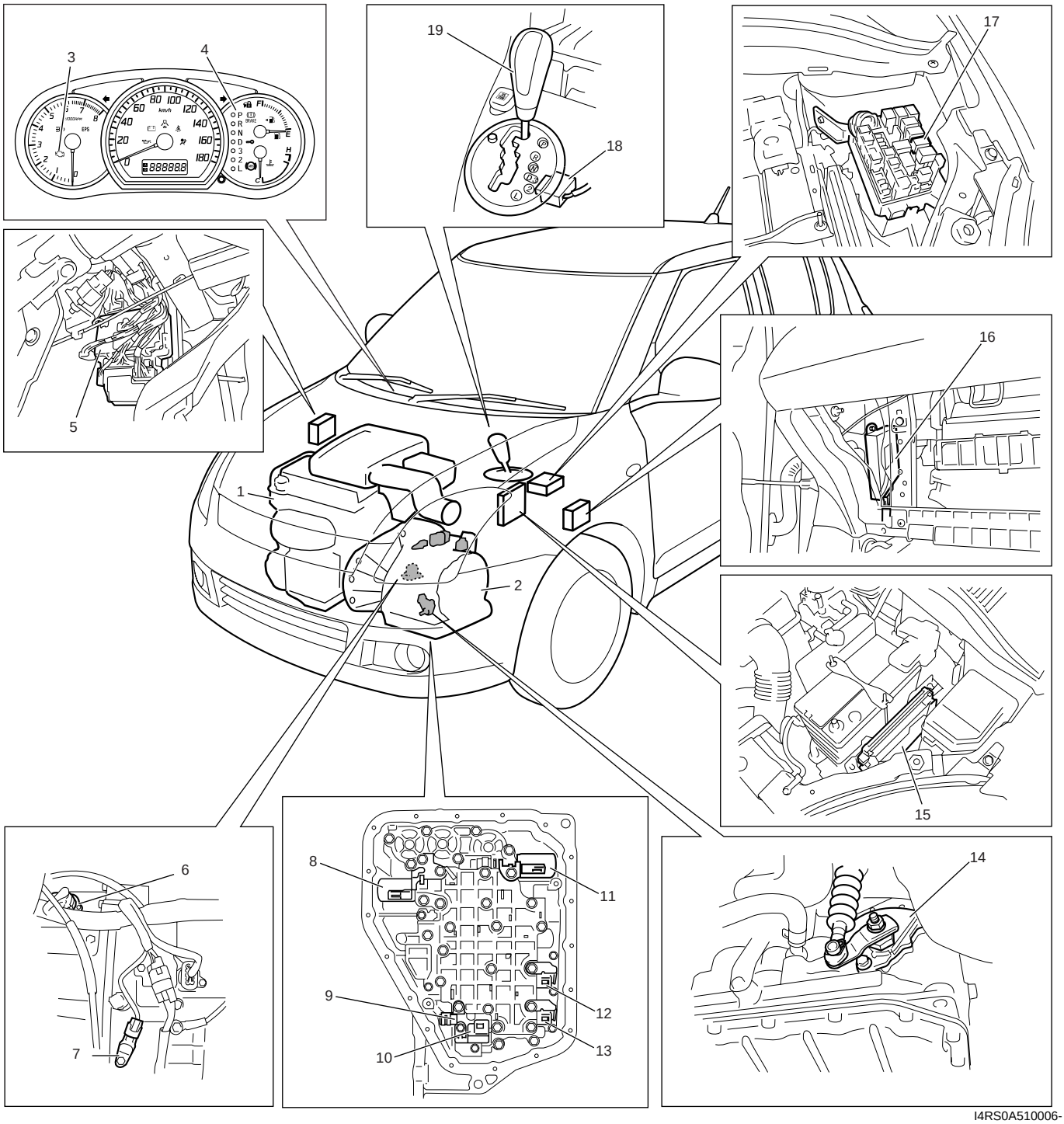
3. Slip lock-up point in D and/or 3 position

	Slip Lock-up clutch status	Throttle opening (%)	Vehicle speed km/h (mph)	Remark
3rd gear	Slip ON	15 – 20%	32 – 37 (20 – 23)	Without lock-up condition
	Slip OFF	15 – 20%	30 – 35 (19 – 22)	
4th gear	Slip ON	15 – 20%	46 – 51 (29 – 32)	Without lock-up condition
	Slip OFF	15 – 20%	43 – 48 (27 – 30)	

Component Location

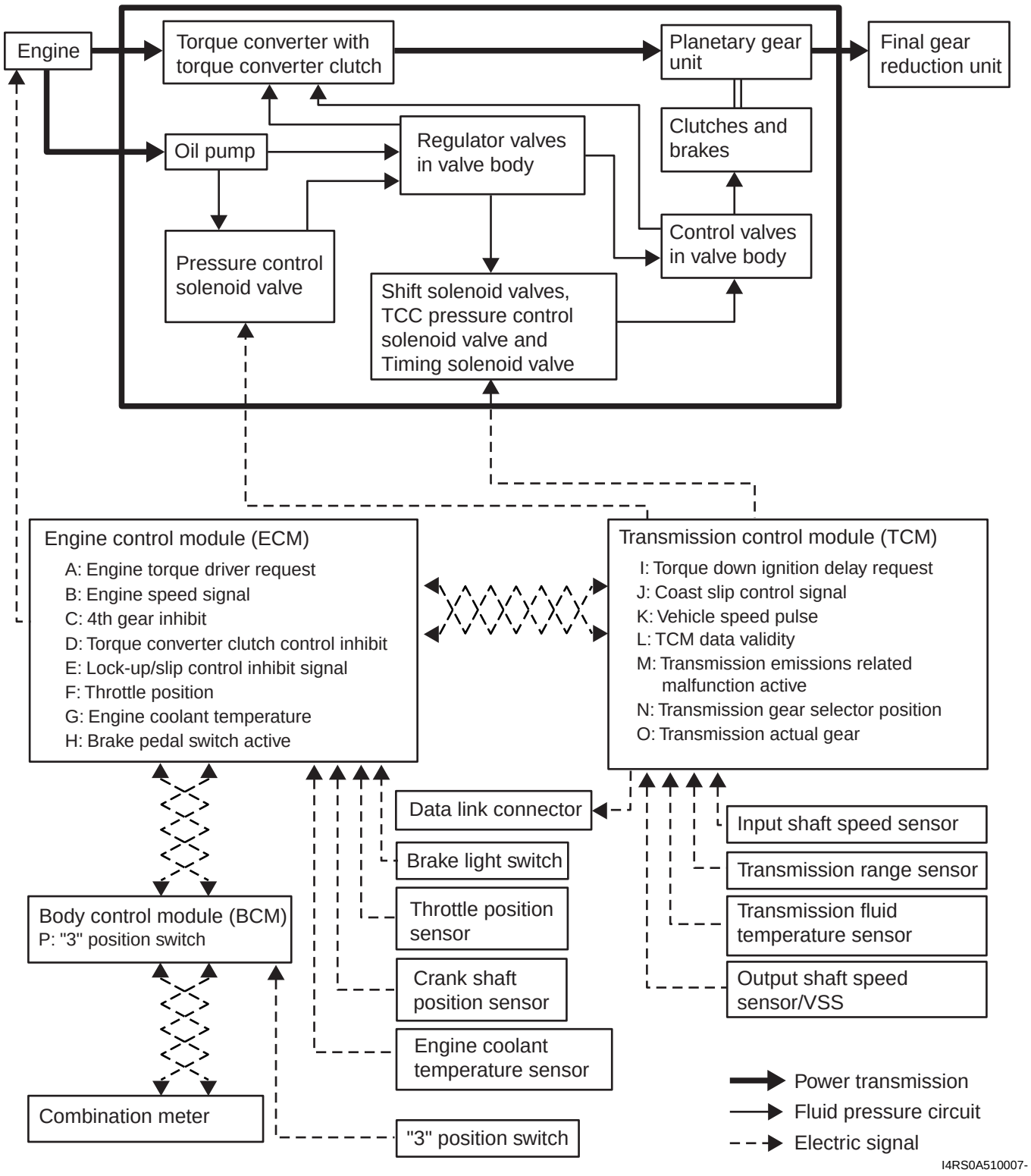
Electronic Shift Control System Components Location

S4RS0A5103001



I4RS0A510006-

1. Engine	8. TCC pressure control solenoid valve	15. ECM
2. Transaxle	9. Transmission fluid temperature sensor	16. TCM
3. MIL	10. Timing solenoid valve	17. AT relay
4. Shift position indicator lamp	11. Pressure control solenoid valve	18. “3” position switch
5. Junction block assembly (included in BCM)	12. Shift solenoid valve-B (No.2)	19. Select lever
6. Output shaft speed sensor (VSS)	13. Shift solenoid valve-A (No.1)	
7. Input shaft speed sensor	14. Transmission range sensor	


Engine
Torque converter with torque converter clutch
Planetary gear unit
Final gear reduction unit
Oil pump
Regulator valves in valve body
Clutches and brakes
Pressure control solenoid valve
Control valves in valve body
Shift solenoid valves, TCC pressure control solenoid valve and Timing solenoid valve
Engine control module (ECM)
A: Engine torque driver request
B: Engine speed signal
C: 4th gear inhibit
D: Torque converter clutch control inhibit
E: Lock-up/slip control inhibit signal
F: Throttle position
G: Engine coolant temperature
H: Brake pedal switch active
Transmission control module (TCM)
I: Torque down ignition delay request
J: Coast slip control signal
K: Vehicle speed pulse
L: TCM data validity
M: Transmission emissions related malfunction active
N: Transmission gear selector position
O: Transmission actual gear
Data link connector
Brake light switch
Throttle position sensor
Crank shaft position sensor
Engine coolant temperature sensor
Input shaft speed sensor
Transmission range sensor
Transmission fluid temperature sensor
Output shaft speed sensor/VSS
Body control module (BCM)
P: "3" position switch
Combination meter
"3" position switch
Power transmission
Fluid pressure circuit
Electric signal
I4RS0A510007-

Diagnostic Information and Procedures

A/T System Check

S4RS0A5104001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	☞ **DTC / freeze frame data check, record and clearance** 1) Check for DTC. *Is there any DTC(s)?*	Print DTC or write them down and clear them by referring to “DTC Clearance: ”. Go to Step 3.	Go to Step 4.
3	☞ **Visual inspection** 1) Perform visual inspection. *Is there any faulty condition?*	Repair or replace malfunction part. Go to Step 11.	Go to Step 5.
4	☞ **Visual inspection** 1) Perform visual inspection. *Is there any faulty condition?*	Repair or replace malfunction part. Go to Step 11.	Go to Step 8.
5	☞ **Trouble symptom confirmation** 1) Confirm trouble symptom. *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	☞ **Rechecking and record of DTC / freeze frame data** 1) Recheck for DTC referring to “DTC Check: ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 8.
7	☞ **Rechecking and record of DTC / freeze frame data** 1) Recheck for DTC referring to “DTC Check: ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	☞ **A/T basic check and A/T symptom diagnosis** 1) Check and repair according to “A/T Basic Check: ” and “A/T Symptom Diagnosis: ”. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
9	☞ **Troubleshooting for DTC** 1) Check and repair according to applicable DTC flow. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
10	☞ **Check for intermittent problems** 1) Check for intermittent problems. *Is there any faulty condition?*	Repair or replace malfunction part(s). Go to Step 11.	Go to Step 11.
11	☞ **Final confirmation test** 1) Clear DTC if any. 2) Perform final confirmation test. *Is there any problem symptom, DTC or abnormal condition?*	Go to Step 6.	End.

Step 1. Customer Complaint Analysis

Record details of the problem such as failure, complaint and how it occurred as described by the customer.
For this purpose, use of such an inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date of Reg.:	Date of problem:	Mileage:

PROBLEM SYMPTOMS
☐ Vehicle does not move (R, D, 2, L or any range)
☐ No upshift automatically (☐ 1st to 2nd ☐ 2nd to 3rd ☐ 3rd to 4th (O/D) ☐ 2 range ☐ D range)
☐ No downshift automatically (☐ 3rd to 2nd ☐ 2nd to 1st ☐ 4th (O/D) to 3rd ☐ 2 range ☐ D range)
☐ No gear change manually (☐ 1st ↔ 3rd ☐ 3rd ↔ 4th)
☐ TCC no lock-up ☐ TCC no lock-up off
☐ Automatic shift point too high or too low
☐ Excessive gear change shock (1st/2nd/3rd/4th (O/D)/Reverse)
☐ No kickdown
☐ Transmission slipping in (1st/2nd/3rd/4th (O/D)/Reverse)
☐ Others _____

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather Temperature Frequency Read	☐ Fair ☐ Cloudy ☐ Rain ☐ Always ☐ Other _____ (°F/ °C) ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ always ☐ Always ☐ Sometimes (times/ day, month) ☐ Only once ☐ Under certain condition ☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous ☐ Uphill ☐ Downhill ☐ Tarmacadam ☐ Gravel ☐ Other _____
Vehicle Condition	
Engine & transmission condition	☐ Cold/ ☐ Warming up phase/ ☐ Warmed up Engine speed (r/min.) Throttle opening (☐ Idle/ ☐ About % ☐ full) O/D cut switch (☐ ON/ ☐ OFF)
Vehicle condition	☐ At stop/ ☐ During driving (☐ Constant speed ☐ Accelerating ☐ Decelerating ☐ Braking) ☐ Right hand corner ☐ Left hand corner ☐ Vehicle speed (km/h mile/h) ☐ Other _____

"O/D OFF" lamp	☐ Blink ☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Malfunction indicator lamp	☐ Blink ☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Diagnostic trouble code	First check: ☐ No code ☐ Malfunction code ( )
	Second check: ☐ No code ☐ Malfunction code ( )

I2RH01510008-

NOTE:

The form is a standard sample. It should be modified according to conditions characteristic of each market.

Step 2. DTC / Freeze Frame Data Check, Record and Clearance
First, referring to “DTC Check: ”, check DTC and pending DTC. If DTC exists, print or write down DTC and freeze frame data and then clear malfunction DTC(s) by referring to “DTC Clearance: ”. Malfunction DTC indicates malfunction in the system but it is not possible to know from it whether the malfunction is occurring now or it occurred in the past and normal condition has been restored. In order to know that, check symptom in question according to Step 5 and then recheck DTC according to Step 6.
Diagnosing a trouble based on the DTC in this step only or failure to clear the DTC in this step may result in an faulty diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting which is otherwise unnecessary.

Step 3 and 4. Visual Inspection
As a preliminary step, be sure to perform visual check of the items that support proper function of the engine and automatic transaxle referring to “Visual Inspection: ”.

Step 5. Trouble Symptom Confirmation
Check trouble symptoms based on information obtained in “Step 1. Customer Complaint Analysis: ” and “Step 2. DTC / Freeze Frame Data Check, Record and Clearance: ”.
Also, reconfirm DTC according to “DTC Confirmation Procedure” described in each DTC flow.

Step 6 and 7. Rechecking and Record of DTC and Freeze Frame Data
Refer to “DTC Check: ” for checking procedure.

Step 8. A/T Basic Check and A/T Symptom Diagnosis
Perform basic check of A/T according to “A/T Basic Check: ” first. When the end of the flow has been reached, check the parts of the system suspected as a possible cause referring to “A/T Symptom Diagnosis: ” and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or A/T basic check) and repair or replace faulty parts, if any.

Step 9. Troubleshooting for DTC
Based on the DTC indicated in Step 6 / 7 and referring to “applicable DTC flow”, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, TCM or other part and repair or replace faulty parts.

Step 10. Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g. wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection: in Section 00” and related circuit of DTC recorded in Step 2.

Step 11. Final Confirmation Test
Confirm that the problem symptom has gone and the vehicle is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once and check to ensure that no malfunction DTC is indicated.

Visual Inspection

S4RS0A5104002

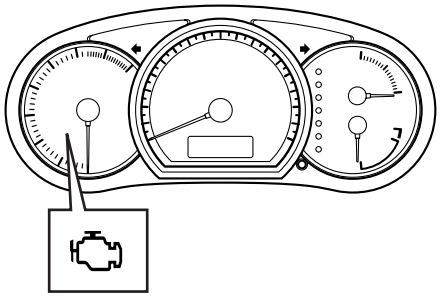
Visually check the following parts and systems.

Inspection item	Referring
• A/T fluid ----- level, leakage, color	"Automatic Transaxle Fluid Level Inspection: in Section 0B"
• A/T fluid hoses ----- disconnection, looseness, deterioration	"A/T Fluid Cooler Hoses Replacement: "
• Throttle cable ----- play (under warm engine), installation	"Accelerator Cable Adjustment: in Section 1D"
• A/T select cable ----- installation	"Select Cable Removal and Installation: "
• Engine oil ----- level, leakage	"Engine Oil and Filter Change: in Section 0B"
• Engine coolant ----- level, leakage	"Engine Coolant Change: in Section 0B"
• Engine mountings ----- play, looseness, damage	"Engine Assembly Removal and Installation: in Section 1D"
• Suspension ----- play, looseness	"Suspension, Wheels and Tires Symptom Diagnosis: in Section 2A"
• Drive shafts ----- damage	"Front Drive Shaft Assembly On-Vehicle Inspection: in Section 3A"
• Battery ----- indicator condition, corrosion of terminal	"Battery Inspection: in Section 1J"
• Connectors of electric wire harness ----- disconnection, friction	"Electronic Shift Control System Components Location: "
• Fuses ----- burning	
• Parts ----- installation, damage	
• Bolts ----- looseness	
• Other parts that can be checked visually	
Also check the following items at engine start, if possible.	
• Malfunction indicator lamp ----- Operation	"Malfunction Indicator Lamp (MIL) Check: "
• Charge warning lamp ----- Operation	"Generator Symptom Diagnosis: in Section 1J"
• Engine oil pressure warning lamp ----- Operation	"Oil Pressure Warning Light Symptom Diagnosis: in Section 9C"
• Engine coolant temp. meter ----- Operation	"Engine Coolant Temperature (ECT) Meter Symptom Diagnosis: in Section 9C"
• Other parts that can be checked visually	

Malfunction Indicator Lamp (MIL) Check

S4RS0A5104003

Refer to the same item in "Malfunction Indicator Lamp (MIL) Check: in Section 1A" for checking procedure.



I4RS0A510008-

DTC Table

S4RS0A5104005

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when MIL lighted
☞ P0705	Transmission range sensor circuit malfunction (PRNDL input)	Multiple signals are inputted simultaneously.	1 driving cycle
☞ P0707	Transmission range sensor circuit low	No sensor signal is inputted.	2 driving cycles
☞ P0712	Transmission fluid temperature sensor circuit low	Sensor output voltage is too low.	1 driving cycle
☞ P0713	Transmission fluid temperature sensor circuit high	Sensor output voltage is too high.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when MIL lighted
☞ P0717	Input / Turbine speed sensor circuit no signal	No sensor signal is detected although output speed sensor signal is inputted.	1 driving cycle
☞ P0722	Output speed sensor circuit no signal	No sensor signal is inputted although input speed sensor signal is inputted.	1 driving cycle
☞ P0741	Torque converter clutch circuit performance or stuck off	Difference in revolution between engine and input shaft is too large although TCM is commanding TCC solenoid to turn ON.	2 driving cycles
☞ P0742	Torque converter clutch circuit stuck on	Difference in revolution between engine and input shaft is too small although TCM is commanding TCC solenoid to turn OFF.	2 driving cycles
☞ P0751	Shift solenoid-A (No.1) performance or stuck off	Actual gear position is 3rd gear although TCM command is for 2nd gear.	2 driving cycles
☞ P0752	Shift solenoid-A (No.1) stuck on	Actual gear position is 2nd gear although TCM command is for 3rd gear.	2 driving cycles
☞ P0756	Shift solenoid-B (No.2) performance or stuck off	Actual gear position is 3rd gear although TCM command is for 4th gear.	2 driving cycles
☞ P0757	Shift solenoid-B (No.2) stuck on	Actual gear position is 4th gear although TCM command is for 3rd gear.	2 driving cycles
☞ P0787	Shift / Timing solenoid control circuit low	Voltage of timing solenoid terminal is low although TCM is commanding timing solenoid to turn ON.	1 driving cycle
☞ P0788	Shift / Timing solenoid control circuit high	Voltage of timing solenoid terminal is high although TCM is commanding timing solenoid to turn OFF.	1 driving cycle
☞ P0962	Pressure control solenoid control circuit low	No electric flow is detected on pressure control solenoid circuit.	1 driving cycle
☞ P0963	Pressure control solenoid control circuit high	Too much electric flow is detected on pressure control solenoid circuit.	1 driving cycle
☞ P0973	Shift solenoid-A (No.1) control circuit low	Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON.	1 driving cycle
☞ P0974	Shift solenoid-A (No.1) control circuit high	Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF.	1 driving cycle
☞ P0976	Shift solenoid-B (No.2) control circuit low	Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON.	1 driving cycle
☞ P0977	Shift solenoid-B (No.2) control circuit high	Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF.	1 driving cycle
☞ P1702	Internal control module memory check sum error	Calculation of current data stored in TCM is not correct comparing with pre-stored checking data in TCM.	1 driving cycle
☞ P1703	CAN invalid data - from other ECU(s)	TCM receives malfunction signal of throttle position, engine coolant temperature, engine revolution and engine torque from ECM.	*1
☞ P1723	Range select switch malfunction	“3” position switch ON signal is inputed although transmission range switch signal is inputed P, R, N or L. range.	*1
☞ P1774	Control module communication bus off	Transmitting and receiving error detected to TCM for specified time continuously.	1 driving cycle
☞ P1775	High speed can communication bus (Transmission error)	Transmitting error detected to TCM for specified time continuously.	1 driving cycle
☞ P1777	TCM lost communication with ECM (Reception error)	Receiving error from ECM detected to TCM for specified time continuously.	1 driving cycle
☞ P1778	TCM lost communication with BCM (Reception error)	Receiving error from BCM detected to TCM for specified time continuously.	*1
☞ P1878	Torque converter clutch shudder	Variation in the output revolution speed of the specified amplitude and specified cycle is detected under slip lock-up condition.	*1

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when MIL lighted
☞ P2763	Torque converter clutch pressure control solenoid control circuit high	Too much electric flow is detected on TCC solenoid circuit.	1 driving cycle
☞ P2764	Torque converter clutch pressure control solenoid control circuit low	No electric flow is detected on TCC solenoid circuit.	1 driving cycle

NOTE:

***1: TCM does not desire turning on malfunction indicator lamp to ECM but DTC is stored in TCM memory. This item can not be read generic scan tool.**

DTC Check

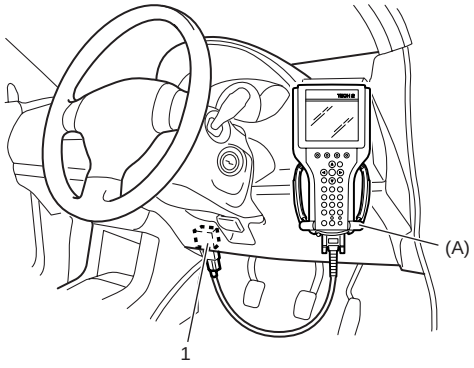
S4RS0A5104006

NOTE:

The MIL is turned on when the ECM and/or TCM detect malfunction(s). Each control module stores diagnostic information as the diagnostic trouble code (DTC) in its memory and outputs the DTC to the scan tool. Therefore, check both of the control modules for any DTC with the scan tool because the DTC stored in ECM and TCM is not read and displayed at a time. However, each of the control modules needs not to be checked with the generic scan tool because the DTC stored in ECM and TCM is read and displayed at a time. In case using generic scan tool, refer to "DTC Table: in Section 1A".

1) Turn ignition switch to OFF position.
2) Connect scan tool to data link connector (DLC) (1).

Special tool
(A): SUZUKI scan tool



I4RS0A510009-

3) Turn ignition switch ON.
4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print it down. Refer to scan tool operator's manual for further details.
   If communication between scan tool and TCM is not possible, check if scan tool is communicable by connecting it to TCM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector.

DTC Clearance

S4RS0A5104007

WARNING:

When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure.

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for "DTC Check: ".
2) Turn ignition switch ON.
3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector (DLC).

NOTE:

DTC and freeze frame data stored in TCM memory are also cleared in the following cases. Be careful not to clear them before keeping their record.

- **When power to TCM is cut off (by disconnecting battery cable, removing fuse or disconnecting TCM connectors).**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles.**

Fail-Safe Table

S4RS0A5104008

This function is provided by the safe mechanism that assures safe driveability even when the solenoid valve, sensor or its circuit fails. The following table shows the fail-safe function for each fail condition of sensor, solenoid or its circuit.

DTC No.	Trouble area	Fail-safe operation
☞ P0705	Transmission range sensor circuit malfunction (PRNDL input)	• Selected range is set in priority order shown below. D > 2 > L > R > N > P • Slip controlled lock-up function is inhibited to operate. • Learning control is inhibited.
☞ P0707	Transmission range sensor circuit low	• Selected range is assumed to be “D” range. • Slip controlled lock-up function is inhibited to operate. • Learning control is inhibited.
☞ P0712 ☞ P0713	Transmission fluid temperature sensor circuit low	• A/T fluid temperature is assumed to be 200 °C (392 °F). • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P0717	Input / Turbine speed sensor circuit no signal	• Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P0722	Output speed sensor circuit no signal	• Vehicle speed which is calculated by input shaft speed sensor signal is used for gear shifting control instead of vehicle speed calculated by output shaft speed sensor (VSS) signal. • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P0787	Shift / Timing solenoid Control Circuit Low	• Power supply for all solenoid valves is cut. • Gear position is fixed in 3rd gear. • Line pressure control at gear shifting is inhibited. • Look-up function is inhibited to operate.
☞ P0788	Shift / Timing solenoid Control Circuit High	
☞ P0962	Pressure control solenoid control circuit low	
☞ P0963	Pressure control solenoid control circuit high	
☞ P0973	Shift solenoid-A (No.1) control circuit low	
☞ P0974	Shift solenoid-A (No.1) control circuit high	
☞ P0976	Shift solenoid-B (No.2) control circuit low	
☞ P0977	Shift solenoid-B (No.2) control circuit high	
☞ P1702	Internal control module memory check sum error	• Power supply for all solenoid valves is cut. • Gear position is fixed in 3rd gear. • Line pressure control at gear shifting is inhibited. • Lock-up function is inhibited to operate.

DTC No.	Trouble area	Fail-safe operation
☞ P1703	CAN invalid data - TCM	In case of throttle position signal malfunction: • Throttle opening used for line pressure control is assumed to be 100%. • Throttle opening used for gear shifting control is assumed to be 0%. • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Garage shift control is inhibited. • Learning control is inhibited. In case of engine coolant temperature signal malfunction: • Slip controlled lock-up function is inhibited to operate. • After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be normal operating temperature, and controls of overdrive and lock-up is released from inhibition. In case of engine revolution signal malfunction: • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Garage shift control is inhibited. • Learning control is inhibited. In case of engine torque signal malfunction: • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Upshifting to 4th gear is inhibited. • Learning control is inhibited.
☞ P1723	Range select switch malfunction	“3” position switch is assumed to be OFF.
☞ P1774	Control module communication bus off	• Throttle opening used for line pressure control is assumed to be 100%. • Throttle opening used for gear shifting control is assumed to be 0%. • Engine revolution is assumed to be 0 RPM. • After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be 90 °C (194 °F). • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Upshifting to 4th gear is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.

DTC No.	Trouble area	Fail-safe operation
☞ P1777	TCM lost communication with ECM (Reception error)	• Throttle opening used for line pressure control is assumed to be 100%. • Throttle opening used for gear shifting control is assumed to be 0%. • Engine revolution is assumed to be 0 RPM. • After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be 90 °C (194 °F). • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Upshifting to 4th gear is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P1878	Torque converter clutch shudder	Slip controlled lock-up function is inhibited to operate.
☞ P2763	Torque converter clutch pressure control solenoid control circuit high	• Lock-up function is inhibited to operate. • Upshifting to 4th gear is inhibited when A/T fluid temperature is more than 150 °C (302 °F). • Vehicle speed is slower than 15 km/h (9 mile/h), gear position is fixed in 1st gear for prevention of engine stall.
☞ P2764	Torque converter clutch pressure control solenoid control circuit low	• Lock-up function is inhibited to operate. • Upshifting to 4th gear is inhibited when A/T fluid temperature is more than 150 °C (302 °F).

Scan Tool Data

S4RS0A5104009

As the data values given in the following table are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.
Also, condition in the following table that can be checked by the scan tool are those detected by TCM and output from TCM as commands and there may be cases where the automatic transaxle or actuator is not operating (in the condition) as indicated by the scan tool.

NOTE:

The following scan tool data related to automatic transaxle can be checked only by communicating with TCM.

Scan tool data	Vehicle condition		Normal condition / reference values
☞ GEAR POSITION	Ignition switch ON	Selector lever is in “P” position	P or N
		Selector lever is in “R” position	R
		Selector lever is in “N” position	P or N
		Selector lever is in “D” position	1
		Selector lever is in “3” position	1
		Selector lever is in “2” position	1
		Selector lever is in “L” position	1
☞ ENGINE SPEED	At engine idle speed		Engine idle speed is displayed
☞ INPUT SHAFT REVOLUTION	Ignition switch ON and engine stop		0 RPM
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear (“3” range)		2300 RPM (displayed in increments of 50 rpm)
☞ OUTPUT SHAFT REVOLUTION	At vehicle stop		0 RPM
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear (“3” range)		2300 RPM (displayed in increments of 50 rpm)
☞ BATTERY VOLTAGE	Ignition switch ON and engine stop		Battery voltage is displayed (8 – 16 V)

Scan tool data	Vehicle condition		Normal condition / reference values
☞ ATF TEMPERATURE	After driving at 60 km/h (37.5 mile/h) for 15 minutes or more, and A/T fluid temperature around sensor reaches 70 – 80 °C (158 – 176 °F)		70 – 80 °C (158 – 176 °F)
☞ SHIFT SOLENOID-A COMMAND	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, O/D off switch ON, 20% or less throttle opening and 3rd gear		OFF
☞ SHIFT SOLENOID-A MONITOR	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, O/D off switch ON, 20% or less throttle opening and 3rd gear		OFF
☞ SHIFT SOLENOID-B COMMAND	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, O/D off switch ON, 20% or less throttle opening and 3rd gear		OFF
☞ SHIFT SOLENOID-B MONITOR	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, O/D off switch ON, 20% or less throttle opening and 3rd gear		OFF
☞ TIMING SOLENOID COMMAND	Ignition switch ON and selector lever is in “N” range		OFF
	For about 0.5 sec. while on gear shifting between 3rd and 4th or gear shifting “N” to “D”		ON
☞ TIMING SOLENOID MONITOR	Ignition switch ON and selector lever is in “N” range		OFF
	For about 0.5 sec. while on gear shifting between 3rd and 4th or gear shifting “N” to “D”		ON
☞ TCC SOLENOID	At vehicle stop, closed throttle, engine idle speed and 1st gear		0%
☞ PRESSURE CONTROL SOLENOID	At vehicle stop, closed throttle, engine idle speed and 1st gear		0%
☞ VEHICLE SPEED	At vehicle stop		0 km/h, 0 MPH
☞ O/D OFF SWITCH	Ignition switch ON	Shift selector lever to “3” or “2” range	ON
		Shift selector lever to other above range	OFF
☞ TRANSAXLE RANGE	Ignition switch ON	Selector lever is in “P” position	P
		Selector lever is in “R” position	R
		Selector lever is in “N” position	N
		Selector lever is in “D” position	D
		Selector lever is in “3” position	D
		Selector lever is in “2” position	2
		Selector lever is in “L” position	L
☞ D RANGE SIGNAL	Ignition switch ON	Selector lever is in “P” position	OFF
		Selector lever is in “R” position	ON
		Selector lever is in “N” position	OFF
		Selector lever is in “D” position	ON
		Selector lever is in “3” position	ON
		Selector lever is in “2” position	ON
		Selector lever is in “L” position	ON
☞ THROTTLE POSITION	Ignition switch ON	Accelerator pedal is depressed	0 – 100% (Varies depending on depressed value)
		Accelerator pedal is released	0%
☞ BRAKE SWITCH	Ignition switch ON	Brake pedal is depressed	ON
		Brake pedal is released	OFF
☞ TORQUE REDUCTION SIGNAL	While on gear upshifting with 25% or more throttle opening		ON
	Under condition of not shifting gear		OFF
☞ ENGINE COOLANT TEMPERATURE	Ignition switch ON		Engine coolant temperature is displayed
☞ AIR CONDITIONER SIGNAL	Ignition switch ON and air conditioner switch OFF		OFF
☞ ENGINE TORQUE SIGNAL	Ignition switch ON and engine stop		0 N·m

Scan tool data	Vehicle condition	Normal condition / reference values
☞ SLIP RPM	Engine running at idle speed and selector lever is in “P” range	0 RPM
	Engine running, vehicle stop and selector lever is in “D” range	Engine speed is displayed
☞ MIL REQUEST	Ignition switch ON	OFF
☞ FUEL CUT FLAG	Ignition switch ON	OFF

Scan Tool Data Definitions:

GEAR POSITION
Current gear position computed by throttle position coming from ECM and vehicle speed.

ENGINE SPEED (RPM)
Engine speed computed by reference pulses from crankshaft position sensor.

INPUT SHAFT REVOLUTION (RPM)
Input shaft revolution computed by reference pulses coming from input shaft speed sensor on transaxle case.

OUTPUT SHAFT REVOLUTION (RPM)
Output shaft revolution computed by reference pulses coming from output shaft speed sensor (VSS) on transaxle case.

BATTERY VOLTAGE (V)
Battery voltage read by TCM as analog input signal by TCM.

ATF TEMPERATURE (°C, °F)
ATF temperature decided by signal from transmission fluid temperature sensor installed on valve body.

SHIFT SOLENOID-A COMMAND
ON: ON command being outputted to shift solenoid valve-A (No.1)
OFF: ON command not being outputted to shift solenoid valve-A (No.1)

SHIFT SOLENOID-A MONITOR
ON: Electricity being passed to shift solenoid valve-A (No.1)
OFF: Electricity not being passed to shift solenoid valve-A (No.1)

SHIFT SOLENOID-B COMMAND
ON: ON command being outputted to shift solenoid valve-B (No.2)
OFF: ON command not being outputted to shift solenoid valve-B (No.2)

SHIFT SOLENOID-B MONITOR
ON: Electricity being passed to shift solenoid valve-B (No.2)
OFF: Electricity not being passed to shift solenoid valve-B (No.2)

TIMING SOLENOID COMMAND
ON: ON command being outputted to timing solenoid valve
OFF: ON command not being outputted to timing solenoid valve

TIMING SOLENOID MONITOR
ON: Electricity being passed to timing solenoid valve
OFF: Electricity not being passed to timing solenoid valve

TCC SOLENOID
Electric current value ratio between electric current value being outputted from TCM to solenoid and maximum value can be outputted by TCM.

PRESSURE CONTROL SOLENOID
Electric current value ratio between electric current value being outputted from TCM to solenoid and maximum value can be outputted by TCM.

VEHICLE SPEED (KPH/MPH)
Vehicle speed computed by reference pulse signals coming from vehicle speed sensor on transaxle case.

O/D OFF SWITCH (“3” position switch)
Inputted signal from “3” position switch in selector lever assembly.
ON: Shift selector lever to “3” or “2” range
OFF: Shift selector lever to other above range

TRANSAXLE RANGE
Transaxle range detected by signal fed from transmission range sensor.

D RANGE SIGNAL
ON: Signal which TCM require ECM to increase idle speed
OFF: Signal which TCM does not require ECM to increase idle speed

THROTTLE POSITION (%)
Throttle opening ratio computed by duty signal from ECM.

BRAKE SWITCH
Inputted signal from brake light switch on pedal bracket.
ON: Brake pedal depressed
OFF: Brake pedal released

TORQUE REDUCTION SIGNAL
ON: Signal which TCM require ECM to reduce output torque at shifting gear
OFF: Signal which TCM does not require ECM to reduce output torque

ENGINE COOLANT TEMPERATURE (°C, °F)
Engine coolant temperature computed by duty signal from ECM.

AIR CONDITIONER SIGNAL
ON: Signal which inform that air conditioner compressor is turned ON.
OFF: Signal which inform that air conditioner compressor is not turned ON.

ENGINE TORQUE SIGNAL (N·m)
Engine torque computed by duty pulse signal outputted from ECM.

SLIP RPM (RPM)
This parameter indicates slipping rotation in the torque converter (difference between input shaft rotation and engine rotation)

MIL REQUEST
ON: Signal which TCM requires combination meter to turn on malfunction indicator lamp.
OFF: Signal which TCM does not require combination meter to turn on malfunction indicator lamp.

FUEL CUT FLAG
ON: Signal which inform that fuel cut is operating.
OFF: Signal which inform that fuel cut is not operating.

A/T Basic Check

S4RS0A5104010

This check is important for troubleshooting when TCM has detected no DTC and no abnormality has been noted in "Visual Inspection: ". Follow the flow carefully.

Step	Action	Yes	No
1	*Was "A/T System Check" preformed?*	Go to Step 2.	Go to "A/T System Check: ".
2	Perform "Road Test". *Is it OK?*	Go to Step 3.	Proceed to "Troubleshooting" in "Road Test: ".
3	Perform "Manual Road Test". *Is it OK?*	Go to Step 4.	Proceed to "Troubleshooting" in "Manual Road Test: ".
4	Perform "Engine Brake Test". *Is it OK?*	Go to Step 5.	Proceed to "Troubleshooting" in "Engine Brake Test: ".
5	Perform "Stall Test". *Is it OK?*	Go to Step 6.	Proceed to "Troubleshooting" in "Stall Test: ".
6	Perform "Time Lag Test". *Is it OK?*	Go to Step 7.	Proceed to "Troubleshooting" in "Time Lag Test: ".
7	Perform "Line Pressure Test". *Is it OK?*	Go to Step 8.	Proceed to "Troubleshooting" in "Line Pressure Test: ".
8	Proceed to "Trouble Diagnosis 1" in "A/T Symptom Diagnosis: ". *Is trouble identified?*	Repair or replace faulty parts.	Go to Step 9.
9	Proceed to "Trouble Diagnosis 2" in "A/T Symptom Diagnosis: ". *Is trouble identified?*	Repair or replace faulty parts.	Proceed to "Trouble Diagnosis 3" in "A/T Symptom Diagnosis: ".

Road Test

S4RS0A5104011

This test is to check if upshift, downshift and lock-up take place at specified speeds while actually driving vehicle on a level road.

WARNING:

- **Carry out test in very little traffic area to prevent an accident.**
- **Test requires 2 persons, a driver and a tester.**

1) Warm up engine.
2) With engine running at idle, shift selector lever “D” range.
3) Accelerate vehicle speed by depressing accelerator pedal gradually.
4) While driving in “D” range, check if gear shift and lock-up occur properly as shown in “Automatic Gear Shift Table: ”.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty valve body component	*Replace valve body assembly.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Seized or broken planetary gear	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Damaged drive plate	*Inspect. If NG, replace.*
	Faulty torque converter	*Replace.*
No gear shift as 3rd gear	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
1 → 2 upshift fails to occur	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty 2nd brake	*Inspect. If NG, replace.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
2 → 3 upshift fails to occur	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty direct clutch	*Inspect. If NG, replace.*

Condition	Possible cause	Correction / Reference Item
3 → 4 upshift fails to occur	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of "3" position switch	*Inspect. If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of crankshaft position sensor	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Gear shift point is incorrect	Abnormal engine condition	*Inspect and repair engine.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
O/D → 3 downshift fails to occur	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of "3" position switch	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty forward clutch	*Inspect. If NG, replace.*
3 → 2 downshift fails to occur	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
2 → 1 downshift fails to occur	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*

Condition	Possible cause	Correction / Reference Item
TCC (lock-up) function pressure control does not operate	Malfunction of TCC pressure control solenoid valve	*Inspect. If NG, replace.*
	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of brake light switch	*Inspect. If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty torque converter	*Replace.*

Manual Road Test

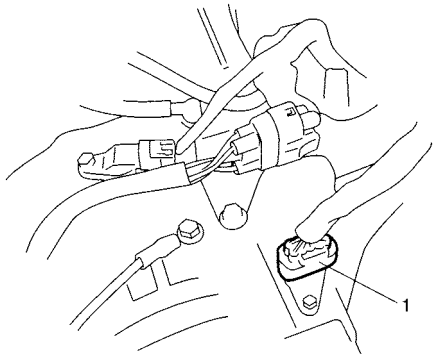
S4RS0A5104012

This test checks the gears being used in “L”, “2” “3” or “D” range when driven with unoperated gear shift control system. Test drive vehicle on a level road.

NOTE:

Before this test, check DTC.

1) With select lever in “P”, start engine and warm it up.
2) After warming up engine, turn ignition switch OFF and disconnect valve body harness connector (1).



I3RM0B510010-

3) With select lever in “L” range, start vehicle and check that 3rd gear is being used referring to the following table.

Vehicle speed per 1000 rpm in engine speed

Gear position	Vehicle speed
1st	**9.2 km/h (5.7 mile/h)**
2nd	**16.8 km/h (10.4 mile/h)**
3rd	**26.4 km/h (16.4 mile/h)**
4th	**37.9 km/h (23.6 mile/h)**
Reverse	**11.7 km/h (7.3 mile/h)**

4) While vehicle is running, shift select lever to “2” range and check that 3rd gear is being used.
5) While vehicle is running, shift select lever to “3” or “D” range and check that 3rd gear is being used.
6) After the checks, stop vehicle then turn ignition switch OFF, and connect valve body harness connector.
7) Clear DTC.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Operated gear is not correct	Faulty valve body component	*Replace valve body assembly.*
	Faulty clutch or brake	*Inspect clutch and brake. If any parts are faulty, replace them.*

Engine Brake Test

S4RS0A5104016

WARNING:

Before test, make sure that there is no vehicle behind so as to prevent rear-end collision.

1) While driving vehicle in 3rd gear of “D” range, shift select lever down to “2” range and check if engine brake operates.
2) In the same way as in Step 1), check engine brake for operation when select lever is shifted down to “L” range.
3) Engine brake should operate in the test.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Failure to operate when shifted down to “2” range	Faulty valve body component	*Replace valve body assembly.*
	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Failure to operate when shifted down to “L” range	Faulty valve body component	*Replace valve body assembly.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*

Stall Test

S4RS0A5104013

This test is to check overall performance of automatic transaxle and engine by measuring stall speed at “D” and “R” ranges. Be sure to perform this test only when transaxle fluid is at normal operating temperature and its level is between FULL and LOW marks.

CAUTION:

- **Do not run engine at stall more than 5 seconds continuously, or fluid temperature may rise excessively high.**
- **After performing stall test, be sure to leave engine running at idle for longer than 1 minute before another stall test.**

1) Apply parking brake and block wheels.
2) Install tachometer.
3) Start engine with select lever shifted to “P” range.
4) Depress brake pedal fully.
5) Shift select lever to “D” range and depress accelerator pedal fully while watching tachometer. Read engine rpm quickly when it has become constant (stall speed).
6) Release accelerator pedal immediately after stall speed is checked.
7) In the same way, check stall speed in “R” range.
8) Stall speed should be within the following specification.

Engine stall speed
Standard: 2,250 – 2,550 rpm

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Lower than standard level in both "D" and "R" range	Engine output torque failure	*Inspect and repair engine.*
	Faulty one-way clutch of torque converter	*Replace torque converter.*
Higher than standard level in "D" range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Slippery forward clutch	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Leakage from "D" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Higher than standard level in "R" range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Slippery reverse clutch	*Inspect. If NG, replace.*
	Slippery 1st and reverse brake	*Inspect. If NG, replace.*
	Leakage from "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Higher than standard level in both "D" and "R" range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Leakage from both "D" and "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*

Time Lag Test

S4RS0A5104014

This test is to check conditions of clutch, brake and fluid pressure. “Time lag” means time elapsed since select lever is shifted with engine idling till shock is felt.

1) With chocks placed before and behind front and rear wheels respectively, depress brake pedal.
2) Start engine.
3) With stop watch ready, shift select lever from “N” to “D” range and measure time from that moment till shock is felt.
4) Similarly measure time lag by shifting select lever from “N” to “R” range.

Gear shifting time lag
“N” → “D”: Less than 0.7 sec.
“N” → “R”: Less than 1.2 sec.

NOTE:

- **When repeating this test, be sure to wait at least one minute after select lever is shifted back to “N” range.**
- **Engine should be warmed up fully for this test.**
- **Repeat test 3 times and take average of those data for final time lag data.**

Troubleshooting

Condition	Possible cause	Correction / Reference Item
“N” → “D” time lag exceeds specification	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Leakage from “D” range fluid pressure circuit	*Overhaul or replace valve body assembly.*
“N” → “R” time lag exceeds specification	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Leakage from “R” range fluid pressure circuit	*Overhaul or replace valve body assembly.*

Line Pressure Test

S4RS0A5104015

Purpose of this test is to check operating conditions of each part by measuring fluid pressure in fluid pressure line. Line pressure test requires the following conditions.

- Automatic fluid is at normal operating temperature (70 – 80 °C / 158 – 176 °F).
- Fluid is replenished to proper level (between FULL and LOW on dipstick).
- Air conditioner switch is turned OFF.

1) Apply parking brake securely and place chocks against wheels.
2) Remove fluid pressure check hole plug bolt.
3) Attach oil pressure gauge to fluid pressure check hole in transaxle case.

Special tool
(A): 09925-37811-001

CAUTION:

After attaching oil pressure gauge, check that no fluid leakage exists.

4) Depress foot brake fully, run engine at idle and stall then check fluid pressure in “D” or “R” range.

CAUTION:

- **Do not continue running engine at stall speed longer than 5 seconds.**
- **After performing line pressure test, be sure to leave engine running at idle for longer than one minute before performing another line pressure test.**

Automatic transaxle line pressure

	“D” range	“R” range
At idle speed	**3.6 – 4.0 kg/cm^2, 51 – 57 psi**	**5.8 – 6.7 kg/cm^2, 82 – 95 psi**
At stall speed	**12.3 – 13.4 kg/cm^2, 175 – 191 psi**	**16.2 – 18.6 kg/cm^2, 230 – 264 psi**

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Higher than standard level in each range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
Lower than standard level in each range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Leakage from both “D” and “R” range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Lower than standard level only in “D” range	Leakage from “D” range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Lower than standard level only in “R” range	Leakage from “R” range fluid pressure circuit	*Overhaul or replace valve body assembly.*

"P" Range Test

S4RS0A5104017

1) Stop vehicle on a slope of 5 degrees or more, shift select lever to "P" range and at the same time apply parking brake.
2) After stopping engine, depress brake pedal and release parking brake.
3) Then, release brake pedal gradually and check that vehicle remains stationary.
4) Depress brake pedal and shift select lever to "N" range.
5) Then, release brake pedal gradually and check that vehicle moves.

WARNING:

Before test, make sure no one is around vehicle or down on a slope and keep watchful for safety during test.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Vehicle moves at "P" range or remains stationary at "N" range	Defective parking lock pawl or spring	*Inspect. If NG, repair.*

A/T Symptom Diagnosis

S4RS0A5104018

Trouble Diagnosis 1

Electrical repair

Condition	Possible cause	Correction / Reference Item
Excessive shift shock	Shift solenoid valve-A and/or -B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty only when N → D or 3 ↔ 4 shifting	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	Crankshaft position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0335: Crankshaft Position (CKP) Sensor Circuit: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
No gear shift as 3rd gear	Shift solenoid valve-A and/or -B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*

Condition	Possible cause	Correction / Reference Item
Poor 1 → 2 shift	Shift solenoid valve-B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Poor 2 → 3 shift	Shift solenoid valve-A circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
Poor 3 → 4 shift	Shift solenoid valve-B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	Engine coolant temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0117: Engine Coolant Temperature Circuit Low: in Section 1A" and/or "DTC P0118: Engine Coolant Temperature Circuit High: in Section 1A". If NG, repair.*
	Crankshaft position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0335: Crankshaft Position (CKP) Sensor Circuit: in Section 1A". If NG, repair.*
	"3" position switch circuit faulty	*Refer to "No Gear Shift to 4th gear: ".*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Poor 4 → 3 shift	Shift solenoid valve-B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	"3" position switch circuit faulty	*Refer to "No Gear Shift to 4th gear: ".*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
Poor 3 → 2 shift	Shift solenoid valve-A circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Poor 2 → 1 shift	Shift solenoid valve-A circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Incorrect gear shift point	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
Non operate TCC (lock-up) system	TCC pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Shift solenoid valve-A and/or -B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	Engine coolant temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0117: Engine Coolant Temperature Circuit Low: in Section 1A" and/or "DTC P0118: Engine Coolant Temperature Circuit High: in Section 1A". If NG, repair.*
	Brake light switch circuit faulty	*Refer to "No Lock-Up Occurs: ".*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Higher or lower stall speed	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
Excessive "N" → "D" or "N" → "R" time lag	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
Higher or lower line pressure	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*

Trouble Diagnosis 2

On-vehicle repair

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty valve body component	*Replace valve body assembly.*
Excessive shift shock	Engine abnormal condition	*Inspect and repair engine.*
	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve only when N → D or 3 ↔ 4 shifting	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Malfunction of brake light switch except N → D or N → R shifting	*Inspect referring to "Stop (Brake) Lamp Switch Inspection: in Section 9B". If NG, replace.*
	Malfunction of crankshaft position sensor	*Inspect referring to "Camshaft Position (CMP) Sensor Inspection: in Section 1C". If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 1 → 2 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 2 → 3 shift	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*

Condition	Possible cause	Correction / Reference Item
Poor 3 → 4 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of "3" position switch	*Inspect. If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect referring to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 4 → 3 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of "3" position off switch	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 3 → 2 shift	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 2 → 1 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Incorrect shift point	Engine abnormal condition	*Inspect and repair engine.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*

Condition	Possible cause	Correction / Reference Item
Non operate TCC (lock-up) system	Malfunction of TCC solenoid valve	*Inspect. If NG, replace.*
	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect referring to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". If NG, replace.*
	Malfunction of brake light switch	*Inspect referring to "Stop (Brake) Lamp Switch Inspection: in Section 9B". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Excessive "N" → "D" or "N" → "R" time lag	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Pressure control solenoid valve circuit faulty	*Inspect. If NG, replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty valve body component	*Replace valve body assembly.*

Trouble Diagnosis 3

Off-vehicle repair

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty oil pump	*Inspect. If NG, replace.*
	Seized or broken planetary gear	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Damaged drive plate	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Faulty torque converter	*Replace.*
Excessive "N" → "D" shift shock	Faulty forward clutch	*Inspect. If NG, replace.*
Excessive "N" → "R" shift shock	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
Poor 1 → 2 shift, excessive shock or slippage	Faulty 2nd brake	*Inspect. If NG, replace.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
Poor 2 → 3 shift, excessive shock or slippage	Faulty direct clutch	*Inspect. If NG, replace.*
Poor 3 ↔ O/D shift, excessive shock or slippage	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Poor 3 → 2 shift, excessive shock or slippage	Faulty direct clutch	*Inspect. If NG, replace.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*

Condition	Possible cause	Correction / Reference Item
Poor 2 → 1 shift, excessive shock or slippage	Faulty 2nd brake	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
Non operate TCC (lock-up) system	Faulty torque converter	*Replace.*
Excessive "N" → "D" time lag	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Leakage from "D" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Excessive "N" → "R" time lag	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Leakage from "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Poor engine brake in downshift to "2" range	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Poor engine brake in downshift to "L" range	Faulty 1st and reverse brake	*Inspect. If NG, replace.*

No Gear Shift to 4th gear

S4RS0A5104019

System Description

TCM does not shift to 4th gear under any of the following condition.

- "3" position switch is turned ON.
- Engine coolant temperature is less than 50 °C (122 °F).
- A/T fluid temperature is less than 20 °C (68 °F).
- A/T fluid temperature is more than 130 °C (266 °F) while TCM is detecting P2763 and P2764.
- TCM detects the following DTCs.
  P0712 / P0713 / P0717 / P0722 / P0787 / P0788 / P0962 / P0963 / P0973 / P0974 / P0976 / P0977 / P1702 / P1703 / P1774 / P1777

Troubleshooting

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** *Is DTC P0712, P0713, P0717, P0722, P0785, P0962, P0963, P0973, P0974, P0976, P0977, P1702, P1703, P1774 and/or P1777 detected?*	Perform DTC flow to repair and retry.	Go to Step 3.

Step	Action	Yes	No
3	1) Perform running test under the following conditions and measure voltage between terminal “C39-16” of TCM connector and ground, terminal “C39-15” of TCM connector and ground. • Engine coolant temperature is in normal operating temperature. • Select lever is in “D” range. • Drive vehicle with 4th gear condition referring to “Automatic Gear Shift Table: ”. **Voltage between TCM connector and ground** **Between terminal “C39-16” of TCM connector and ground: 0 – 1 V** **Between terminal “C39-15” of TCM connector and ground: 9 – 14 V** *Do results satisfy the value?*	Faulty shift solenoid valve, circuit or transaxle.	“BRN” circuit shorted to power circuit or open, or “BLK/YEL” circuit shorted to ground. If wire is OK, go to Step 4.
4	**O/D off switch signal inspection** 1) With ignition switch ON, check voltage between terminal “C38-9” of TCM connector and ground. **O/D off switch specification** **O/D off switch OFF (“O/D OFF” lamp does not light): 8 – 14 V** **O/D off switch ON (“O/D OFF” lamp lights): 0 – 1 V** *Is result as specified?*	Substitute a known-good TCM and recheck.	Faulty O/D off switch or its circuit. If OK, substitute a know-good TCM and recheck.

No Lock-Up Occurs

S4RS0A5104020

System Description

TCM turns TCC solenoid OFF under any of the following conditions.

- Brake light switch is turned ON (Brake pedal is depressed).
- Transmission fluid temperature is less than 60 °C (140 °F).
- Throttle opening is as much as 0%.
- TCM detects the following DTCs.
  P0705 / P0707 / P0712 / P0713 / P0717 / P0722 / P0787 / P0788/ P0962 / P0963 / P0973 / P0974/ P0976 / P0977 / P1702 / P1703 / P1774 / P1777 / P2763 / P2764

Troubleshooting

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

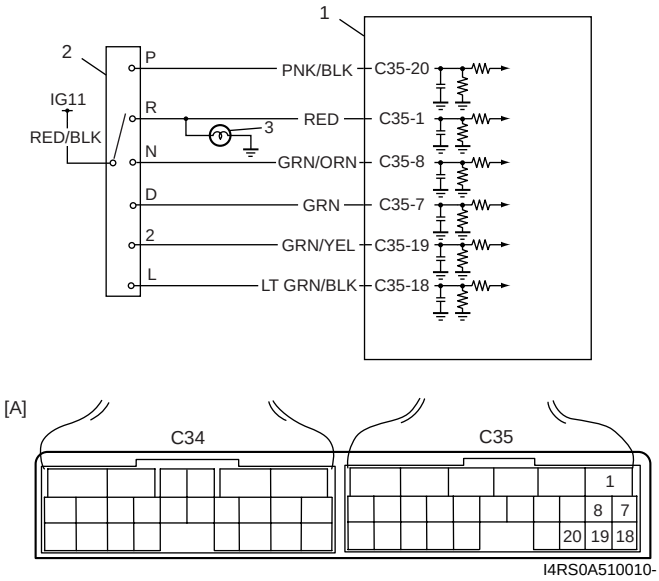
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check DTC** *Is DTC P0705, P0707, P0712, P0713, P0717, P0722, P0787, P0788, P0962, P0963, P0973, P0974, P0976, P0977, P1702, P1703, P1774, P1777, P2763 and/or P2764 detected?*	Perform DTC flow to repair and retry.	Go to Step 3.

Step	Action	Yes	No
3	**Brake light switch signal inspection** 1) With ignition switch ON, check voltage between terminal "E23-20" of ECM connector and ground. **Brake light switch signal specification** **Brake pedal is released: 0 – 1 V** **Brake pedal is depressed: 8 – 14 V** *Is result as specified?*	Substitute a known-good TCM and recheck.	Mis-adjusted brake light switch, faulty brake light switch. If OK, substitute a known-good TCM and recheck.

DTC P0705: Transmission Range Sensor Circuit Malfunction

S4RS0A5104021

Wiring Diagram



I4RS0A510010-

1. TCM	3. Backup lamp
2. Transmission range sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Multiple or more signals are inputted simultaneously for 12 seconds.	• Select cable maladjusted • Transmission range sensor (switch) maladjusted • Transmission range sensor (switch) or its circuit malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM memory by using scan tool.
3) Start engine and shift select lever to "D" range.
4) Keep engine running at idle speed for 25 seconds or more.
5) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 4.

Step	Action	Yes	No
3	**Check transmission range sensor (switch) circuit for operation** Check by using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check transmission range signal (“P”, “R”, “N”, “D”, “2” or “L”) on display when shifting select lever to each range. *Is applicable range indicated?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.	Go to Step 5.
4	**Check transmission range sensor (switch) circuit for operation** Check by not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminals “C35-1”, “C35-7”, “C35-8”, “C35-18”, “C35-19” and “C35-20” respectively with select lever shifted to each range. Taking terminal “C35-19” as an example, is battery voltage indicated only when select lever is shifted to “2” range and 0 V for other ranges as shown in the following table. Check voltage at other terminals likewise, referring to the following table. *Are check results satisfactory?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.	Go to Step 5.
5	1) Check select cable for adjustment referring to “Select Cable Adjustment: ”. *Is it adjusted correctly?*	Go to Step 6.	Adjust.
6	**Check transmission range sensor for installation position** 1) Shift select lever to “N” range. 2) Check that “N” reference line on sensor and needle direction shaped on lock washer are aligned. *Are they aligned?*	Go to Step 7.	Adjust.
7	1) Check transmission range sensor (switch) referring to “Transmission Range Sensor (Shift Switch) Inspection and Adjustment: ”. *Are check results satisfactory?*	“RED/BLK”, “PNK/BLK”, “RED”, “GRN/ORN”, “GRN”, “GRN/YEL” or “LT GRN/BLK” circuit shorted to power circuit or shorted each other. If wires and connections are OK, substitute a know-good TCM and recheck.	Replace transmission range sensor.

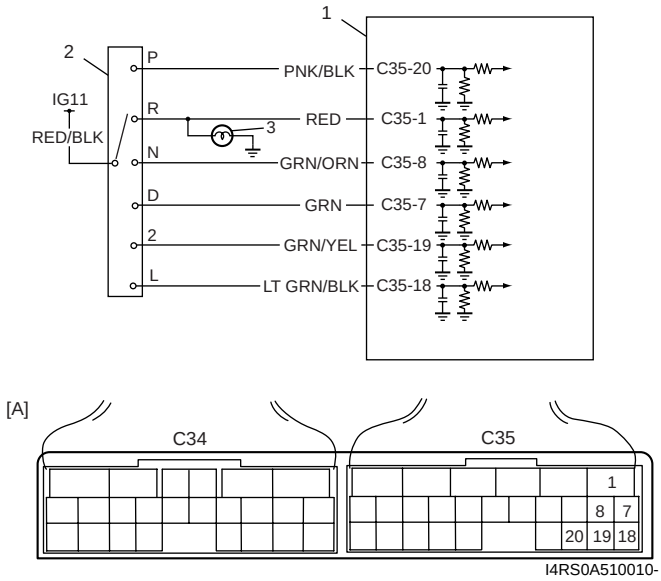
Table for Step 4

		Terminal					
		C35-20	**C35-1**	**C35-8**	**C35-7**	**C35-19**	**C35-18**
Select lever position	P	8 – 14 V	0 V	0 V	0 V	0 V	0 V
	R	0 V	8 – 14 V	0 V	0 V	0 V	0 V
	N	0 V	0 V	8 – 14 V	0 V	0 V	0 V
	D or 3	0 V	0 V	0 V	8 – 14 V	0 V	0 V
	2	0 V	0 V	0 V	0 V	8 – 14 V	0 V
	L	0 V	0 V	0 V	0 V	0 V	8 – 14 V

DTC P0707: Transmission Range Sensor Circuit Low

S4RS0A5104045

Wiring Diagram



1. TCM	3. Backup lamp
2. Transmission range sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission range switch signal (P, R, N, D, 2, or L) is not inputted for more than 32 seconds when vehicle speed is faster than 30 km/h (19 mile/h) and engine speed is faster than 1500 rpm.	• Select cable maladjusted • Transmission range sensor (switch) maladjusted • Transmission range sensor (switch) or its circuit malfunction • TCM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM memory by using scan tool.
3) Start engine and shift select lever to “D” range.
4) Start vehicle and increase vehicle speed to 40 km/h (25 mile/h) or more for 1 minutes.
5) Stop vehicle and turn ignition switch OFF.
6) Repeat Step 3) to 4) one time.
7) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 4.

Step	Action	Yes	No
3	**Check transmission range sensor (switch) circuit for operation** Check by using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check transmission range signal (P, R, N, D, 2 or L) on display when shifting select lever to each range. *Is applicable range indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 5.
4	**Check transmission range sensor (switch) circuit for operation** Check by not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminals "C35-1", "C35-7", "C35-8", "C35-18", "C35-19" and "C35-20" respectively with select lever shifted to each range. Taking terminal "C35-19" as an example, is battery voltage indicated only when select lever is shifted to "2" range and 0 V for other ranges as shown in the following table. Check voltage at other terminals likewise, referring to the following table. *Are check results satisfactory?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 5.
5	1) Check select cable for adjustment referring to "Select Cable Adjustment: ". *Is it adjusted correctly?*	Go to Step 6.	Adjust.
6	**Check transmission range sensor for installation position** 1) Shift select lever to "N" range. 2) Check that "N" reference line on sensor and needle direction shaped on lock washer are aligned. *Are they aligned?*	Go to Step 7.	Adjust.
7	1) Check transmission range sensor (switch) referring to "Transmission Range Sensor (Shift Switch) Inspection and Adjustment: ". *Are check results satisfactory?*	"RED/BLK", "PNK/BLK", "RED", "GRN/ORN", "GRN", "GRN/YEL" or "LT GRN/BLK" circuit open or short to ground. If wires and connections are OK, substitute a know-good TCM and recheck.	Replace transmission range sensor.

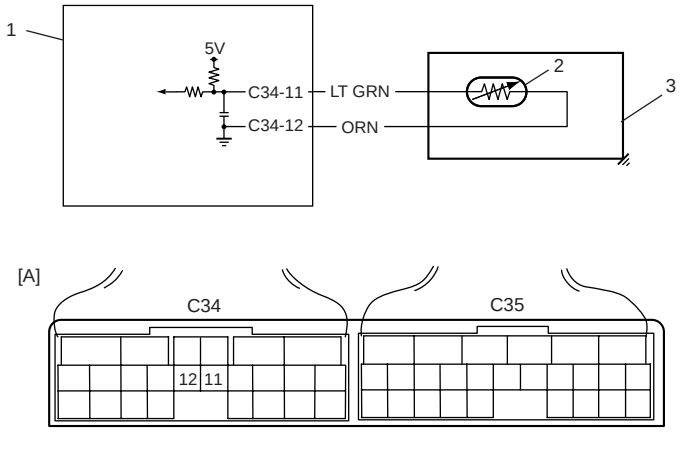
Table for Step 4

		Terminal					
		C35-20	**C35-1**	**C35-8**	**C35-7**	**C35-19**	**C35-18**
Select lever position	P	8 – 14 V	0 V	0 V	0 V	0 V	0 V
	R	0 V	8 – 14 V	0 V	0 V	0 V	0 V
	N	0 V	0 V	8 – 14 V	0 V	0 V	0 V
	D or 3	0 V	0 V	0 V	8 – 14 V	0 V	0 V
	2	0 V	0 V	0 V	0 V	8 – 14 V	0 V
	L	0 V	0 V	0 V	0 V	0 V	8 – 14 V

DTC P0712: Transmission Fluid Temperature Sensor Circuit Low

S4RS0A5104046

Wiring Diagram



I4RS0A510011-

1. TCM	3. A/T
2. Transmission fluid temperature sensor	4. Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission temperature sensor terminal voltage is less than specified value for 5 minutes or more after turning ignition switch ON.	• Transmission fluid temperature sensor or its circuit malfunction • TCM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Keep engine running at idle speed for 10 minutes or more.
4) Stop vehicle and check DTC.

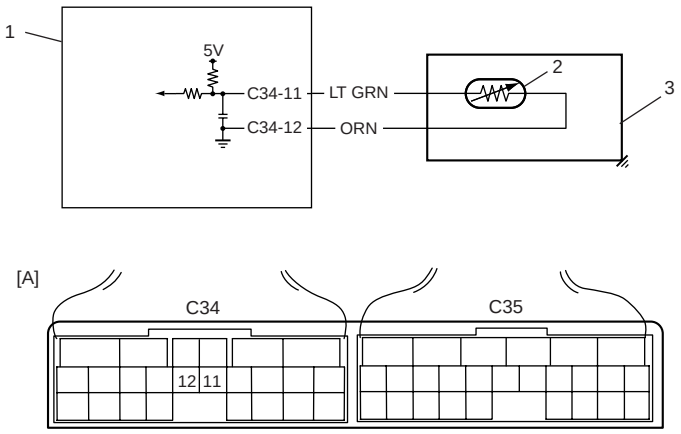
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check transmission fluid temperature circuit for ground short** 1) Check continuity between terminal "C34-11" of disconnected harness side TCM connector and ground. *Is continuity indicated?*	"LT GRN" circuit shorted to ground.	Go to Step 3.
3	**Inspect transmission fluid temperature sensor** 1) Inspect transmission fluid temperature sensor referring to "Transmission Fluid Temperature Sensor Inspection: ". *Is result satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.	Replace transmission fluid temperature sensor.

DTC P0713: Transmission Fluid Temperature Sensor Circuit High

S4RS0A5104023

Wiring Diagram



I4RS0A510011-

1. TCM	3. A/T
2. Transmission fluid temperature sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission fluid temperature sensor terminal voltage is more than specified value and sensor variation is less than specified value evan though engine was running in “R”, “D”, “3”, “2” or “L” range for 15 minutes after starting engine.	• Transmission fluid temperature sensor or its circuit malfunction • TCM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Start vehicle and increase vehicle speed to about 40 km/h (25 mile/h) for 20 minutes or more.
4) Stop vehicle and check DTC.

DTC Troubleshooting

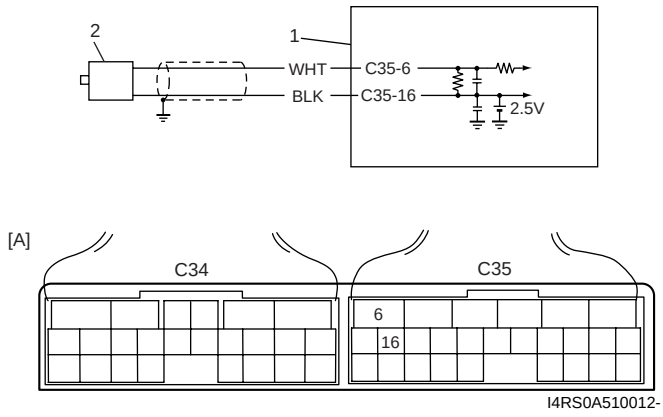
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check transmission fluid temperature circuit for open** 1) Turn ignition switch OFF. 2) Disconnect TCM connectors from TCM. 3) Check for proper connection to transmission fluid temperature sensor at terminals “C34-11” and “C34-12”. 4) If OK, check continuity between terminals “C34-11” and “C34-12” of disconnected harness side TCM connector. *Is continuity indicated?*	Go to Step 3.	“LT GRN” or “ORN” circuit open.

Step	Action	Yes	No
3	**Check transmission fluid temperature circuit for IG short** 1) Cool down A/T fluid temperature under ambient temperature. 2) Connect TCM connectors to TCM with ignition switch OFF. 3) Turn ignition switch ON. 4) Measure voltage between terminal “C34-11” of TCM connector and ground. *Is it 4.6 V or more?*	“LT GRN” circuit shorted to power circuit. If circuit is OK, go to Step 4.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.
4	**Inspect transmission fluid temperature sensor** 1) Inspect transmission fluid temperature sensor referring to “Transmission Fluid Temperature Sensor Inspection: ”. *Is result satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Replace transmission fluid temperature sensor.

DTC P0717: Input / Turbine Speed Sensor Circuit Malfunction

S4RS0A5104024

Wiring Diagram



1. TCM	2. Input shaft speed sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No input shaft speed sensor signal is detected although output shaft speed sensor signals are detected.	• Input shaft speed sensor or its circuit malfunction • Improper input shaft speed sensor installation • Damaged direct clutch drum • Foreign material attachment to sensor or drum • TCM

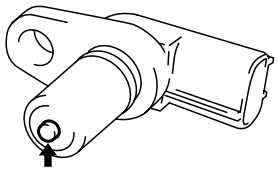
DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Shift selector lever to “D” range and drive vehicle at 50 km/h (31 mile/h) or more with 3rd gear at least for 5 minutes.
4) Stop vehicle and check DTC.

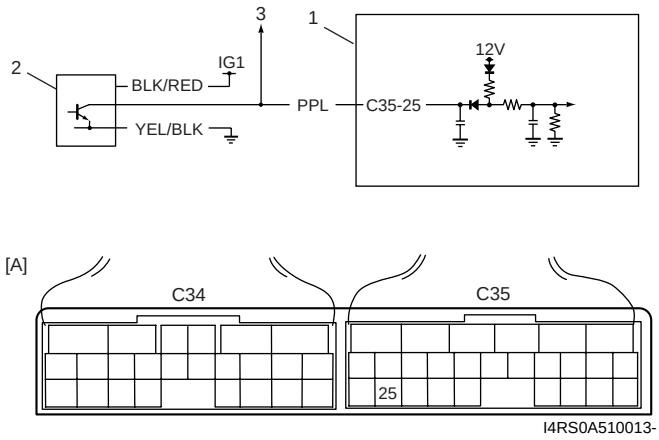
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check input shaft speed sensor circuit** 1) Disconnect TCM connectors with ignition switch OFF. 2) Check for proper connection to input shaft speed sensor at “C35-6” and “C35-16” terminals. 3) If OK, check resistance of sensor circuit. **Input shaft speed sensor specification** **Between terminals “C35-6” and “C35-16”: 560 – 680 Ω at 20 °C (68 °F)** **Between terminal “C35-6” / “C35-16” and ground: No continuity** *Are check result satisfactory?*	Go to Step 4.	Go to Step 3.
3	**Inspect input shaft speed sensor** 1) Inspect input shaft speed sensor referring to “Input Shaft Speed Sensor Inspection: ”. *Is result satisfactory?*	“WHT” or “BLK” circuit open or short.	Replace input shaft speed sensor.
4	**Check visually input shaft speed sensor and direct clutch drum for the following** • No damage • No foreign material attached • Correct installation  I2RH0B510020- *Are they in good condition?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Clean, repair or replace.

DTC P0722: Output Speed Sensor (VSS) Circuit No Signal

S4RS0A5104025

Wiring Diagram



I4RS0A510013-

1. TCM	3. To ECM
2. Output shaft speed sensor (VSS)	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No output shaft speed sensor signal is detected although input shaft speed sensor signals are detected while vehicle is running at 5 km/h (3 mile/h) or more in vehicle speed with “D”, “2” or “L” range.	• Output shaft speed sensor or its circuit malfunction • Damaged sensor gear (driven gear) • Damaged output shaft speed sensor (VSS) drive gear • TCM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Shift selector lever to “D” range and drive vehicle at 50 km/h (31 mile/h) or more vehicle speed at least for 3 minutes.
4) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check output shaft speed sensor (VSS) power circuit** 1) Turn ignition switch OFF. 2) Disconnect output shaft speed sensor connector. 3) Turn ignition switch ON. 4) Measure voltage between “BLK/RED” wire terminal of disconnected output shaft speed sensor harness side connector and ground. *Is it 10 – 14 V?*	Go to Step 3.	“BLK/RED” wire open or shorted to ground.

Step	Action	Yes	No
3	**Check output shaft speed sensor (VSS) ground circuit** 1) Turn ignition switch OFF. 2) Check continuity between “YEL/BLK” wire terminal of disconnected output shaft speed sensor harness side connector and ground. *Is continuity indicated?*	Go to Step 4.	“YEL/BLK” wire open.
4	**Check output shaft speed sensor (VSS) signal circuit for short** 1) Disconnect TCM connectors. 2) Check continuity between “PPL” wire terminal of disconnected output shaft speed sensor harness side connector and ground. *Is continuity indicated?*	“PPL” wire shorted to ground.	Go to Step 5.
5	**Check output shaft speed sensor (VSS) signal circuit for open** 1) Check continuity between “PPL” wire terminal of disconnected output shaft speed sensor harness side connector and terminal “C35-25” of disconnected harness side TCM connector. *Is continuity indicated?*	Go to Step 6.	“PPL” wire open.
6	**Inspect output shaft speed sensor (VSS)** 1) Inspect output shaft speed sensor referring to “Output Shaft Speed Sensor (VSS) Inspection: ”. *Is check result satisfactory?*	Go to Step 7.	Replace output shaft speed sensor (VSS).
7	**Check output shaft speed sensor (VSS) gears visually** 1) Check output shaft speed sensor gears for the followings. • No damage in drive gear on differential case • No damage in driven gear in output shaft speed sensor *Is result satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Replace drive gear and/or driven gear of output shaft speed sensor.

DTC P0741 / P0742: TCC Circuit Performance or Stuck OFF / TCC Circuit Stuck ON

S4RS0A5104027

DTC Detecting Condition and Trouble Area

DTC P0741

DTC detecting condition	Trouble area
When driving vehicle with 3rd or 4th gear in “D” range, difference in revolution between engine and A/T input (input shaft speed) is larger than specification although TCM commanded TCC solenoid to turn ON.	• Mechanical malfunction of TCC solenoid valve • Malfunction of valve body assembly • Fluid passage clogged or leaking • Torque converter clutch malfunction

DTC P0742

DTC detecting condition	Trouble area
When driving vehicle with 2nd, 3rd or 4th gear in “D” range, difference in revolution between engine and A/T input (input shaft speed) is smaller than specification although TCM commanded TCC solenoid to turn OFF.	• Mechanical malfunction of TCC solenoid valve • Malfunction of valve body assembly • Fluid passage clogged or leaking • Torque converter clutch malfunction

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and warm it up to normal operating temperature.
4) Shift select lever to “N” and “D” range for each 10 seconds.
5) Drive vehicle with 4th gear in “D” range and lock-up ON for 20 seconds or longer referring to “Automatic Gear Shift Table: ”.
6) Shift select lever to “3” range.
7) Drive vehicle with 2nd or 3rd gear in “3” range, 15 – 20% throttle opening and at vehicle speed of 25 – 40 km/h (16 – 25 mile/h).
8) Stop vehicle and turn ignition switch OFF.
9) Repeat Step 3) to 7) one time.
10) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	1) Check TCC solenoid valve for operation referring to “Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection: ”. *Are they in good condition?*	Clean fluid passage or replace valve body assembly.	Replace TCC solenoid valve.

DTC P0751 / P0752 / P0756 / P0757: Shift Solenoid Malfunction

S4RS0A5104030

DTC P0751: Shift Solenoid-A (No.1) Performance or Stuck OFF
DTC P0752: Shift Solenoid-A (No.1) Stuck ON
DTC P0756: Shift Solenoid-B (No.2) Performance or Stuck OFF
DTC P0757: Shift Solenoid-B (No.2) Stuck ON

DTC Detecting Condition and Trouble Area

DTC P0751

DTC detecting condition	Trouble area
3rd gear ratio is detected although TCM command is for 2nd gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-A (No.1) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC P0752

DTC detecting condition	Trouble area
2nd gear ratio is detected although TCM command is for 3rd gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-A (No.1) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC P0756

DTC detecting condition	Trouble area
3rd gear ratio is detected although TCM command is for 4th gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-B (No.2) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC P0757

DTC detecting condition	Trouble area
4th gear ratio is detected although TCM command is for 3rd gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-B (No.2) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and warm it up to normal operating temperature.

4) Shift select lever to “N” and “D” range for 10 seconds.
5) Start vehicle and increase vehicle speed to 65 km/h (40 mile/h) with throttle position 10% or more.
6) Stop vehicle and turn ignition switch OFF.
7) Repeat Step 3) to 5) one time.
8) Stop vehicle and check DTC.

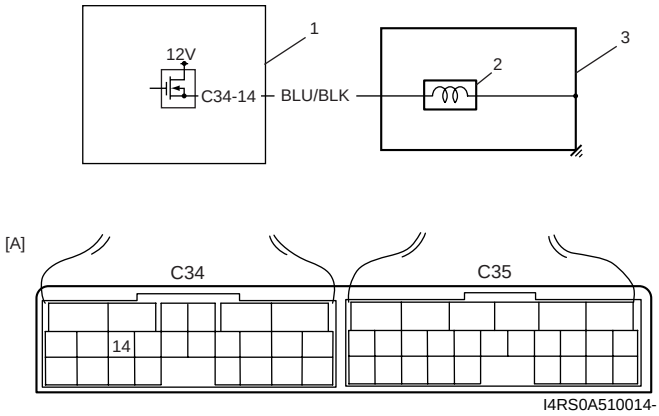
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	1) Check shift solenoid valve-A (No.1) or -B (No.2) for operation referring to “Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection: ”. *Are they in good condition?*	Clean fluid passage or replace valve body assembly.	Replace shift solenoid valve-A or -B.

DTC P0787: Shift / Timing Solenoid Control Circuit Low

S4RS0A5104042

Wiring Diagram



1. TCM	3. A/T
2. Timing solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

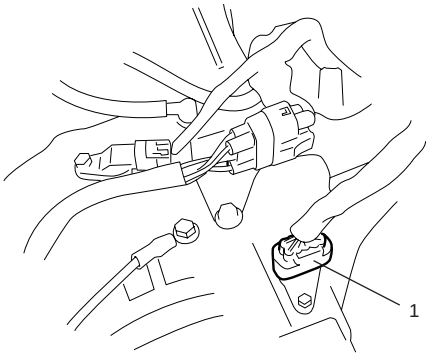
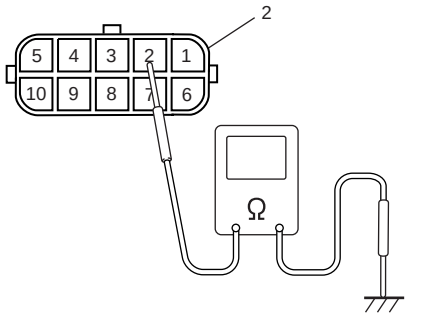
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of timing solenoid valve TCM terminal is low although TCM is commanding timing solenoid valve to turn ON.	• Timing solenoid valve circuit shorted to ground • Timing solenoid valve malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and shift select lever to “N” range.
4) Repeat shifting select lever from “N” range to “D” range and vice versa for 3 times.
5) Check DTC.

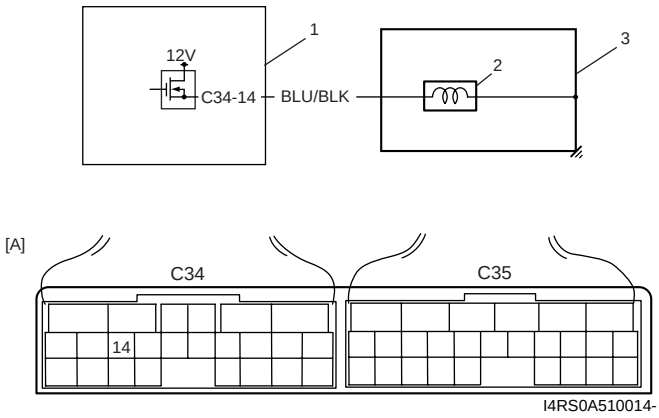
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check timing solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on transaxle. 3) Check for proper connection to solenoid valve at "BLU/BLK" circuit. 4) Check resistance of solenoid valve. **Timing solenoid valve resistance** **Between terminal of transaxle side valve body harness connector and transaxle: 11 – 15 Ω at 20 °C (68 °F)**   I3RM0B510018- *Is check result satisfactory?*	Go to Step 3.	Replace timing solenoid valve or lead wire.
3	**Check timing solenoid valve circuit for ground short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Measure resistance between terminal "C34-14" of disconnected harness side TCM connector and ground. *Is it 11 – 15 Ω at 20 °C (68 °F)?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.	"WHT/GRN" circuit shorted to ground.

DTC P0788: Shift / Timing Solenoid Control Circuit High

S4RS0A5104050

Wiring Diagram



I4RS0A510014-

1. TCM	3. A/T
2. Timing solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

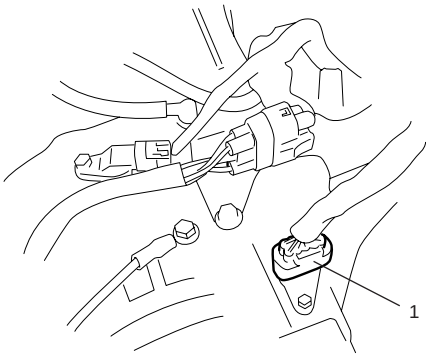
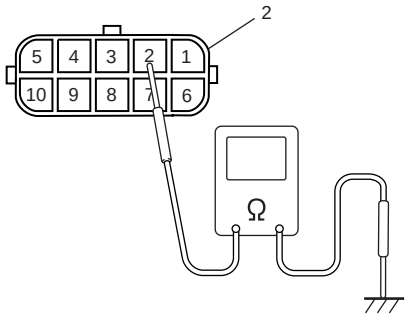
DTC detecting condition	Trouble area
Voltage of timing solenoid valve TCM terminal is high although TCM is commanding timing solenoid valve to turn OFF.	• Timing solenoid valve circuit open or shorted to power circuit • Timing solenoid valve malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and shift select lever to “N” range.
4) Repeat shifting select lever from “N” range to “D” range and vice versa for 3 times.
5) Check DTC.

DTC Troubleshooting

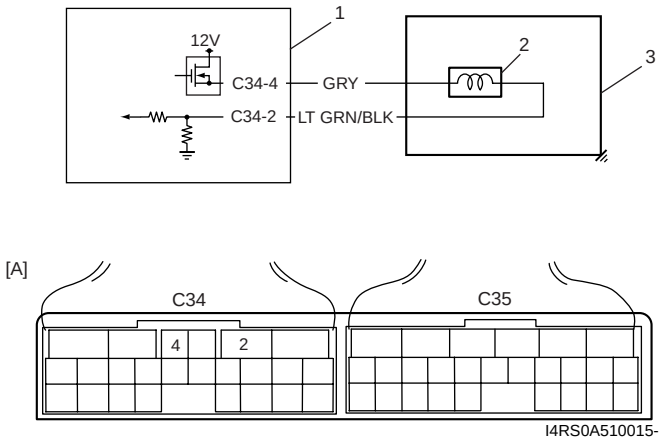
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check timing solenoid valve circuit for IG short** 1) Disconnect TCM connectors. 2) Turn ignition switch ON and measure voltage between terminal “C34-14” of harness side TCM connector and ground. *Is it 0 – 1 V?*	Go to Step 3.	“BLU/BLK” circuit shorted to power circuit.
3	**Check timing solenoid valve circuit for open** 1) Measure resistance between terminal “C34-14” of disconnected harness side TCM connector and ground. *Is it 11 – 15 Ω at 20 °C (68 °F)?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Go to Step 4.

Step	Action	Yes	No
4	**Check timing solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on transaxle. 3) Check for proper connection to solenoid valve at “BLU/BLK” circuit. 4) Check resistance of solenoid valve. **Timing solenoid valve resistance** **Between terminal of transaxle side valve body harness connector and transaxle: 11 – 15 Ω at 20 °C (68 °F)**   I3RM0B510018- *Is check result satisfactory?*	“BLU/BLK” circuit open.	Replace timing solenoid valve or lead wire.

DTC P0962: Pressure Control Solenoid Control Circuit Low

S4RS0A5104032

Wiring Diagram



1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

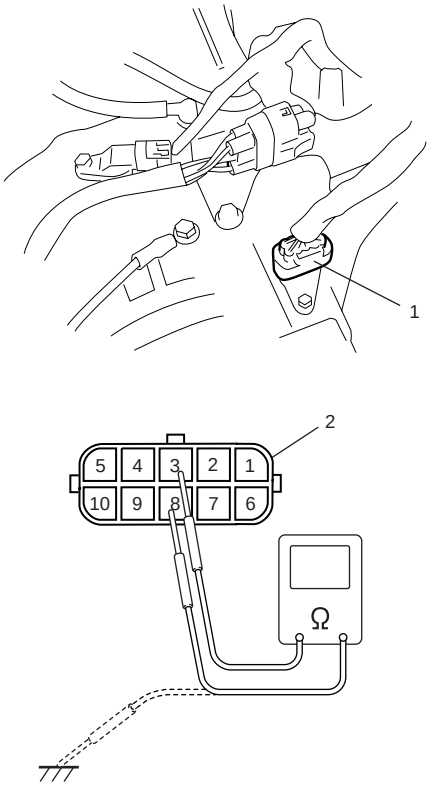
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Pressure control solenoid valve output voltage is too low comparing with TCM command value.	• Pressure control solenoid valve circuit open or shorted to ground • Malfunction of pressure control solenoid valve • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed for 30 seconds or more.
5) Stop vehicle and check DTC.

DTC Troubleshooting

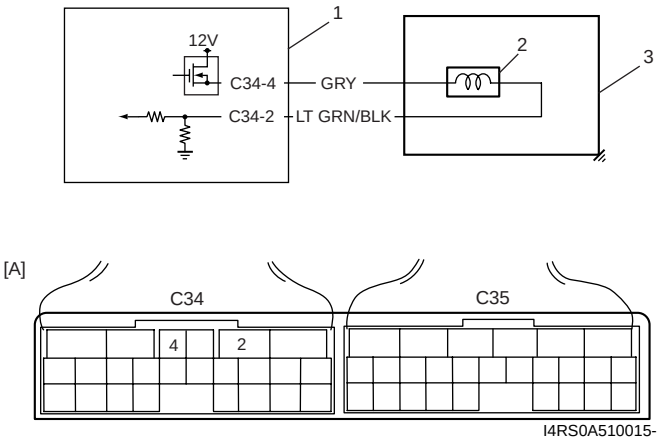
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "GRY" and "LT GRN/BLK" circuit. 4) Check resistance of pressure control solenoid. **Pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle side valve body harness connector and Transaxle: Infinity**  I3RM0B510020- *Is check results satisfactory?*	Go to Step 3.	Replace pressure control solenoid valve or valve body harness.
3	**Check pressure control solenoid valve circuit for ground short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminals "C34-2" and "C34-4". If connection is OK, check continuity between terminal "C34-4" of disconnected harness side TCM connector and ground. *Is continuity indicated?*	"GRY" or "LT GRN/BLK" circuit shorted to ground.	Go to Step 4.

Step	Action	Yes	No
4	**Check pressure control solenoid valve circuit for open** 1) Check resistance continuity between terminals “C34-2” and “C34-4” of disconnected harness side TCM connector. *Is it infinite?*	“GRY” or “LT GRN/BLK” circuit open.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.

DTC P0963: Pressure Control Solenoid Control Circuit High

S4RS0A5104047

Wiring Diagram



1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

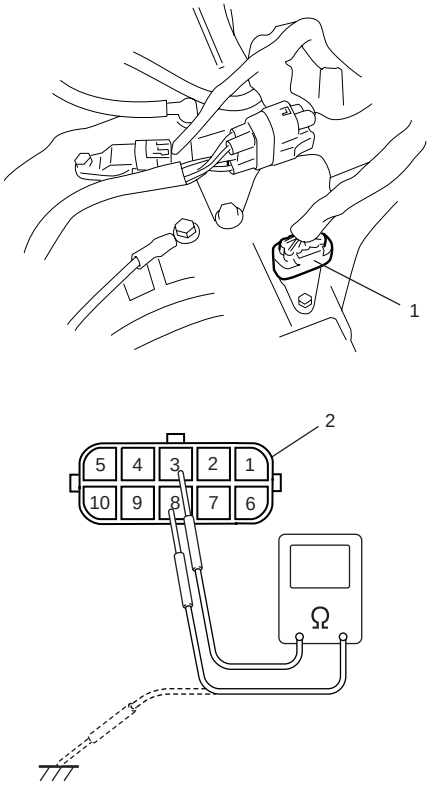
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Pressure control solenoid valve output voltage is too high comparing with TCM command value.	• Pressure control solenoid valve circuit shorted to power circuit • Pressure control solenoid valve malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed for 10 seconds or more.
5) Check DTC.

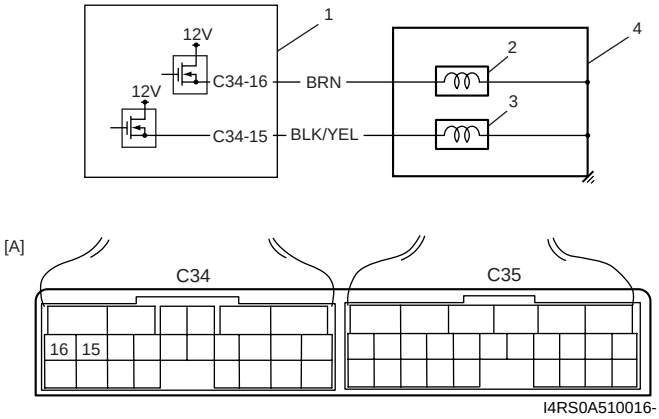
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check pressure control solenoid circuit for IG short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal "C34-2" and "C34-4". 4) If connection is OK, turn ignition switch ON and measure voltage between terminal "C34-4" of disconnected harness side TCM connector and ground. *Is it 0 – 2 V?*	Go to Step 3.	"BRN/YEL" or "LT GRN" circuit shorted to power circuit.
3	**Check pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "GRY" and "LT GRN/BLK" circuit. 4) Check resistance of pressure control solenoid. **Pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle valve body harness connector and transaxle: Infinity**  *Is check results satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.	Replace pressure control solenoid valve or valve body harness.

DTC P0973 / P0976: Shift Solenoid-A (No.1) Control Circuit Low / Shift Solenoid-B (No.2) Control Circuit Low

S4RS0A5104051

Wiring Diagram



1. TCM	3. Shift solenoid valve-B (No.2)
2. Shift solenoid valve-A (No.1)	[A]: Terminal arrangement of TCM connector (Viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of shift solenoid valve TCM terminal is low although TCM is commanding shift solenoid to turn ON	• Shift solenoid valve circuit shorted to ground • Malfunction of shift solenoid valve • TCM

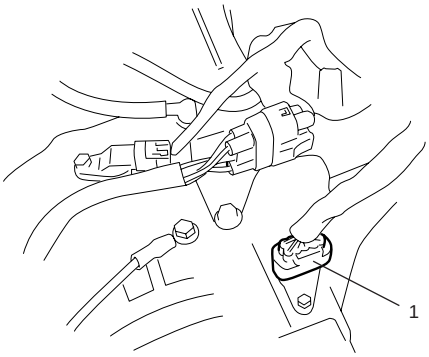
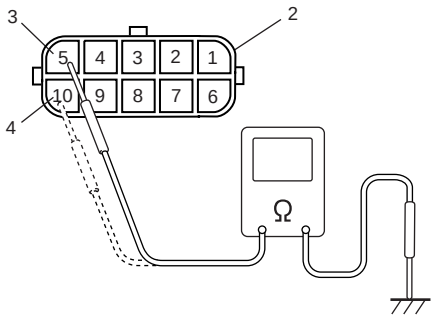
DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine shift select lever to “D” range.
4) Start vehicle and increase vehicle speed until gear position reaches 3rd or 4th gear.
5) Decrease vehicle speed and stop vehicle.
6) Check DTC.

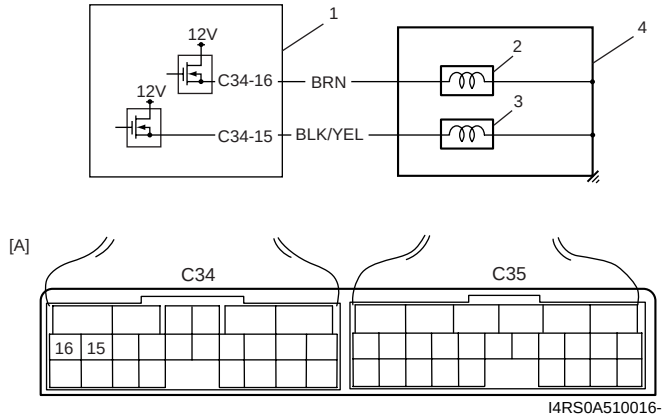
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automatic Transaxle Diagnostic Flow Table" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check shift solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transmission. 3) Check for proper connection to solenoid at "BRN" (for shift solenoid valve-A (No.1)) or "BLK/YEL" (for shift solenoid valve-B (No.2)) circuit. Check resistance of solenoid valve. **Shift solenoid valve resistance** **Between shift solenoid valve-A (No.1) terminal (3) and transaxle: 11 – 15 Ω at 20 °C (68 °F)** **Between shift solenoid valve-B (No.2) terminal (4) and transaxle: 11 – 15 Ω at 20 °C (68 °F)**   I3RM0B510022- *Is check results satisfactory?*	Go to Step 3.	Replace applicable shift solenoid valve or valve body harness.
3	**Check shift solenoid valve circuit for ground short** 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)). 3) If connection is OK, check continuity between terminal "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)) of disconnected harness side TCM connector and ground. *Is continuity indicated?*	DTC P0973: "BRN" circuit shorted to ground. DTC P0976: "BLK/YEL" circuit shorted to ground.	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.

DTC P0974 / P0977: Shift Solenoid-A (No.1) / Shift Solenoid-B (No.2) Control Circuit High

S4RS0A5104048

Wiring Diagram



1. TCM	3. Shift solenoid valve-B (No.2)	[A]: Terminal arrangement of TCM connector (viewed from harness side)
2. Shift solenoid valve-A (No.1)	4. A/T	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of shift solenoid valve TCM terminal is high although TCM is commanding shift solenoid to turn OFF	• Shift solenoid valve circuit open or shorted to power circuit • Malfunction of shift solenoid valve • TCM

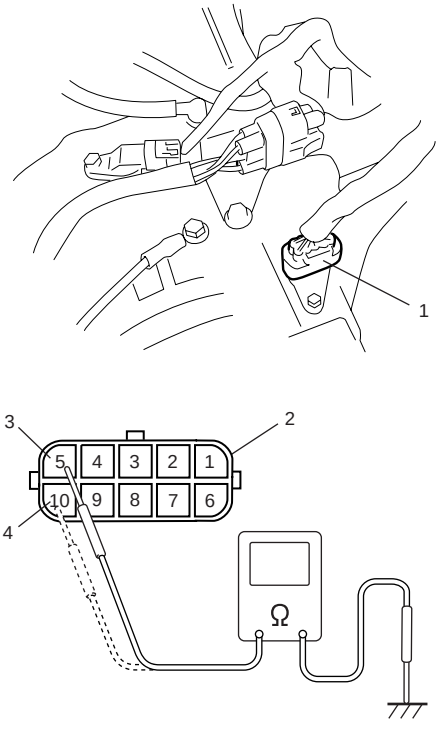
DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and shift select lever to “D” range.
4) Start vehicle and increase vehicle speed until gear position reaches 3rd or 4th gear.
5) Decrease vehicle speed and stop vehicle.
6) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check shift solenoid valve circuit for IG short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)). 4) If connection is OK, turn ignition switch ON and measure voltage between terminal "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)) of disconnected harness side TCM connector and ground. *Is it 0 – 2 V?*	Go to Step 3.	DTC P0974: "BRN" circuit shorted to power circuit. DTC P0977: "BLK/YEL" circuit shorted to power circuit.
3	**Check shift solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "BRN" (for shift solenoid valve-A (No.1)) or "BLK/YEL" (for shift solenoid valve-B (No.2)) circuit. Check resistance of solenoid valve. **Shift solenoid valve resistance** **Between shift solenoid valve-A (No.1) terminal (3) and transaxle: 11 – 15 Ω at 20 °C (68 °F)** **Between shift solenoid valve-B (No.2) terminal (4) and transaxle: 11 – 15 Ω at 20 °C (68 °F)**  *Is check results satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.	Replace applicable shift solenoid valve or valve body harness.

DTC P1702: Internal Control Module Memory Check Sum Error

S4RS0A5104033

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Calculation of current data stored in TCM is not correct comparing with pre-stored checking data in TCM.	TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTC in TCM memory.
3) After 10 seconds passed from turning ignition switch ON, check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1702 detected after performing "DTC Confirmation Procedure"?*	Faulty TCM. Replace TCM.	Could be a temporary malfunction of TCM.

DTC P1703: Can Invalid Data - TCM

S4RS0A5104034

DTC Detecting Condition and Trouble Area

When abnormality either on the gear shift control signal from ECM is detected by TCM, TCM sets DTC P1703.

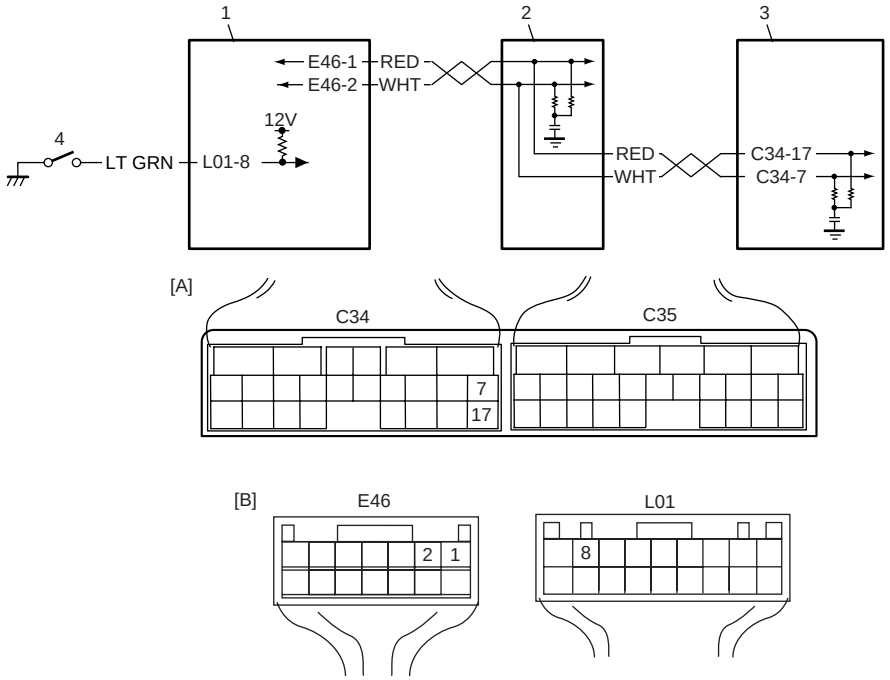
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**DTC check** 1) Check DTC of ECM referring to "DTC Check: in Section 1A". *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good TCM and recheck. If OK, substitute a known-good ECM and recheck.

DTC P1723: Range Select Switch Malfunction

S4RS0A5104052

Wiring Diagram



I4RS0A510017-

1. BCM	3. TCM	[A]: BCM connector (viewed from harness side)
2. ECM	4. "3" position switch	[B]: TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
"3" position switch ON signal is inputed although transmission range switch signal is inputed P, R, N or L. range.	• "3" position switch or its circuit malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool and turn ignition switch ON.
3) Shift selector lever to each of "L", "2", "3", "D", "N", "R" and "P" ranges for 20 seconds each.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

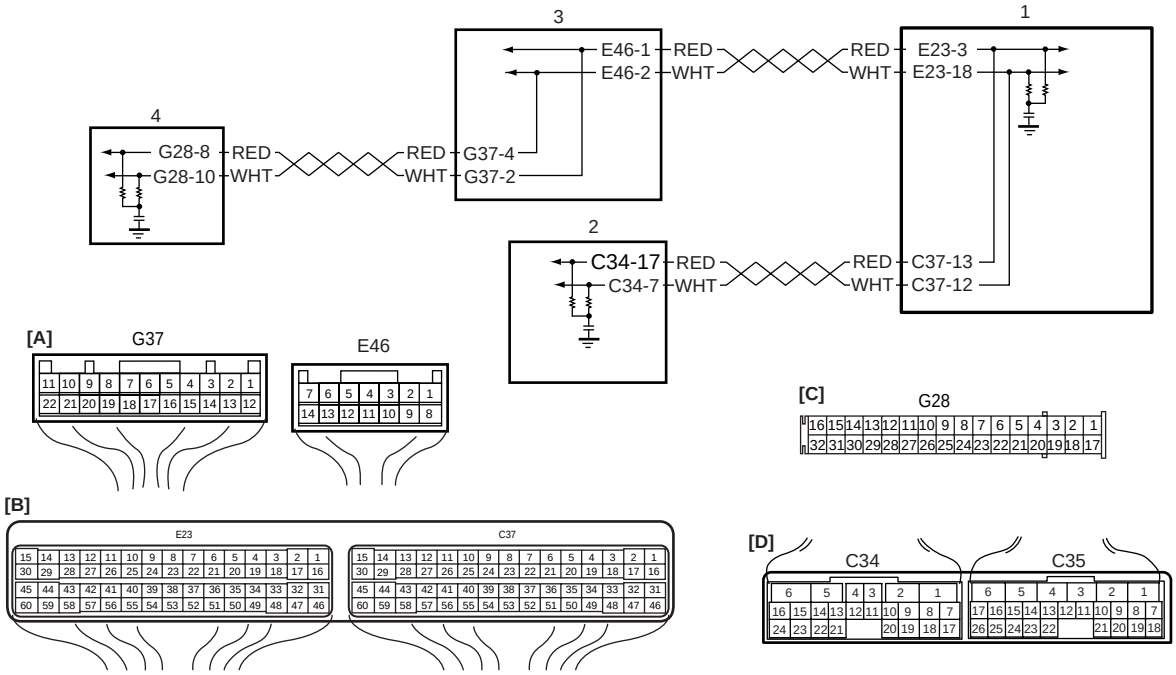
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**"3" position switch circuit for operation** 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check "3" position switch signal on scan tool data display when shifting select lever to each range. *Does indicate "3" position switch (O/D OFF switch) condition OFF when shifting select lever to "P", "R", "N" and "L" range?*	Substitute a known-good TCM and recheck.	Go to Step 3.

Step	Action	Yes	No
3	**“3” position switch signal inspection** With ignition switch ON, check voltage between “L01-8” terminal of BCM coupler and ground. **“3” position switch specifications** **Shift selector lever to “3” or “2” range: Battery voltage** **Shift selector lever to other above range: 0 V** *Is the result as specified?*	Substitute a known-good BCM and recheck.	Go to Step 4.
4	**Check “3” position switch operation** *Is it in good condition?*	“LT GRN” wire shorted to ground.	Replace “3” position switch.

DTC P1774: Control Module Communication Bus Off

S4RS0A5104053

Wiring Diagram



I4RS0A510018-

1. ECM	4. Combination meter	[C]: Terminal arrangement of Combination meter connector (viewed from harness side)
2. TCM	[A]: Terminal arrangement of BCM connector (viewed from harness side)	[D]: Terminal arrangement of TCM connector (viewed from harness side)
3. BCM	[B]: Terminal arrangement of ECM connector (viewed from harness side)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	• ECM • BCM • TCM • Combination meter • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM and BCM. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check ECM, TCM, BCM and combination meter connectors** 1) Check for proper connection at each ECM, TCM, BCM and combination meter connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1774?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
4	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check: ". *Is it in good condition?*	Go to Step 5.	Repair TCM power and/or ground circuits.
5	**Check DTC in BCM and ECM (bus off)** 1) Check DTC(s) in ECM and BCM. *Is there DTC(s) P1674 in ECM and/or U1073 in BCM?*	Go to Step 6.	Go to Step 7.
6	**Check DTC in BCM and ECM (bus off)** 1) Disconnect connectors from TCM with ignition switch turned OFF. 2) Check DTC(s) in ECM and BCM. *Is there DTC(s) P1674 in ECM and/or U1073 in BCM?*	Go to Step 7.	Substitute a known-good TCM and recheck.
7	**Check DTC in TCM** 1) Connect connectors to TCM and disconnect connectors from combination meter with ignition switch turned OFF. 2) Check DTC in TCM. *Is there DTC 1774?*	Go to Step 8.	Substitute a known-good combination meter and recheck.
8	**Check DTC in TCM** 1) Disconnect connector from ECM with ignition switch turned OFF. 2) Check DTC in TCM. *Is there DTC 1774?*	Go to Step 9.	Substitute a known-good ECM and recheck.

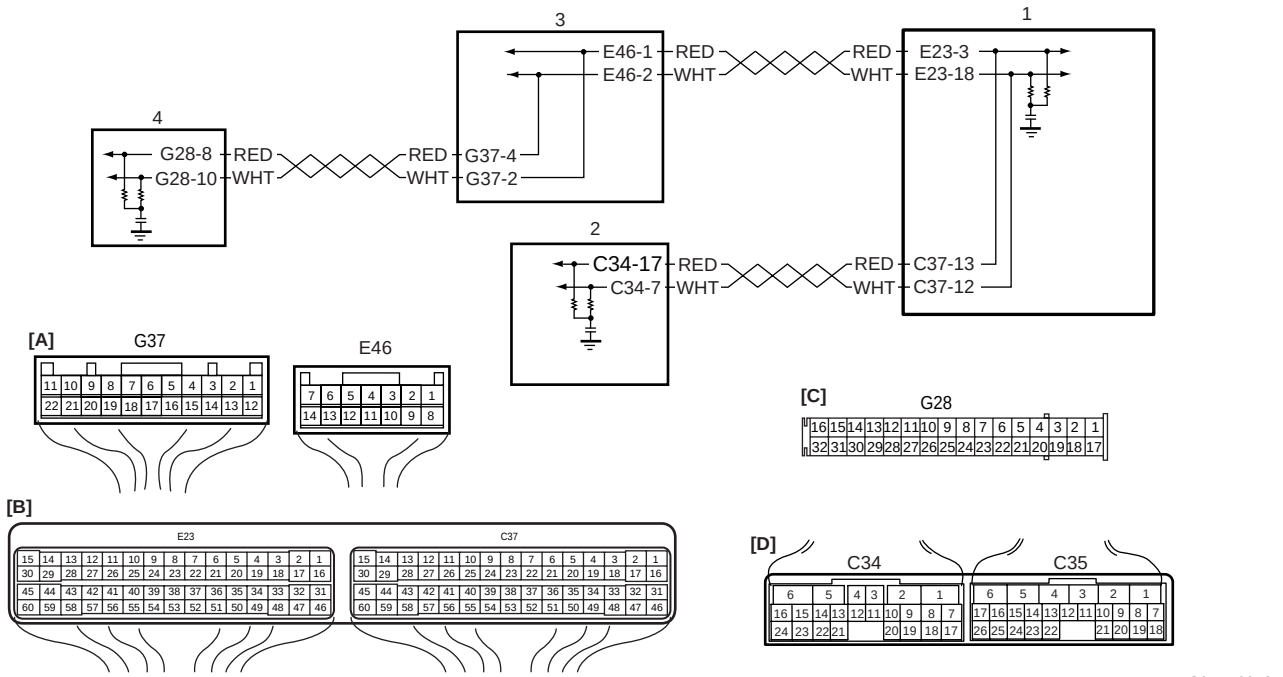
Step	Action	Yes	No
9	**Check CAN communication line circuit insulation** 1) Disconnect connectors from ECM, BCM, TCM and combination meter with ignition switch OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” and “E23-18” terminals of ECM connector • Between “C37-13” and “C37-12” terminals of ECM connector • Between “G37-4” and “G37-2” terminals of BCM connector *Is each resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
10	**Check CAN communication line circuit continuity** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and “E46-1” terminal of BCM connector • Between “E23-18” terminal of ECM connector and “E46-2” terminal of BCM connector • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector • Between “G37-4” terminal of BCM connector and “G28-8” terminal of combination meter connector • Between “G37-2” terminal of BCM connector and “G28-10” terminal of combination meter connector *Is each resistance below 1 Ω?*	Go to Step 11.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 12.	Repair shorted to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.

Step	Action	Yes	No
12	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Substitute a known-good BCM (included in junction block assembly) and recheck. If DTC is still detected, substitute a known-good ECM and recheck.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.

DTC P1775: High Speed CAN Communication Bus Off (Transmission Error)

S4RS0A5104054

Wiring Diagram



I4RS0A510018-

1. ECM	4. Combination meter	[C]: Terminal arrangement of Combination meter connector (viewed from harness side)
2. TCM	[A]: Terminal arrangement of BCM connector (viewed from harness side)	[D]: Terminal arrangement of TCM connector (viewed from harness side)
3. BCM	[B]: Terminal arrangement of ECM connector (viewed from harness side)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for TCM is detected more than specified time continuously.	• ECM • BCM • TCM • Combination meter • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

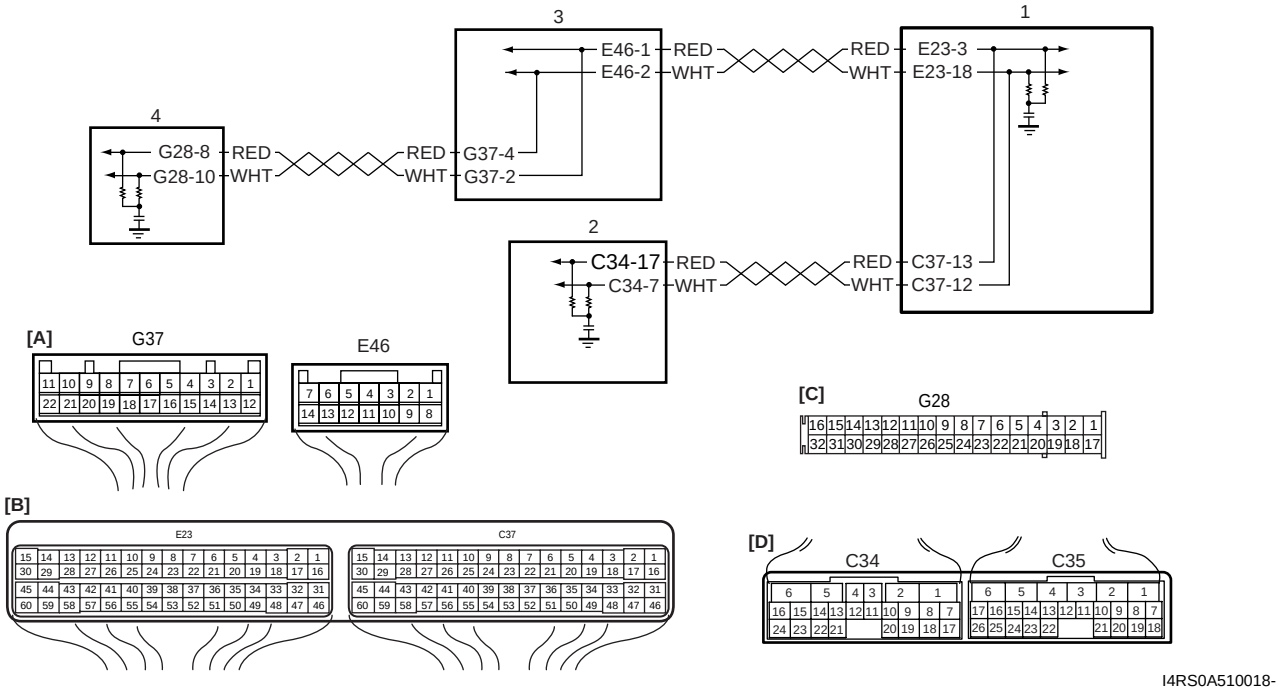
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM and BCM. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check TCM for CAN communication error** 1) Check DTC in TCM. *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off: ".	Go to Step 4.
4	**Check ECM and TCM connectors** 1) Check for proper connection at each ECM and TCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1775?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check: ". *Is it in good condition?*	Go to Step 6.	Repair TCM power and/or ground circuits.
6	**Check DTC in ECM and BCM** 1) Check DTC P1674 in ECM and DTC U1073 in BCM. *Is it indicated?*	Go to applicable DTC diag. flow.	Go to Step 7.
7	**Check CAN communication line circuit continuity** 1) Disconnect connectors from ECM and TCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "C37-13" terminal of ECM connector and "C34-17" terminal of TCM connector • Between "C37-12" terminal of ECM connector and "C34-7" terminal of TCM connector *Is each resistance below 1 Ω?*	Go to Step 8.	Repair open or high resistance CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".

Step	Action	Yes	No
8	**Check CAN communication line circuit insulation** 1) Measure resistance between “C34-17” and “C34-7” terminals of TCM connector. *Is resistance infinity?*	Go to Step 9.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
9	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between “C34-17” terminal of TCM connector and vehicle body ground • Between “C34-7” terminal of TCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 10.	Repair shorted to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
10	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “C34-17” terminal of TCM connector and vehicle body ground • Between “C34-7” terminal of TCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 11.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check ECM internal circuit** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connector • Between “E23-18” and “C37-12” terminals of ECM connector *Is resistance below 1 Ω?*	Substitute a known-good TCM and recheck.	Substitute a known-good ECM and recheck.

DTC P1777: TCM Lost Communication with ECM (Reception Error)

S4RS0A5104055

Wiring Diagram



I4RS0A510018-

1. ECM	4. Combination meter	[C]: Terminal arrangement of Combination meter connector (viewed from harness side)
2. TCM	[A]: Terminal arrangement of BCM connector (viewed from harness side)	[D]: Terminal arrangement of TCM connector (viewed from harness side)
3. BCM	[B]: Terminal arrangement of ECM connector (viewed from harness side)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for ECM is detected more than specified time continuously.	• ECM • BCM • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

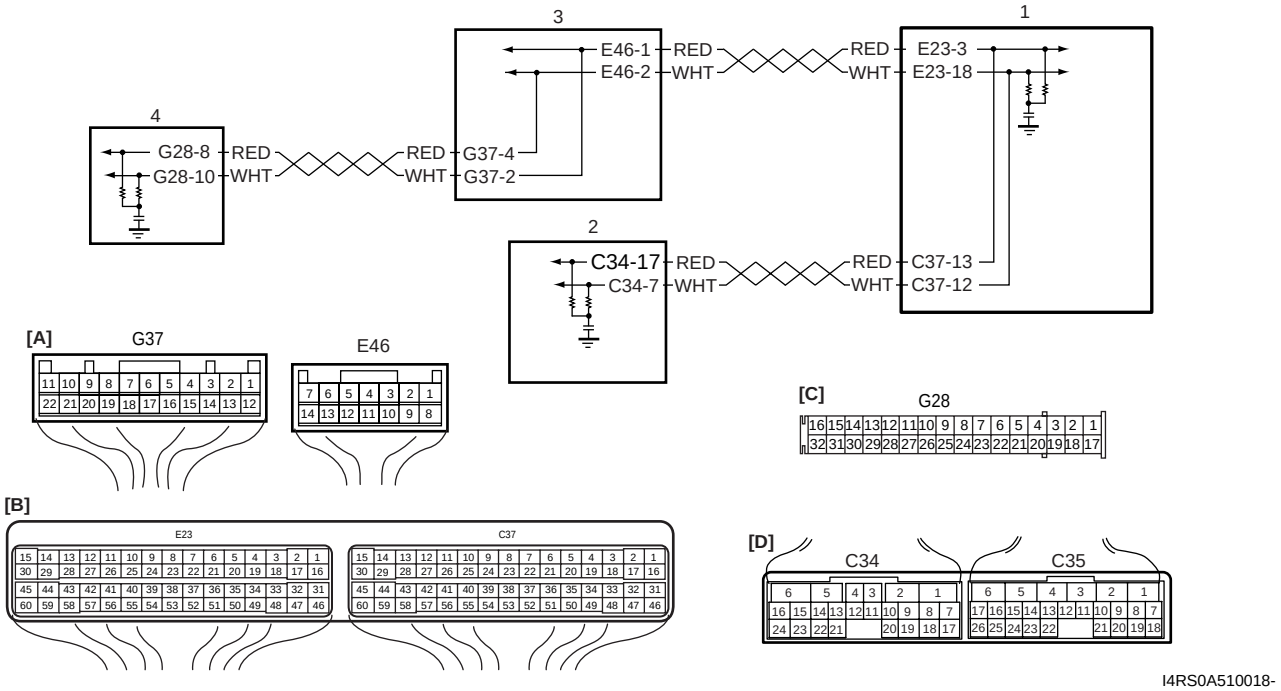
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM and BCM. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check TCM for CAN communication error** 1) Check DTC in TCM. *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off: ".	Go to Step 4.
4	**Check ECM and TCM connectors** 1) Check for proper connection at each ECM and TCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1777?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check: ". *Is it in good condition?*	Go to Step 6.	Repair TCM power and/or ground circuits.
6	**Check DTC for ECM** 1) Check DTC P1674 in ECM. *Is it indicated?*	Go to "DTC P1674: CAN Communication (Bus Off Error): in Section 1A".	Go to Step 7.
7	**Check CAN communication line circuit continuity** 1) Disconnect connectors from ECM and TCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "C37-13" terminal of ECM connector and "C34-17" terminal of TCM connector • Between "C37-12" terminal of ECM connector and "C34-7" terminal of TCM connector *Is each resistance below 1 Ω?*	Go to Step 8.	Repair open or high resistance CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".
8	**Check CAN communication line circuit insulation** 1) Measure resistance between "C34-17" and "C34-7" terminals of TCM connector. *Is resistance infinity?*	Go to Step 9.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".
9	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between "C34-17" terminal of TCM connector and vehicle body ground • Between "C34-7" terminal of TCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 10.	Repair shorted to ground of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".

Step	Action	Yes	No
10	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “C34-17” terminal of TCM connector and vehicle body ground • Between “C34-7” terminal of TCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 11.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check DTC in BCM** 1) Connect connectors to ECM and TCM with ignition switch turned OFF. 2) Check DTC U1100 in BCM. *Is it indicated?*	Substitute a known-good ECM and recheck.	Go to Step 12.
12	**Check ECM internal circuit** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connector • Between “E23-18” and “C37-12” terminals of ECM connector *Is resistance below 1 Ω?*	Substitute a known-good TCM and recheck.	Substitute a known-good ECM and recheck.

DTC P1778: TCM Lost Communication with BCM (Reception Error)

S4RS0A5104056

Wiring Diagram



I4RS0A510018-

1. ECM	4. Combination meter	[C]: Terminal arrangement of Combination meter connector (viewed from harness side)
2. TCM	[A]: Terminal arrangement of BCM connector (viewed from harness side)	[D]: Terminal arrangement of TCM connector (viewed from harness side)
3. BCM	[B]: Terminal arrangement of ECM connector (viewed from harness side)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for BCM is detected more than specified time continuously.	• ECM • TCM • BCM • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM and BCM. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.

Step	Action	Yes	No
3	**Check TCM for CAN communication error** 1) Check DTC in TCM. *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off: ".	Go to Step 4.
4	**Check ECM, TCM and BCM connectors** 1) Check for proper connection at each ECM, TCM and BCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1778?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check: ". *Is it in good condition?*	Go to Step 6.	Repair TCM power and/or ground circuits.
6	**Check DTC for BCM** 1) Check DTC U1073 in BCM. *Is it indicated?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: in Section 10B".	Go to Step 7.
7	**Check CAN communication line circuit continuity** 1) Disconnect connectors from TCM and BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "C34-17" terminal of TCM connector and "E46-1" terminal of BCM connector • Between "C34-7" terminal of TCM connector and "E46-2" terminal of BCM connector *Is each resistance below 1 Ω?*	Go to Step 9.	Go to Step 8.
8	**Check ECM internal circuit** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "E23-3" and "C37-13" terminals of ECM connector • Between "E23-18" and "C37-12" terminals of ECM connector *Is resistance below 1 Ω?*	Repair open or high resistance CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".	Substitute a known-good ECM and recheck.
9	**Check CAN communication line circuit insulation** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "E23-3" and "E23-18" terminals of ECM connector • Between "C37-13" and "C37-12" terminals of ECM connector *Is resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".

Step	Action	Yes	No
10	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 11.	Repair shorted to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 12.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
12	**Check DTC for ECM** 1) Connect connectors to ECM and BCM with ignition switch turned OFF. 2) Check DTC P1678 in ECM. *Is it indicated?*	Substitute a known-good BCM and recheck.	Substitute a known-good TCM and recheck.

DTC P1878: Torque Converter Clutch Shudder

S4RS0A5104057

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
The acceleration slip control function stops when the variation in the output revolution speed of the specified amplitude and specified cycle is detected within a specified period of time. When the specified variation is not detected after the acceleration slip control stops.	• Mismatching ATF • Torque converter clutch malfunction • Valve body

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and warm it up to normal operating temperature.
4) Drive vehicle with 3rd or 4th gear in “D” range and slip controlled lock-up ON for 20 seconds or longer referring to “Automatic Gear Shift Table: ”.
5) Stop vehicle.
6) Check DTC, pending DTC and freeze-frame data.

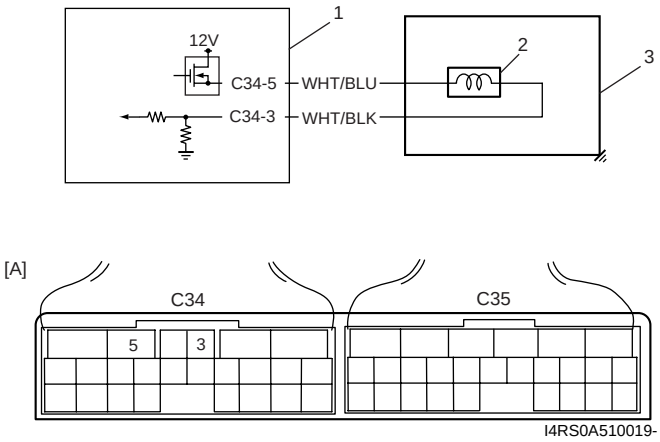
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	Change A/T fluid referring to “A/T Fluid Change: ”. Check DTC after performing “DTC Confirmation Procedure”. *Is DTC P1878 still indicated?*	Faulty torque converter clutch. Replace torque converter.	System is in good condition.

DTC P2763: Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit High

S4RS0A5104037

Wiring Diagram



1. TCC lock-up pressure control solenoid valve	3. A/T
2. TCM	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TCC lock-up pressure control solenoid valve TCM terminal is high although TCM is commanding TCC lock-up pressure control solenoid to turn OFF.	• TCC lock-up pressure control solenoid valve circuit shorted to ground • Malfunction of TCC lock-up pressure control solenoid valve • TCM

DTC Confirmation Procedure

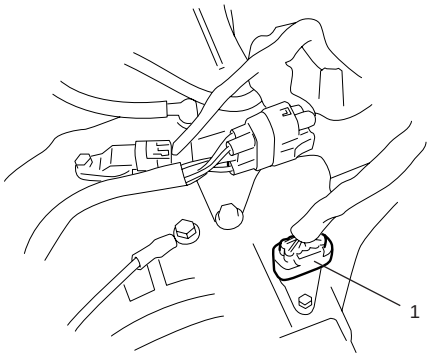
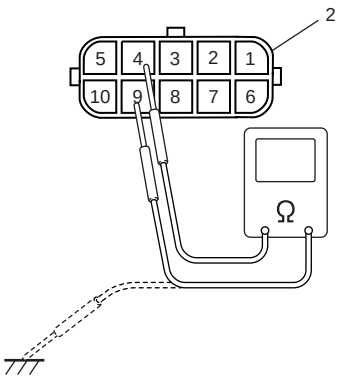
WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed in “P” range for 10 seconds or more.
5) Check DTC.

DTC Troubleshooting

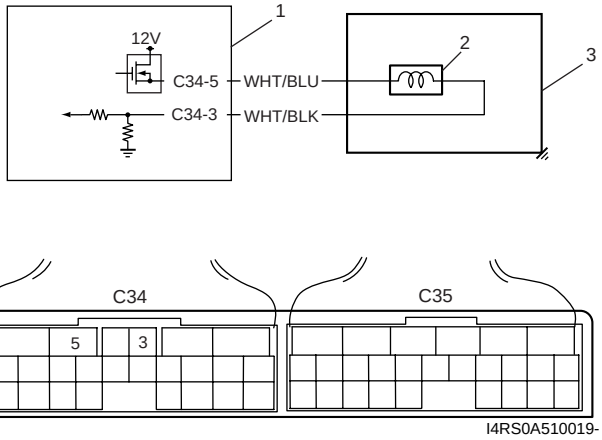
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.

Step	Action	Yes	No
2	**Check TCC solenoid valve circuit for IG short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal “C34-3” and “C34-5”. 4) If connection is OK, turn ignition switch ON and measure voltage between terminal “C34-3” of disconnected harness side TCM connector and ground between terminal “C34-5” of disconnected harness side TCM connector and ground. *Are voltage 1 V or less?*	Go to Step 3.	“WHT/BLU” or “WHT/BLK” circuit shorted to power circuit.
3	**Check TCC lock-up pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at “WHT/BLU” and “WHT/BLK” circuits. 4) Check resistance of TCC lock-up pressure control solenoid valve. **TCC lock-up pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle side valve body harness connector and transaxle: Infinity**   I4RS0A510020- *Is check results satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Replace TCC lock-up pressure control solenoid valve or lead wire.

DTC P2764: Torque Converter Clutch (TCC) Circuit Pressure Control Solenoid Control Circuit Low

S4RS0A5104036

Wiring Diagram



I4RS0A510019-

1. TCC pressure control solenoid valve	3. A/T
2. TCM	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TCC lock-up pressure control solenoid valve TCM terminal is low although TCM is commanding TCC lock-up pressure control solenoid to turn ON.	• TCC lock-up pressure control solenoid valve circuit shorted to ground • Malfunction of TCC lock-up pressure control solenoid valve • TCM

DTC Confirmation Procedure

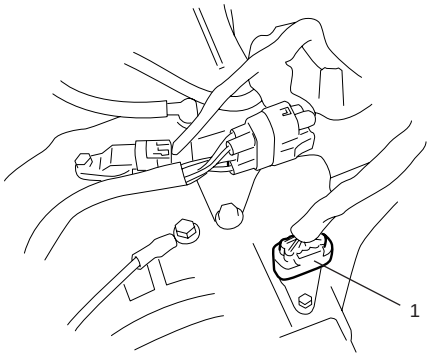
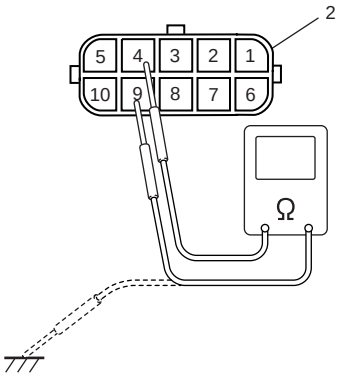
WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed in “P” range for 20 seconds or more.
5) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.

Step	Action	Yes	No
2	**Check TCC lock-up pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at “WHT/BLU” and “WHT/BLK” circuits. 4) Check resistance of TCC lock-up pressure control solenoid valve. **TCC lock-up pressure control solenoid valve resistance** **Between shift terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between shift terminals of transaxle side valve body harness connector and transaxle: Infinity**   I4RS0A510020- *Is check results satisfactory?*	Go to Step 3.	Replace TCC lock-up pressure control solenoid valve or lead wire.
3	**Check TCC lock-up pressure control solenoid valve circuit for ground short** 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals “C34-3” and “C34-5”. 3) If connection is OK, check continuity between terminal “C34-5” of disconnected harness side TCM connector and ground, between terminal “C34-3” of disconnected harness side TCM connector and ground. *Are continuity indicated?*	“WHT/BLU” or “WHT/BLK” circuit shorted to ground.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.

Inspection of TCM and Its Circuits

S4RS0A5104038

TCM and its circuits can be checked at TCM wiring connectors by measuring voltage, pulse signal and resistance.

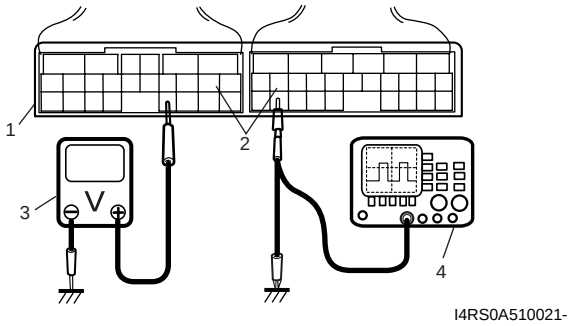
CAUTION:

TCM cannot be checked by itself, it is strictly prohibited to connect voltmeter or ohmmeter to TCM with connector disconnected from it.

1) Remove TCM (1) from vehicle referring to “Transmission Control Module (TCM) Removal and Installation: ”.
2) Connect TCM connectors (2) to TCM.
3) Check voltage and/or pulse signal at each terminal of connectors connected, using voltmeter (3) and oscilloscope (4).

NOTE:

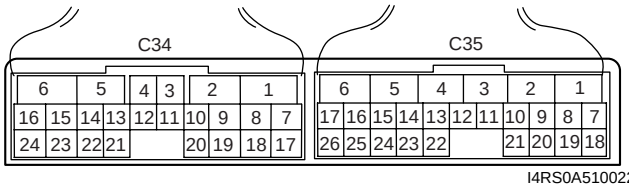
- **As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Voltage with asterisk(*) cannot be measured by voltmeter because it is pulse signal. check it with oscilloscope if necessary.**



I4RS0A510021-

3. Body ground

Terminal arrangement of TCM coupler (Viewed from harness side)



I4RS0A510022-

Connector “C34”

Terminal	Wire color	Circuit	Standard voltage	Condition
1	BLK	Ground	0 – 1 V	Ignition switch ON
2	LT GRN/ BLK	Pressure control solenoid valve (–)	0.6 – 1.0 V	Ignition switch ON
3	WHT/BLK	TCC pressure control solenoid valve (–)	0.6 – 1.0 V	Ignition switch ON
4	GRY	Pressure control solenoid valve (+)	*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No. 1: ”)	Engine running at idling. (Output signal is duty pulse. Duty ratio varies depending on throttle valve opening.)

Terminal	Wire color	Circuit	Standard voltage	Condition
5	WHT/BLU	TCC pressure control solenoid valve (+)	*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No. 2: ”)	Engine running at idling (Output signal is duty pulse. Duty ratio varies depending on torque converter clutch operating condition).
6	YEL/BLK	Power source	10 – 14 V	Ignition switch ON
7	WHT	CAN communication line (Low)	*2.5 – 3.6 V ↑↓ 1.6 – 2.5 V (“Reference waveform No. 3: ”)	Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.))
8	—	—	—	—
9	—	—	—	—
10	—	—	—	—
11	LT GRN	Transmission fluid temperature sensor (+)	2.9 – 3.1 V	Ignition switch ON, fluid temperature is 20 °C (68 °F)
			0.3 – 0.5 V	Ignition switch ON, fluid temperature is 100 °C (212 °F)
12	ORN	Transmission fluid temperature sensor (–)	0 – 1 V	Ignition switch ON
13	—	—	—	—
14	BLU/BLK	Timing solenoid valve	0 – 1 V	Ignition switch ON
15	BLK/YEL	Shift solenoid valve-B (No.2)	9 – 14 V	Ignition switch ON, select lever in “P” range
16	BRN	Shift solenoid valve-A (No.1)	9 – 14 V	Ignition switch ON, select lever in “P” range
17	RED	CAN communication line (High)	*2.5 – 3.6 V ↑↓ 1.6 – 2.5 V (“Reference waveform No. 3: ”)	Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.)
18	—	—	—	—
19	—	—	—	—
20	—	—	—	—
21	—	—	—	—
22	—	—	—	—
23	BLK	Ground	0 – 1 V	Ignition switch ON
24	WHT/RED	Power source for back-up	10 – 14 V	Constantly

Connector “C35”

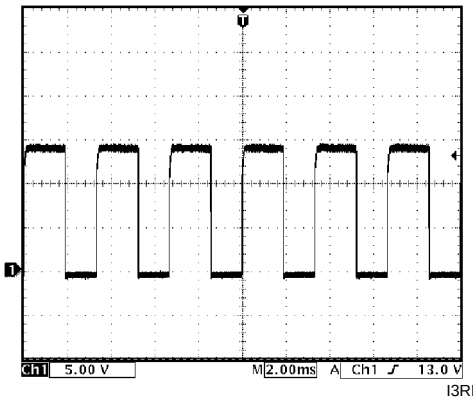
Terminal	Wire color	Circuit	Standard voltage	Condition
1	RED	Transmission range sensor (“R” range)	8 – 14 V	Ignition switch ON, selector lever at “R” range
			0 – 1 V	Ignition switch ON, selector lever at other than “R” range
2	—	—	—	—
3	—	—	—	—
4	—	—	—	—
5	—	—	—	—
6	WHT	Input shaft speed sensor (+)	2 – 3 V	Ignition switch turned ON, engine stops.
			*(“Reference waveform No. 4: ”)	While engine running. (Output signal is waveform. Waveform frequency varies depending on output shaft speed. (16 pulses are generated par 1 input shaft revolution.))

Terminal	Wire color	Circuit	Standard voltage	Condition
7	GRN	Transmission range sensor (“D” range)	8 – 14 V	Ignition switch ON, selector lever at “D” range
			0 – 1 V	Ignition switch ON, selector lever at other than “D” range
8	GRN/ORN	Transmission range sensor (“N” range)	8 – 14 V	Ignition switch ON, selector lever at “N” range
			0 – 1 V	Ignition switch ON, selector lever at other than “N” range
9	—	—	—	—
10	—	—	—	—
11	—	—	—	—
12	—	—	—	—
13	—	—	—	—
14	—	—	—	—
15	—	—	—	—
16	BLK	Input shaft speed sensor (–)	2 – 3 V	Ignition switch ON, engine at stop
17	—	—	—	—
18	LT GRN/ BLK	Transmission range sensor (“L” range)	8 – 14 V	Ignition switch ON, selector lever at “L” range
			0 – 1 V	Ignition switch ON, selector lever at other than “L” range
19	GRN/YEL	Transmission range sensor (“2” range)	8 – 14 V	Ignition switch ON, selector lever at “2” range
			0 – 1 V	Ignition switch ON, selector lever at other than “2” range
20	PNK/BLK	Transmission range sensor (“P” range)	8 – 14 V	Ignition switch ON, selector lever at “P” range
			0 – 1 V	Ignition switch ON, selector lever at other than “P” range
21	—	—	—	—
22	—	—	—	—
23	PPL/WHT	Data link connector	8 – 14 V	Ignition switch ON
24	—	—	—	—
25	PPL	Output shaft speed sensor (VSS)	8 – 14 V	Ignition switch ON
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No. 5: ”)	Vehicle running. (Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (8190 pulses are generated par 60 km/h, 37.5 mile/h)
26	—	—	—	—

Reference waveform No. 1

Pressure control solenoid valve signal at engine idling.

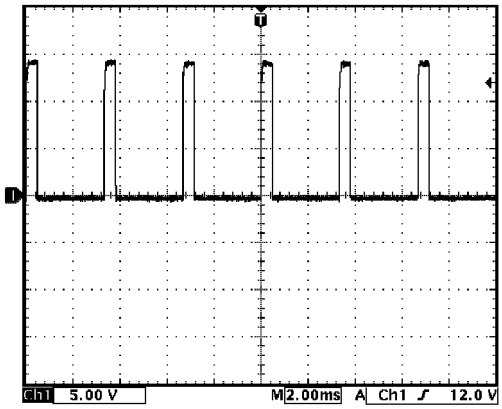
Measurement terminal	CH1: “C34-4” to “C34-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 20 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range.



I3RM0B510029-

Reference waveform No. 2
TCC pressure control solenoid valve signal at engine idling.

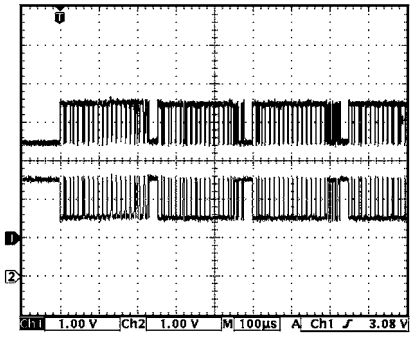
Measurement terminal	CH1: “C34-5” to “C34-1”
Oscilloscope setting	CH1: 5 V/DIV Time: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range



I4RS0A510024-

Reference waveform No. 3
CAN communication line (High & Low) signal at engine idling.

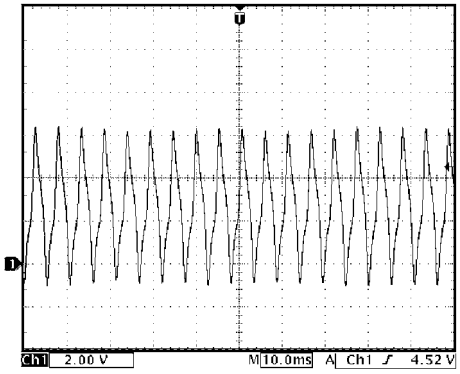
Measurement terminal	CH1: “C34-7” to “C34-1” CH2: “C34-17” to “C34-1”
Oscilloscope setting	CH1: 1 V/DIV TIME: 100 μs/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range.



I3RM0B510030-

Reference waveform No. 4
Input shaft speed sensor signal at engine idling.

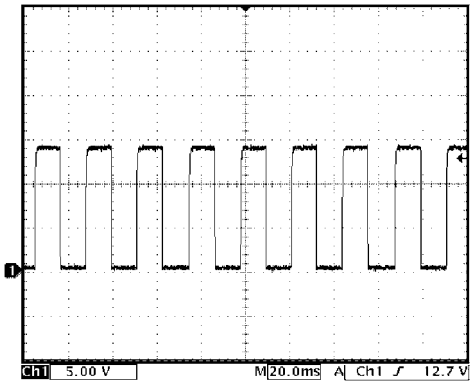
Measurement terminal	CH1: “C35-6” to “C34-1”
Oscilloscope setting	CH1: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range.



I3RM0B510027-

Reference waveform No. 5
Output shaft speed sensor (VSS) signal at vehicle speed 60 km/h (37 mile/h).

Measurement terminal	CH1: “C35-25” to “C34-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 60 km/h (37 mile/h).

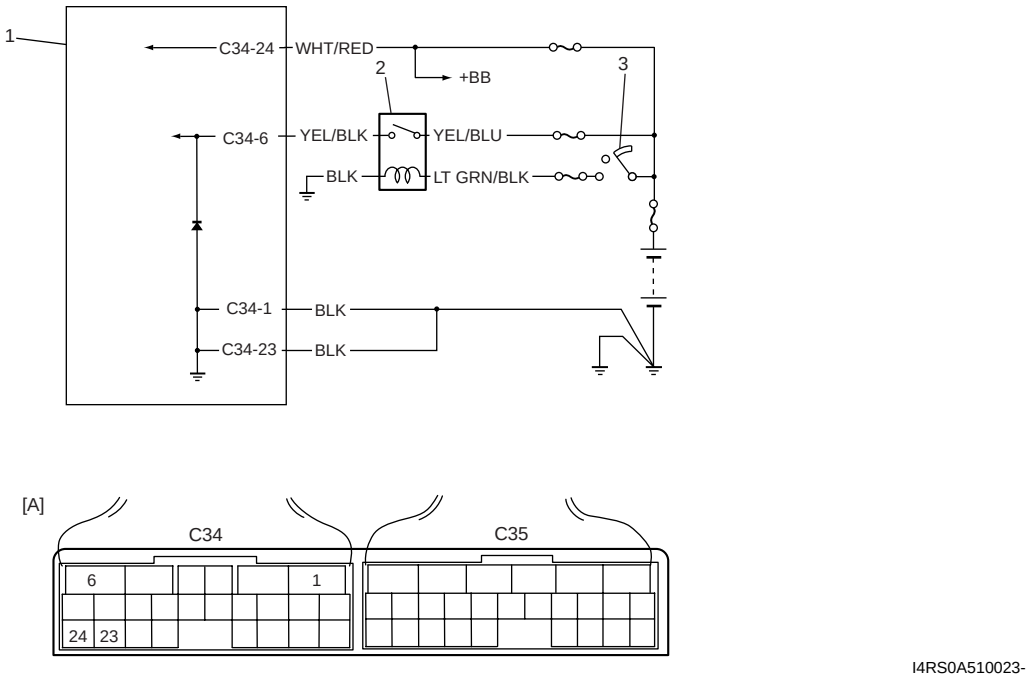


I3RM0B510028-

TCM Power and Ground Circuit Check

S4RS0A5104039

Wiring Diagram



I4RS0A510023-

1. TCM	3. Ignition switch
2. A/T relay	[A]: Terminal arrangement of TCM connector (viewed from harness side)

Troubleshooting

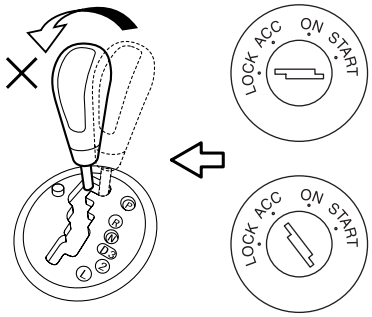
Step	Action	Yes	No
1	**Check TCM back-up power circuit** 1) Disconnect TCM connector with ignition switch OFF. 2) Check for proper connection to TCM at “C34-24” terminal. 3) If OK, check voltage at terminal “C34-24” of disconnected TCM connector. *Is it 10 – 14 V?*	Go to Step 2.	“WHT/RED” circuit open or shorted to ground.
2	**Check TCM power circuit** 1) Disconnect TCM connector with ignition switch OFF. 2) Check for proper connection to TCM at “C34-6” terminal. 3) If OK, turn ignition switch ON and check voltage at terminal “C34-6” of disconnected TCM connector. *Is it 10 – 14 V?*	Go to Step 4.	Go to Step 3.
3	**Check A/T relay operation** 1) Check A/T relay operation referring to “A/T Relay Inspection: ”. *Is check result satisfactory?*	“YEL/BLK”, “YEL/BLU”, “LT GRN/BLK” or “BLK” circuit for power supply open.	Replace A/T relay.

Step	Action	Yes	No
4	**Check TCM ground circuit** 1) Turn ignition switch OFF. 2) With TCM connectors disconnected, check for proper connection to TCM at “C34-1” / “C34-23” terminal. 3) If OK, check resistance between “C34-1” / “C34-23” terminal of disconnected TCM connector and body ground. *Is continuity indicated?*	TCM power and ground circuits are in good condition.	“BLK” circuit for TCM ground open.

Brake Interlock System Inspection

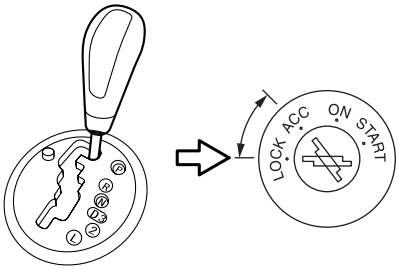
S4RS0A5104058

1) Check that selector lever cannot be moved to any other range from “P” range position when ignition switch key is at ACC position, at LOCK position or it is removed from keyhole of ignition switch, or brake pedal is not depressed.



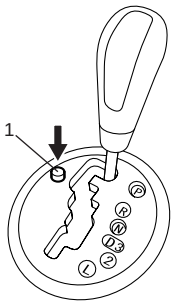
I4RS0A510047-

2) Shift selector lever to “P” range position, release knob button and check for the following.
   - Ignition key can be turned between LOCK and ACC positions back and forth and also it can be removed from ignition switch.



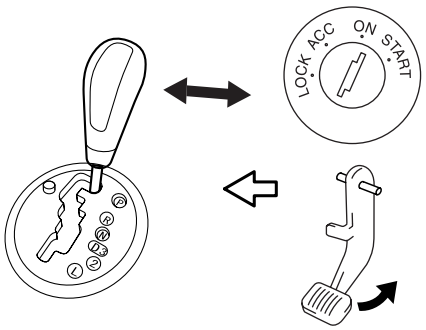
I4RS0A510048-

   - With shift lock solenoid release button (1) pushed and ignition key turned to ACC position, selector lever can be shifted from “P” range position to any other range.
   - With shift lock solenoid release button (1) pushed and ignition key turned to LOCK position, selector lever can not be shifted from “P” range position to any other range.



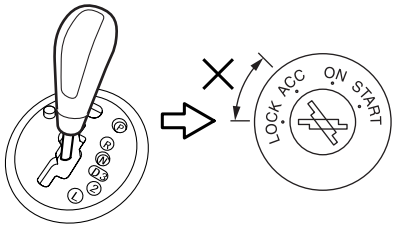
I4RS0A510049-

   - When ignition switch is turned ON and brake pedal is depressed, selector lever can be shifted from “P” range position to any other range.



I4RS0A510050-

3) With ignition lever shifted to any position other than “P” range, check that ignition key cannot be turned LOCK position and it cannot be removed from ignition switch unless it is at LOCK position.



I4RS0A510051-

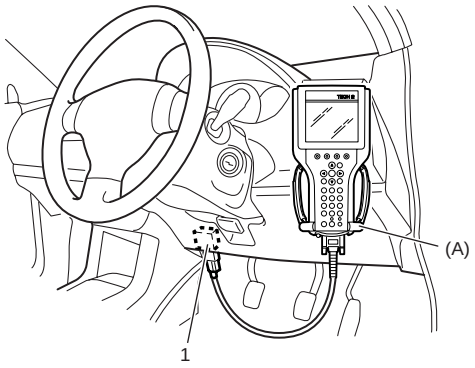
Repair Instructions

Learning Control Initialization

S4RS0A5106067

1) Connect san tool to DLC (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



I4RS0A510009-

2) Start engine and shift selector lever to “P” range.
3) Select “Misc Test” mode on scan tool.
4) Perform “AT learned initialize” on scan tool.

A/T Fluid Level Check

S4RS0A5106001

CAUTION:

Do not use any fluid other than the specified ATF. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.

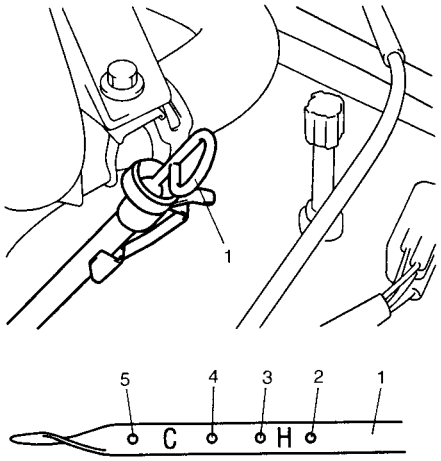
Level Check at Normal Operating (Hot) Temperature – Hot Check

1) Stop vehicle and place it level.
2) Apply parking brake and place chocks against wheels.
3) With selector at “P” position, start engine.
4) Warm up engine till fluid temperature reaches normal operating temperature (70 – 80 °C / 158 – 176 °F). As a guide to check fluid temperature, warm up engine to normal operating.
5) Keep engine idling and shift selector slowly to “L” and back to “P” position.
6) With engine idling, pull out fluid level gauge, wipe it off with a clean cloth and put it back into place.
7) Pull out fluid level gauge (1) again and check fluid level indicated on it. The lowest fluid level should be between FULL HOT (2) and LOW HOT (3). If it is below LOW HOT, add SUZUKI ATF 3317 or Mobil ATF 3309 up to FULL HOT.

Automatic transaxle fluid
SUZUKI ATF 3317 or Mobil ATF 3309

NOTE:

- **Do not race engine while checking fluid level, even after the engine start.**
- **Do not overfill. Overfilling can cause foaming and loss of fluid through breather. Then slippage and transaxle failure can result.**
- **Bringing the level from LOW HOT to FULL HOT requires 0.4 liters (0.85 / 0.70 US/Imp. pt).**
- **If vehicle was driven under high load such as pulling a trailer, fluid level should be checked about half an hour after it is stopped.**



I3RM0B510032-

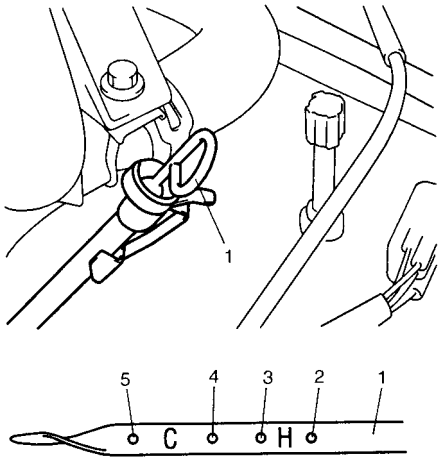
4. “FULL COLD” mark	5. “LOW COLD” mark

Level Check at Room (Cold) Temperature – Cold Check

Fluid level can be checked temporarily at room (cold) temperature which correspond to 20 – 30 °C (68 – 86 °F). This level check is considered to be preparation before performing level check under normal operating (hot) temperature. Checking procedure itself is the same as that described in “Level Check at Normal Operating (Hot) Temperature – Hot Check: ”. If fluid level is between “FULL COLD” (4) and “LOW COLD” (5), proceed to test drive. And when fluid temperature has reached normal operating temperature, check fluid level again and adjust it as necessary.

CAUTION:

Fluid level check at room (cold) temperature is recommended only for preparation of level check under normal (hot) operating condition.
Failure to perform fluid level check under normal (hot) operating temperature may result in damage to transaxle.



I3RM0B510032-

1. Fluid level gauge	3. “LOW HOT” mark
2. “FULL HOT” mark	

A/T Fluid Change

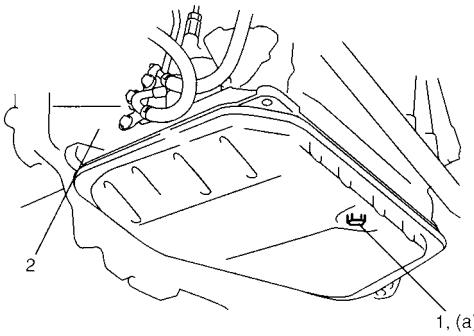
S4RS0A5106002

CAUTION:

Do not use any fluid other than the specified ATF. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.

1) Lift up vehicle.
2) When engine is cool, remove drain plug (1) from transaxle housing (2) and drain A/T fluid.
3) Install drain plug (1).

Tightening torque
A/T fluid drain plug (a): 17 N·m (1.7 kg-m, 12.5 lb-ft)

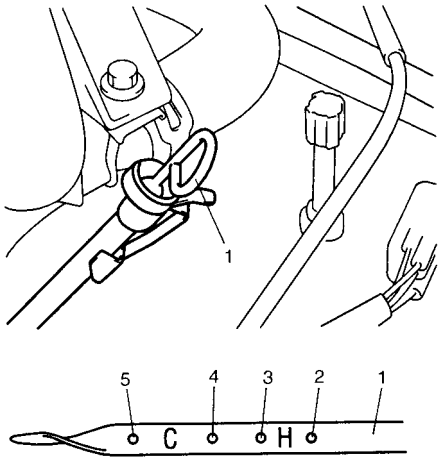


I3RM0B510033-

4) Lower vehicle and pour proper amount of SUZUKI ATF 3317 or Mobil ATF 3309.
5) Check fluid level referring to “A/T Fluid Level Check: ”.

Automatic transaxle fluid
SUZUKI ATF 3317 or Mobil ATF 3309

Automatic transaxle fluid capacity
When draining from drain plug hole: 3.3 liters (6.97 / 5.81 US/Imp. pt.)
When overhauling: 5.6 liters (11.83 / 9.86 US/Imp. pt.)

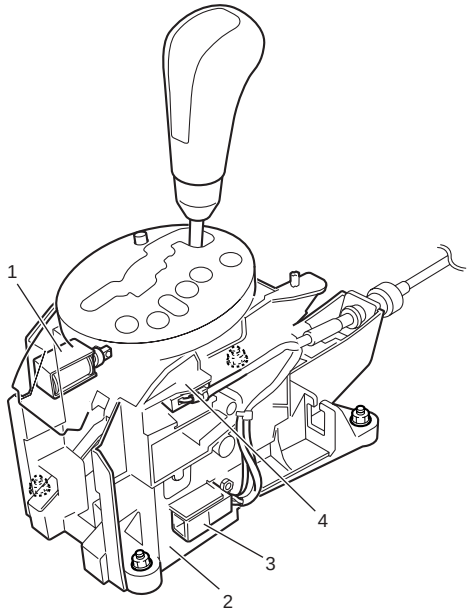


I3RM0B510032-

1. Fluid level gauge	4. “FULL COLD” mark
2. “FULL HOT” mark	5. “LOW COLD” mark
3. “LOW HOT” mark	

Selector Lever Components

S4RS0A5106004



I4RS0A510052-

1. Shift lock solenoid	3. Connector
2. Selector lever assembly	4. “3” position switch

Select Lever Assembly Installation

S4RS0A5106068

Note the following when installing select lever assembly:

- After installing select lever assembly, adjust select cable referring to “Select Cable Adjustment: ”.

Select Lever Knob Installation

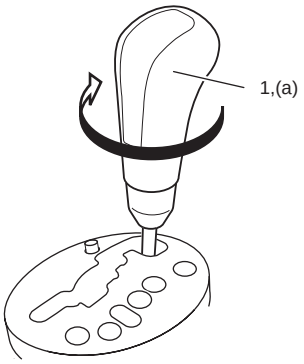
S4RS0A5106069

Screw select lever knob onto select lever by specified numbers of rotation below.

Rotation numbers for select lever knob
Installation (a): 11 – 12 rotations

CAUTION:

When installing select lever knob, do not turn more than specified numbers of rotation. Otherwise select lever knob is damaged.



I4RS0A510058-

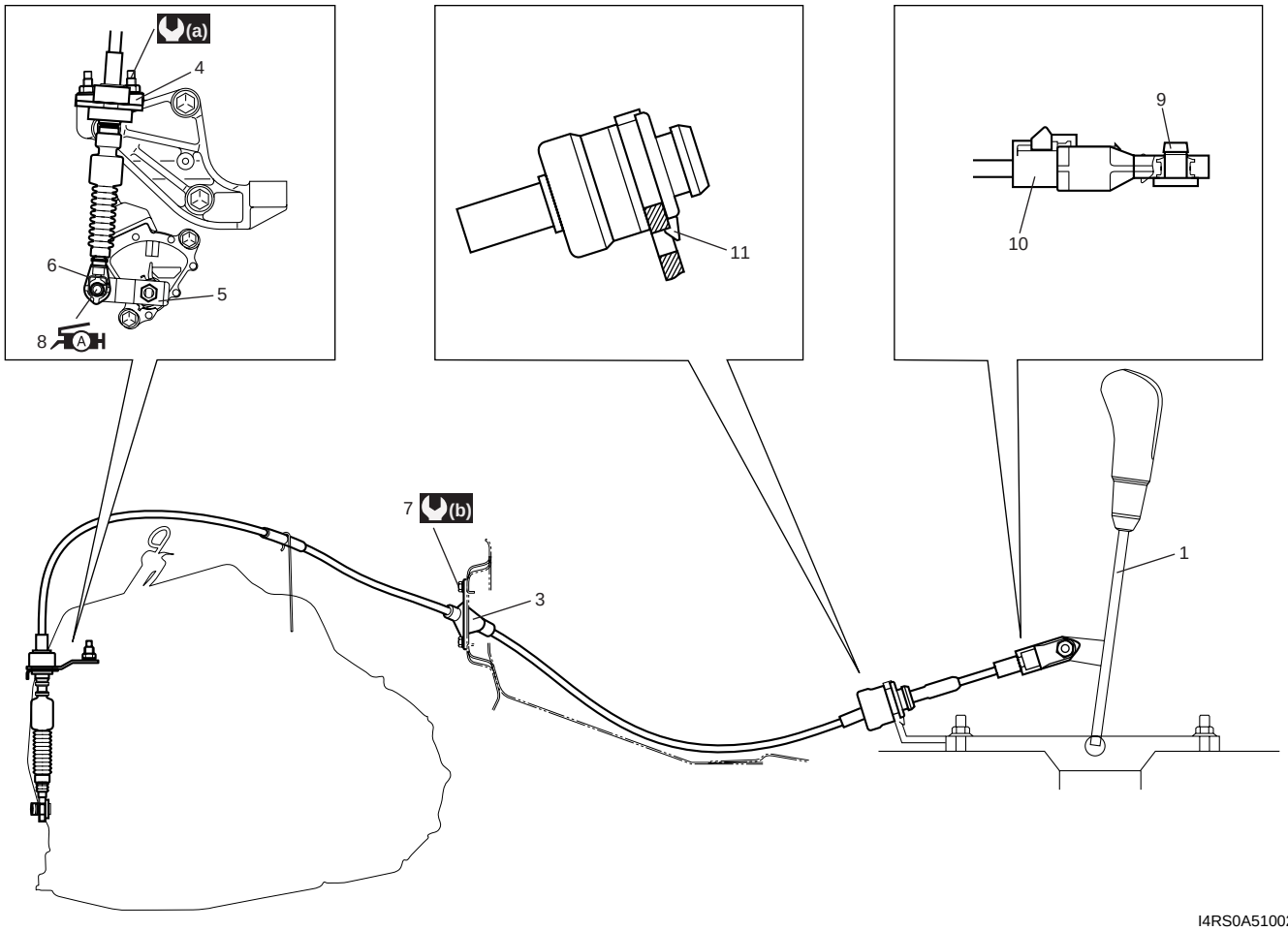
Selector Lever Inspection

S4RS0A5106005

Check select lever for smooth and clear-cut movement individually. If a malfunction is found, replace select lever assembly.

Select Cable Components

S4RS0A5106006



I4RS0A510025-

1. Selector lever assembly	6. Clip	11. Lock
2. Select cable	7. Select cable retainer bolt	(a): 23 N·m (2.0 kg-m, 17.0 lb-ft)
3. Select cable retainer	8. Manual select lever pin : Apply lithium grease 99000-25010 to all around pin (0.15 g)	(b): 5.0 N·m (0.55 kg-m, 4.0 lb-ft)
4. Cable bracket	9. Selector lever pin : Apply lithium grease 99000-25010 to all around pin (0.15 g)	: Tightening torque
5. Manual select lever	10. Adjuster case	

Select Cable Removal and Installation

S4RS0A5106003

Removal

1) Remove parking brake lever cover.
2) Remove console box.
3) Disconnect select cable from selector lever and then detach from bracket.
4) Remove clip and disconnect select cable from manual select lever.
5) Remove select cable retainer from dash panel.

Installation

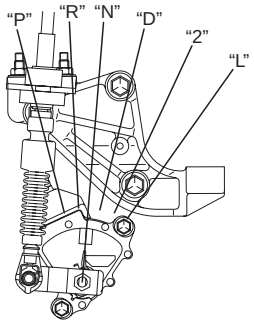
Install select cable by reversing removal procedure.
The important steps in installation are as follows.

- Apply grease to pin and cable joint.
- Tighten bolts to specified torque referring to “Select Cable Components: ”.
- Adjusting procedure is as follows. Refer to “Select Cable Adjustment: ”.

Select Cable Adjustment

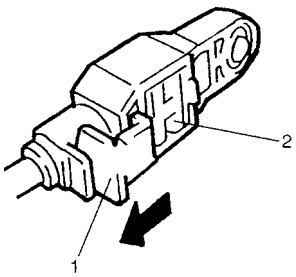
S4RS0A5106007

1) Shift manual shift lever to “N” range (transmission range sensor “N” range).



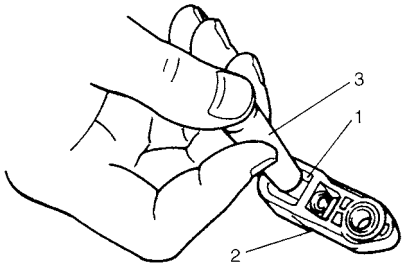
I3RM0B510036-

2) Remove adjuster (cable end) from selector lever pin of selector lever assembly.
3) Release lock plate (1) which restrict moving of cable end holder (2).



I2RH01510046-

4) Push cable end holder (1) out from eye-end (2) using an appropriate tool (3) to disengage cable.

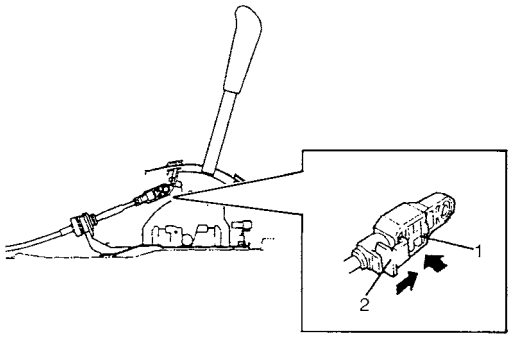


I2RH01510047-

5) Shift selector lever to “N” position.
6) Apply grease to selector lever pin and install adjuster (cable end) to it.

: Grease 99000–25010

7) With both selector lever and transmission range sensor kept each “N” position, drive cable end holder (1) in until it locks cable.
8) Slide lock plate (2) to secure cable end holder in position.



I3RM0B510037-

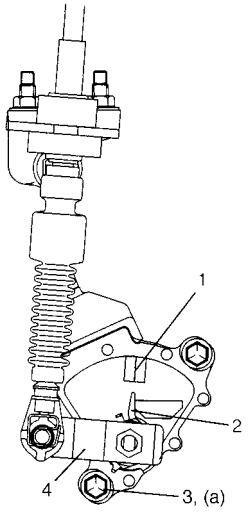
9) After select cable was installed, check for the following.
   - Push vehicle with selector lever shifted to “P” range. Vehicle should not move.
   - Vehicle can not be driven in “N” range.
   - Vehicle can be driven in “D”, “3”, “2” and “L” ranges.
   - Vehicle can be backed in “R” range.

Transmission Range Sensor (Shift Switch) Inspection and Adjustment

S4RS0A5106008

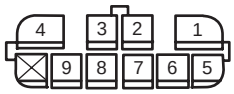
1) Shift manual select lever (4) to “N” range.
2) Check that needle direction shaped on lock washer (2) and “N” reference line (1) on transmission range sensor are aligned. If not, loosen sensor bolts (3) and align them.

Tightening torque
Transmission range sensor bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



I3RM0B510038-

3) Check that engine starts in “N” and “P” ranges but it doesn’t start in “D”, “2”, “L” or “R” range. Also, check that back-up lamp lights in “R” range.
If faulty condition cannot be corrected by adjustment, disconnect transmission range sensor connector and check that continuity exists as shown by moving manual select lever.



Sensor Position	Terminal No. 1	2	3	4	5	6	7	8	9
P	○			○			○		○
R							○	○	
N	○			○	○		○		
D			○				○		
2						○	○		
L		○					○		

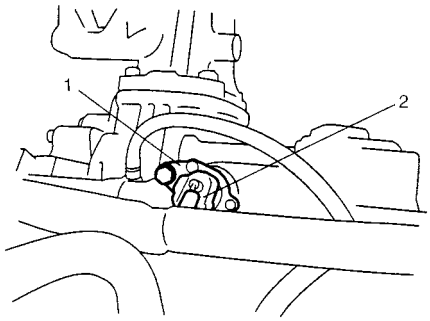
I3RM0B510039-

Output Shaft Speed Sensor (VSS) Removal and Installation

S4RS0A5106009

Removal

1) Disconnect negative cable at battery.
2) Disconnect output shaft speed sensor connector (2).
3) Remove output shaft speed sensor (VSS) (1) by removing its bolt.



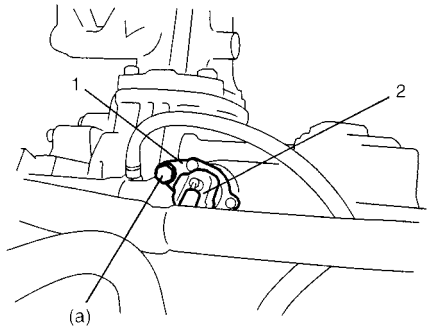
I3RM0B510040-

Installation

1) Apply A/T fluid to output shaft speed sensor O-ring.
2) Install output shaft speed sensor (VSS) (1) to A/T case and tighten bolt to specified torque.

Tightening torque
Output shaft speed sensor (VSS) bolt (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

3) Connect output shaft speed sensor connector (2) to output shaft speed sensor (VSS) (1).



I3RM0B510041-

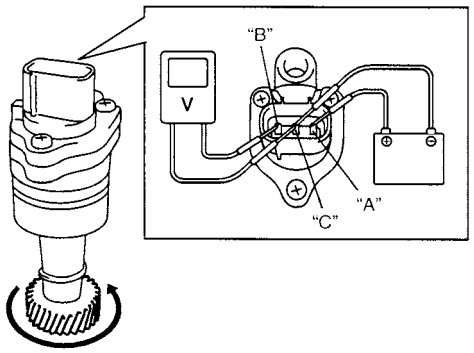
4) Connect negative cable to battery.

Output Shaft Speed Sensor (VSS) Inspection

S4RS0A5106010

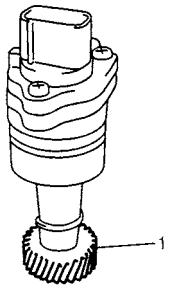
1) Connect positive cable of 12 volt battery to “A” terminal of sensor and ground cable to “C” terminal. Then using voltmeter, check voltage between “B” terminal and “C” terminal with output shaft speed sensor (VSS) driven gear rotated.
If measured voltage (pulse signal) is not as specified, replace sensor.

Output shaft speed sensor (VSS) output voltage
Pulse signal of alternating 0 – 1 V and 10 – 14 V



I2RH0B510045-

2) Check output shaft speed sensor (VSS) driven gear (1) for wear.
Replace if necessary.



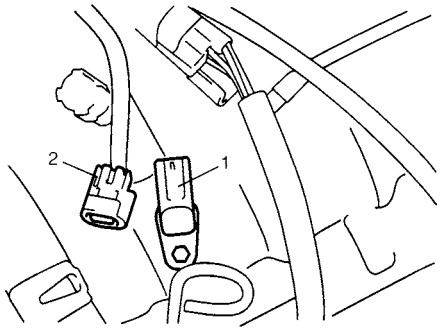
I2RH0B510046-

Input Shaft Speed Sensor Removal and Installation

S4RS0A5106011

Removal

1) Disconnect negative cable at battery.
2) Disconnect input shaft speed sensor connector (2).
3) Remove input shaft speed sensor (1) by removing its bolt.



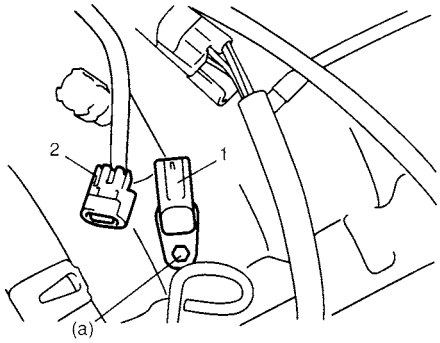
I2RH0B510047-

Installation

1) Apply A/T fluid to input shaft speed sensor O-ring.
2) Install input shaft speed sensor (1) to A/T case and tighten bolt to specified torque.

Tightening torque
Input shaft speed sensor bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

3) Connect input shaft speed sensor connector (2) to input shaft speed sensor (1).



I2RH0B510048-

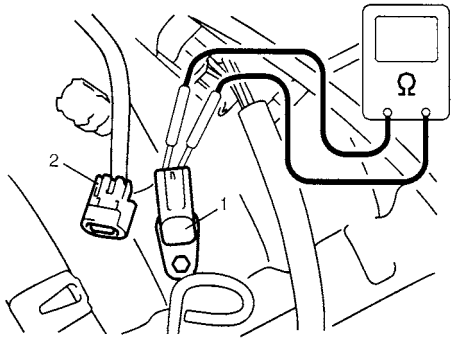
4) Connect negative cable to battery.

Input Shaft Speed Sensor Inspection

S4RS0A5106012

1) Disconnect negative cable at battery.
2) Disconnect input shaft speed sensor connector (2).
3) Check resistance between input shaft speed sensor (1) terminals.

Input shaft speed sensor resistance
Standard: 560 – 680 Ω at 20 °C (68 °F)



I2RH0B510049-

Transmission Fluid Temperature Sensor Removal and Installation

S4RS0A5106059

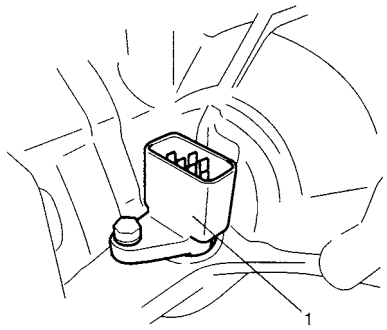
Removal

1) Disconnect negative cable at battery.
2) Lift up vehicle.
3) With engine is cool, remove drain plug and drain A/T fluid.
4) Install drain plug. Refer to “A/T Fluid Change: ”.
5) Remove A/T oil pan.
6) Remove oil strainer assembly.
7) Remove valve body assembly referring to “Automatic Transaxle Unit Disassembly: ”.

CAUTION:

When pulling solenoid wire harness out of transaxle case, take care not to damage transmission fluid temperature sensor at narrow exit of case.
Careless sensor treatment might cause sensor malfunction.

8) Remove solenoid wire harness (1).



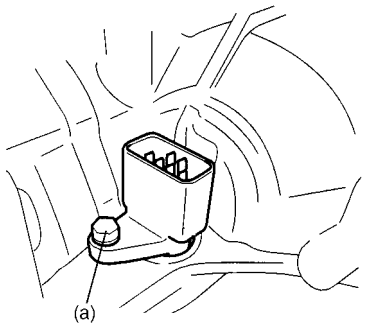
I2RH0B510050-

Installation

Reverse removal procedure to install solenoid wire harness and valve body assembly noting the following points.

- For details of valve body assembly and their connectors installation, refer to “Automatic Transaxle Unit Assembly: ”.
- For details of A/T oil pan installation, refer to “Automatic Transaxle Unit Assembly: ”. Use new oil pan gasket.
- Tighten valve body harness connector bolt to specified torque.

Tightening torque
Valve body harness connector bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



I2RH0B510051-

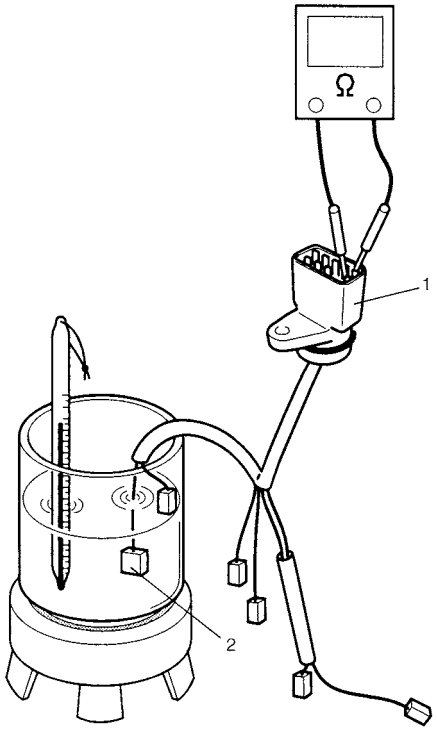
- Pour A/T fluid and check fluid level according to procedure described in “A/T Fluid Change: ”.
- Check for fluid leakage after warming up A/T.

Transmission Fluid Temperature Sensor Inspection

S4RS0A5106013

Warm up transmission fluid temperature sensor (2). Check resistance between terminals of valve body harness connector (1). Thus make sure its resistance decrease as its temperature increase.

Transmission fluid temperature sensor resistance
10 °C (50 °F): 5.8 – 7.1 kΩ
110 °C (230 °F): 231 – 263 Ω
145 °C (293 °F): 105 – 117 Ω



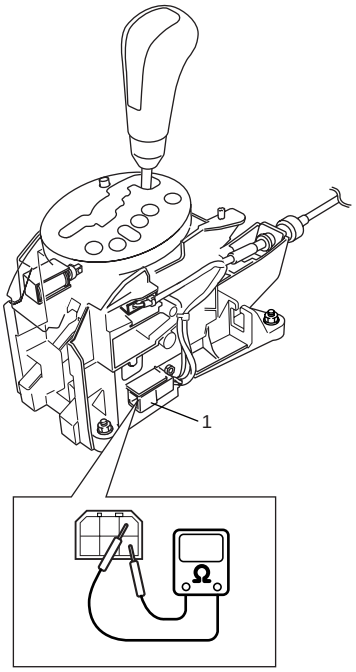
I2RH0B510052-

“3” Position Switch Inspection

S4RS0A5106014

1) Remove console box referring to “Console Box Components: in Section 9H”.
2) Disconnect “3” position switch connector (1).
3) Check continuity between “3” position switch terminals.

“3” position switch specification
Shift selector lever to “3” or “2” range: Continuity
Shift other above range: No continuity



I4RS0A510026-

Solenoid Valves (Shift Solenoid Valves and Timing Solenoid Valve) Removal and Installation

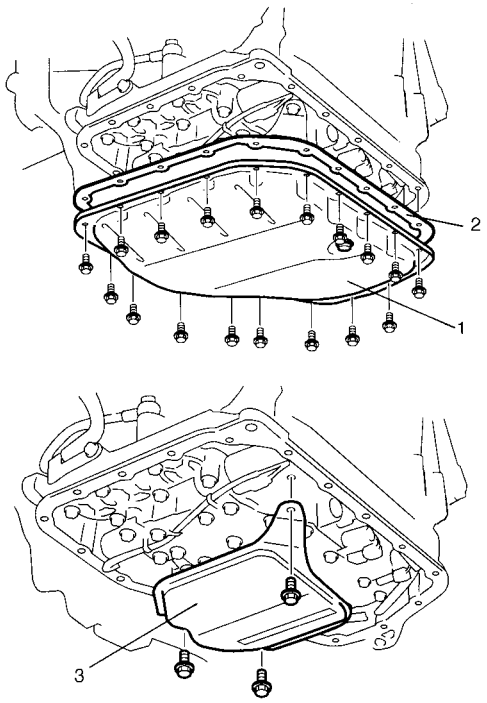
S4RS0A5106015

Removal

1) Disconnect negative cable at battery.
2) Lift up vehicle.
3) Remove drain plug and drain A/T fluid.
4) Install drain plug.

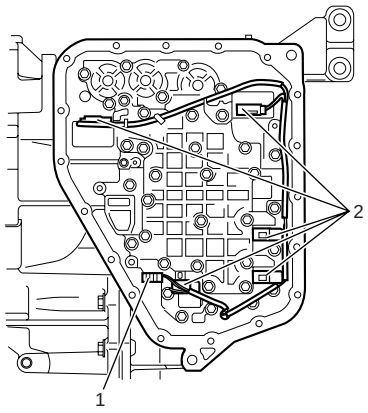
Tightening torque
A/T fluid drain plug: 17 N·m (1.7 kg-m, 12.5 lb-ft)

5) Remove A/T oil pan (1) and oil pan gasket (2).
6) Remove oil strainer assembly (3).



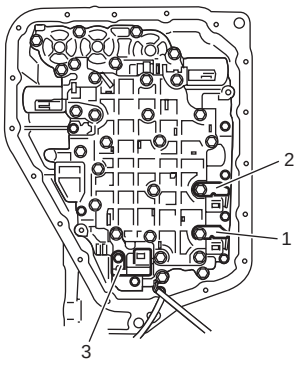
I2RH0B510054-

7) Remove transmission fluid temperature sensor (1) from sensor clamp.
8) Disconnect solenoid connectors (2).



I4RS0A510027-

9) Remove shift solenoid valve-A (No.1) (1), shift solenoid valve-B (No.2) (2) and timing solenoid valve (3) by removing bolts.

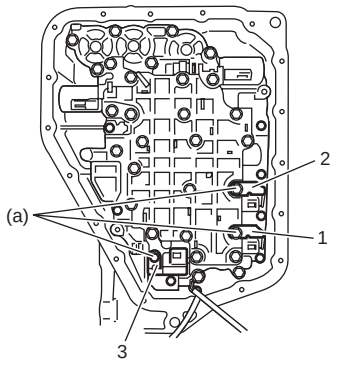


I4RS0A510028-

Installation

1) Install shift solenoid valve-A (No.1) (1), shift solenoid valve-B (No.2) (2) and timing solenoid valve (3).

Tightening torque
Shift solenoid bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

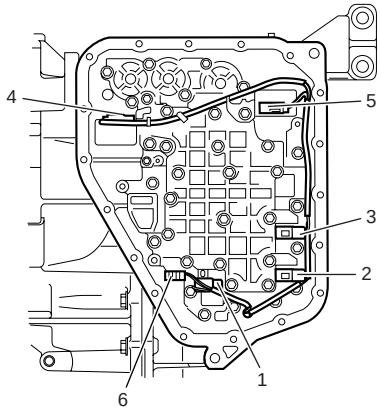


I4RS0A510029-

2) Connect solenoid connectors identifying their installing positions by wire color.

Solenoid coupler	Wire color
Shift solenoid valve-A (No.1) (2)	White
Shift solenoid valve-B (No.2) (3)	Black
Timing solenoid valve (1)	Yellow
TCC pressure control solenoid valve (4)	Light green / Brown
Pressure control solenoid valve (5)	Green / Gray

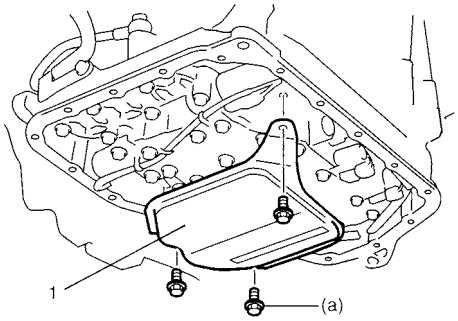
3) Install transmission fluid sensor (6) and sensor wire to clamp.



I4RS0A510030-

4) Install oil strainer assembly (1).

Tightening torque
Oil strainer bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

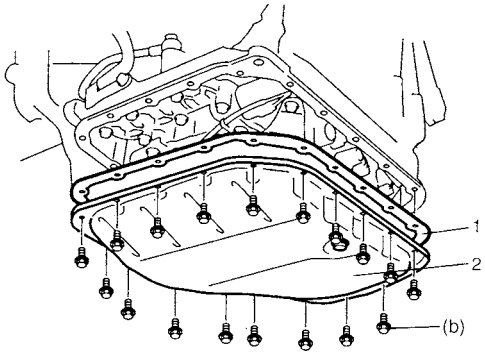


I2RH0B510059-

5) Install new oil pan gasket (1) and oil pan (2).

6) Tighten oil pan bolts to specified torque diagonally and little by little.

Tightening torque
Oil pan bolt (b): 7.0 N·m (0.7 kg-m, 5.0 lb-ft)



I2RH0B510060-

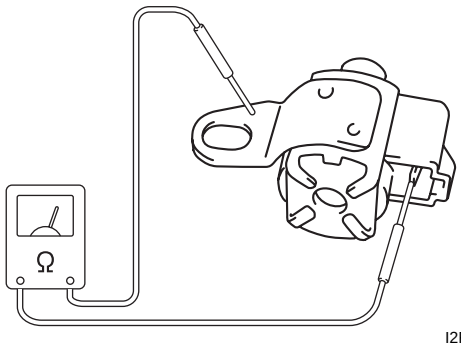
Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection

S4RS0A5106016

Resistance Check

Check shift solenoid valves and timing solenoid valve.

Shift solenoid valves and timing solenoid valve resistance
Standard: 11 – 15 Ω at 20 °C (68 °F)



I2RH0B510061-

Operation Check

Shift solenoid valve-A (No.1) and -B (No.2)

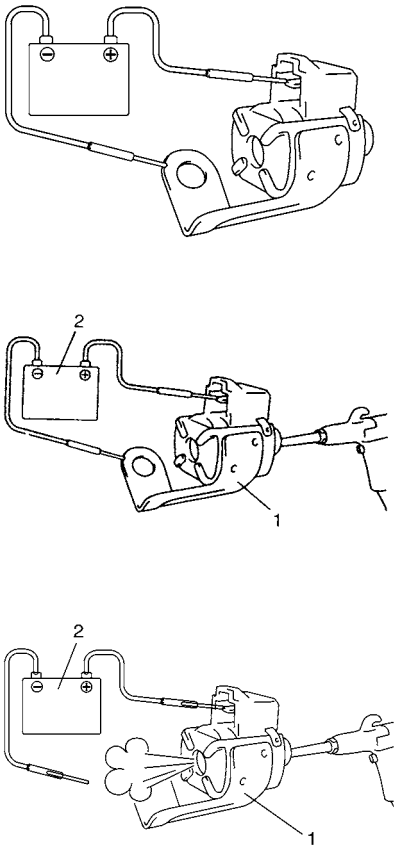
CAUTION:

- **Do not insert air gun against strainer installed on inlet of solenoid valve too deeply, when blowing air into solenoid valve. If not, the strainer will be damaged.**
- **Be very careful as dust etc. does not enter when solenoid valves are inspected.**

- Check that solenoid valve (1) actuate with click sound when battery voltage is conducted.
- When solenoid valve (1) is connected to battery (2), confirm that solenoid valve is close condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.
- When solenoid valve (1) is not connected to battery (2), confirm that solenoid valve is open condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.

NOTE:

Do not fail to inspect with air to prevent mistaken checking because return spring for valve is not installed into solenoid valve.



I2RH0B510062-

Timing solenoid valve

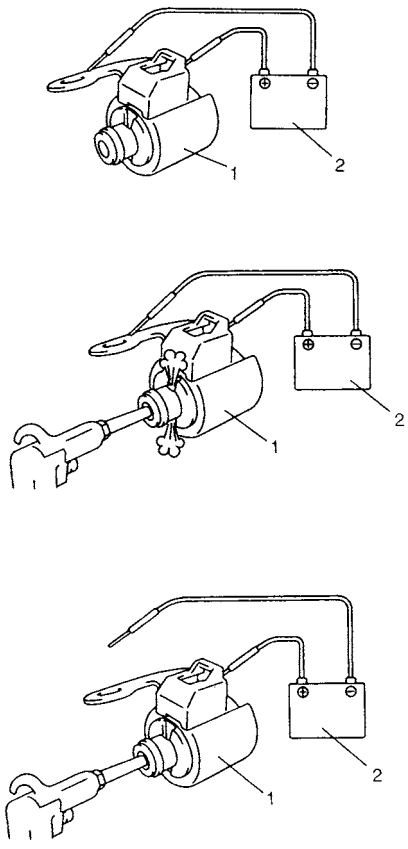
CAUTION:

- **Do not insert air gun against strainer installed on inlet of solenoid valve too deeply, when blowing air into solenoid valve. If not, the strainer will be damaged.**
- **Be very careful as dust etc. does not enter when solenoid valves are inspected.**

- Check that solenoid valve (1) actuate with click sound when battery voltage is conducted.
- When timing solenoid valve (1) is connected to battery (2), confirm that timing solenoid valve is open condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.
- When timing solenoid valve (1) is not connected to battery (2), confirm that timing solenoid valve is close condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.

NOTE:

Do not fail to inspect with air to prevent mistaken checking because return spring for valve is not installed into solenoid valve.



I2RH0B510063-

Pressure Control Solenoid Valves (Pressure Control Solenoid and TCC Pressure Control Solenoid) Removal and Installation

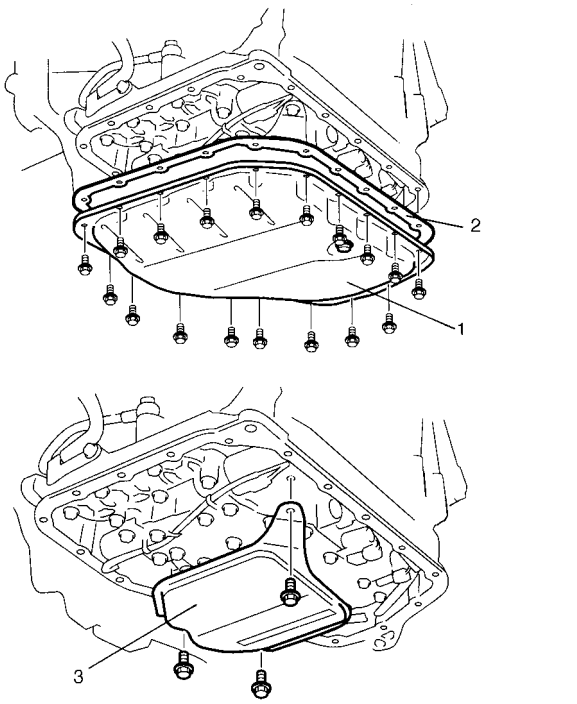
S4RS0A5106060

Removal

1) Disconnect negative cable at battery.
2) Lift up vehicle.
3) Remove drain plug and drain A/T fluid.
4) Install drain plug.

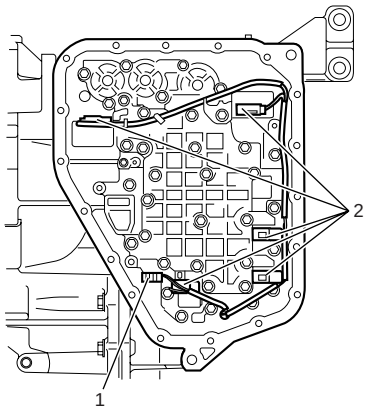
Tightening torque
A/T fluid drain plug: 17 N·m (1.7 kg-m, 12.5 lb-ft)

5) Remove A/T oil pan (1) and oil pan gasket (2).
6) Remove oil strainer assembly (3).



I2RH0B510054-

7) Remove transmission fluid temperature sensor (1) from sensor clamp.
8) Disconnect solenoid connectors (2).



I4RS0A510027-

9) Remove valve body assembly referring to "Automatic Transaxle Unit Disassembly: ".
10) Remove pressure control solenoid valve and TCC pressure control solenoid valve referring to "Valve Body Assembly Disassembly and Reassembly: ".

Installation

Reverse removal procedure to install pressure control solenoid valve and valve body assembly noting the following points.

- For detail of pressure control solenoid valve and TCC pressure control solenoid valve installation, refer to "Valve Body Assembly Disassembly and Reassembly: ".
- For detail of valve body assembly installation, refer to "Automatic Transaxle Unit Assembly: ".
- For detail of installing wire harness for solenoid valves and sensor, refer to "Automatic Transaxle Unit Assembly: ". Use new O-rings.
- For detail of A/T oil pan and oil strainer assembly installation, refer to "Automatic Transaxle Unit Assembly: ". Use new oil pan gasket.
- Pour A/T fluid and check fluid level according to procedure described in "A/T Fluid Change: ".
- Check for fluid leakage after warming up A/T.

Pressure Control Solenoid Valve Inspection

S4RS0A5106017

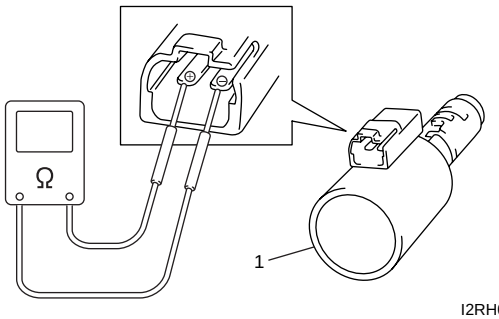
CAUTION:

- **Be very careful as dust etc. does enter when pressure control solenoid valves are inspected.**

Resistance Check

Measure resistance between pressure control solenoid valves (Pressure control solenoid and TCC pressure control solenoid) (1) terminals.

Pressure control solenoid valve and TCC pressure control solenoid valve resistance
Standard: 5.0 – 5.6 Ω at 20 °C (68 °F)



I2RH01510071-

Operation Check

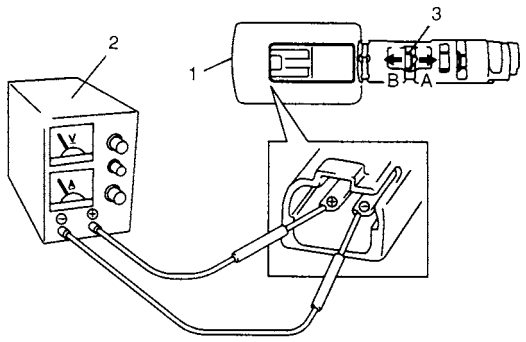
Check pressure control solenoid valves (Pressure control solenoid and TCC pressure control solenoid) operation in the either manner of the following.

Using regulated DC power supply

1) Connect pressure control solenoid valve (1) with regulated DC power supply (2) as shown in figure.
2) Turn regulated DC power supply switch ON and increase voltage of power supply keeping current within 1.0 A.
3) Check for gradual movement of valve (3) in the direction of arrow “A” as voltage is increased.
4) Check movement of valve (3) in the direction of arrow “B” as voltage is decreased.
5) Turn power supply switch OFF.

CAUTION:

Do not pass current 1.0 A or more, or pressure control solenoid is burned out.



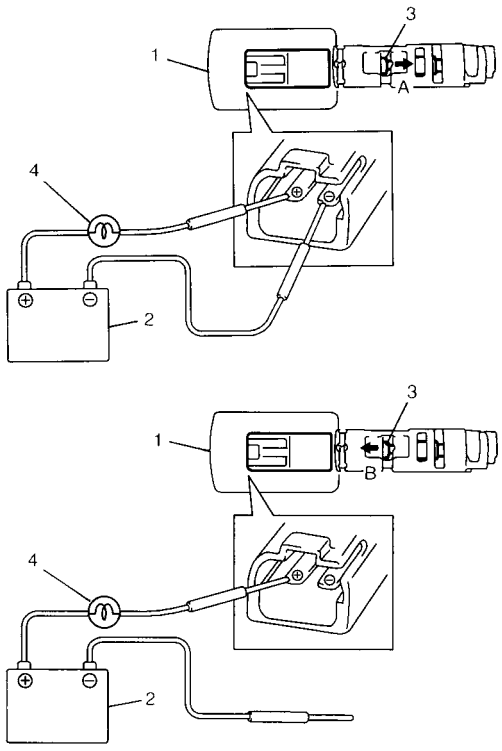
I2RH0B510064-

Not using regulated DC power supply

1) Connect pressure control solenoid valve (1) to battery (2) setting 21 W bulb (4) on the way as shown in figure.
2) Check for movement of valve (3) in the direction of arrow “A”.
3) Disconnect pressure control solenoid valve (1) from battery (2) and check movement of valve (3) in the direction of arrow “B” as shown in figure.

CAUTION:

Set 21 W bulb on the way, or pressure control solenoid valve is burned out.



I4RS0A510031-

Transmission Control Module (TCM) Removal and Installation

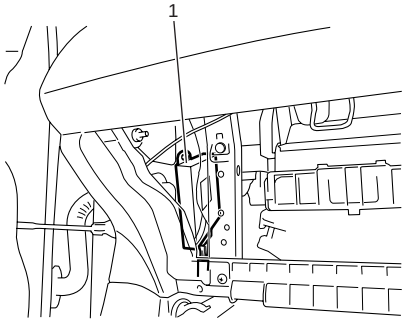
S4RS0A5106018

CAUTION:

- **TCM and ECM consists of highly precise parts, therefore when handling it, be careful not to expose to excessive shock.**
- **When replacing TCM with used one, all learned contents, which have been stored in TCM memory by executing learning control, should be initialized after replacement.**

Removal

1) Disconnect negative cable at battery.
2) If the vehicle is equipped with air bag system, disable air bag system. Refer to “Disabling Air Bag System: in Section 8B”.
3) Disconnect connectors from TCM (1).
4) Remove TCM by removing its bolts.



I4RS0A510032-

Installation

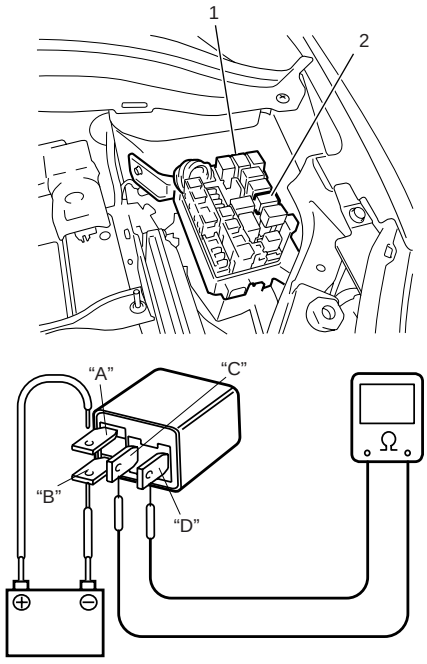
Reverse removal procedure noting the following.

- Connect TCM connectors securely.
- If the vehicle is equipped with air bag system, be sure to enable air bag system after TCM is back in place. Refer to “Enabling Air Bag System: in Section 8B”.

A/T Relay Inspection

S4RS0A5106061

1) Disconnect negative cable at battery.
2) Remove A/T relay (2) from fuse and relay box (1).
3) Check that there is no continuity between terminal “C” and “D”.
   If continuity is indicated, replace A/T relay.
4) Connect battery positive (+) terminal to terminal “A” of A/T relay and battery negative (–) terminal to terminal “B” of A/T relay.
   Check continuity between terminal “C” and “D” of A/T relay.
   If continuity does not indicated, replace A/T relay.

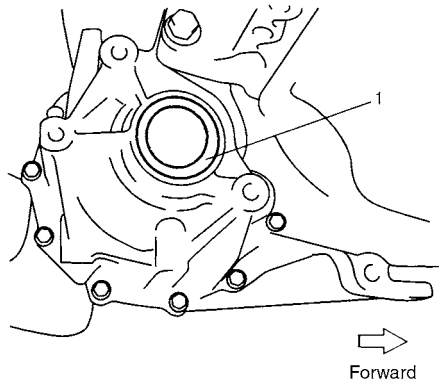


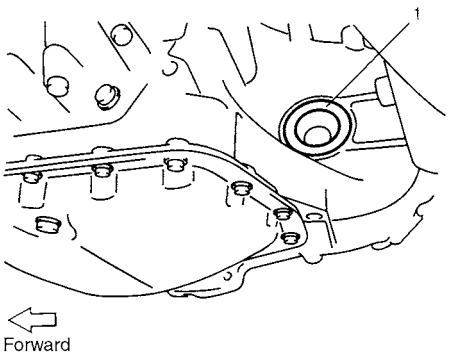
I4RS0A510033-

Differential Side Oil Seal Replacement

S4RS0A5106019

1) Lift up vehicle and drain automatic transaxle fluid.
2) Remove drive shaft joints from differential gear of transaxle. Refer to “Front Drive Shaft Assembly Removal and Installation: in Section 3A” for procedure to disconnect drive shaft joints.
   For differential side oil seal removal, it is not necessary to remove drive shafts from steering knuckle.
3) Remove differential side oil seal (1) by using screwdriver or the like.





I2RH0B510067-

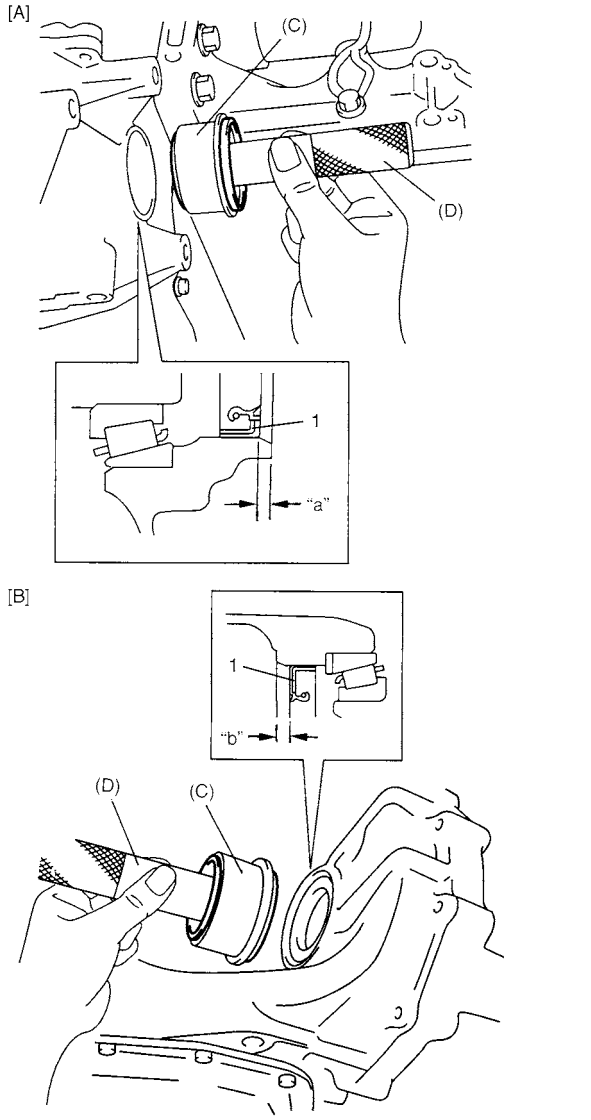
4) Apply grease to new differential side oil seal lips.

   : Grease 99000–25030

5) Install new differential side oil seals (1) by using special tool.

   Special tool
   (C): 09944–88220
   (D): 09924–74510

   Differential side oil seal installing depth
   Right side “a”: 2.6 – 3.6 mm (0.10 – 0.14 in.)
   Left side “b”: 3.8 – 4.8 mm (0.15 – 0.19 in.)



I2RH0B510068-

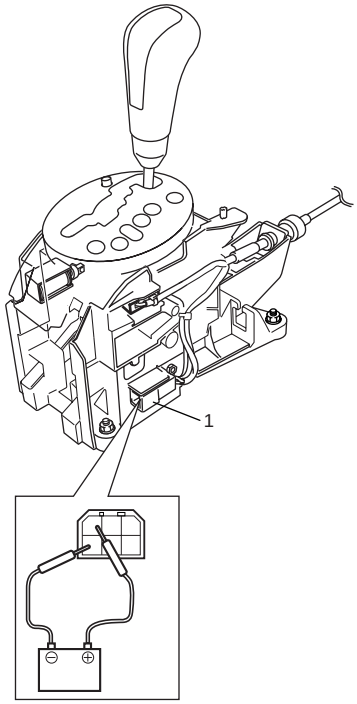
[A]: Right side	[B]: Left side

6) Install drive shaft referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”.
7) Pour A/T fluid referring to “A/T Fluid Change: ”.

Shift Lock Solenoid Inspection

S4RS0A5106064

Check that shift lock solenoid (1) actuate when battery voltage is conducted.

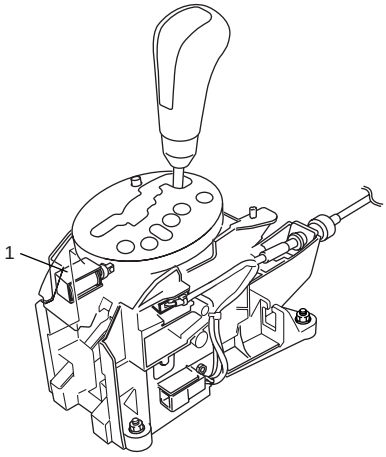


I4RS0A510034-

Shift Lock Solenoid Replacement

S4RS0A5106065

1) Remove console box referring to “Console Box Components: in Section 9H”.
2) Replace shift lock solenoid (1) using flat head or like.
3) Install covers as they were.



I4RS0A510053-

Key Interlock Cable Removal and Installation

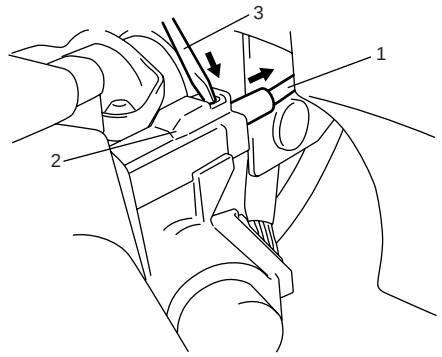
S4RS0A5106066

NOTE:

Don't bend interlock cable excessively when removing and installing it, or system will not operate correctly.

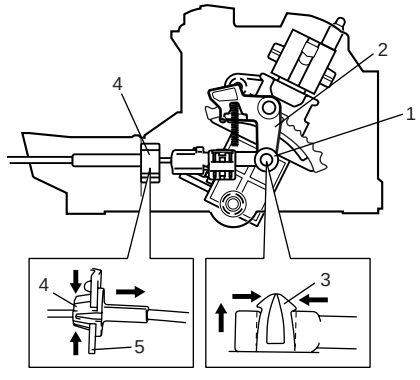
Removal

1) If the vehicle is equipped with air bag system, disconnect negative cable at battery and disable air bag system, referring to "Disabling Air Bag System: in Section 8B".
2) Remove steering column cover.
3) Turn ignition switch to ACC position.
4) Pull out key interlock cable (1) from key cylinder cover (2) while pressing checkhook with slotted screwdriver (3) or the like.



I2RH01510083-

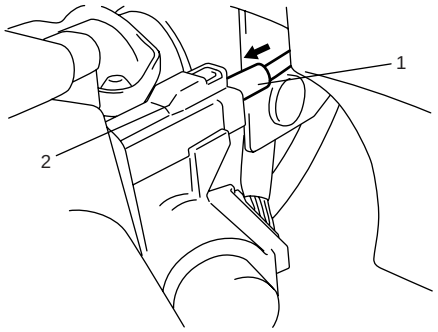
5) Turn ignition switch to LOCK position.
6) Remove parking brake cover and console box.
7) Detach cable end (1) from interlock cam (2) while pressing claws (3) of interlock cam boss.
   At this time, be careful not to cause damage to its claws.
   Detach cable casing cap (4) from selector bracket (5) while pressing checkhook.
8) Remove interlock cable.



I4RS0A510054-

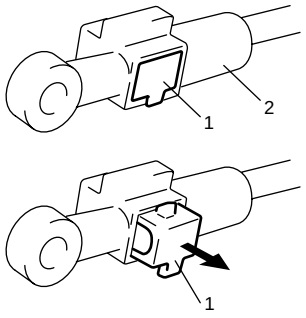
Installation

1) Lay interlock cable to its original cabling route.
2) Turn ignition switch to ACC position.
3) Insert cable casing cap (1) into key cylinder cover (2) securely.



I2RH01510085-

4) Pull out lock button (1) of selector side cable end (2).



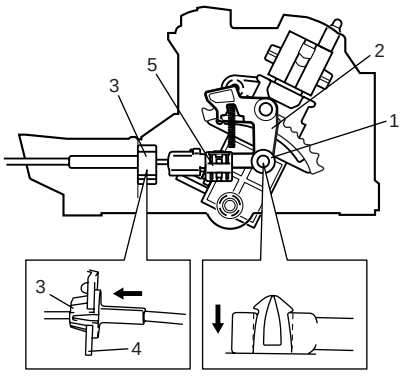
I2RH01510086-

5) Shift selector lever to "N" position.

NOTE:

If selector lever is in "P" position, shift selector lever referring to "Selector Lever Inspection: ".

6) Install cable casing cap (3) to selector bracket (4).
7) Connect cable end (1) to interlock cam (2) with ignition switch turned to ACC position.
8) Drive lock button (5) in cable end until it locks cable expansion and contraction.



I4RS0A510055-

9) With selector lever set at "P" position, turn ignition key to ACC position and then check for the following conditions.
   - With knob button released, ignition key can be turned from ACC position to LOCK position.
   - With knob button pressed, ignition key cannot be turned from ACC position to LOCK position.
10) Install steering column cover.

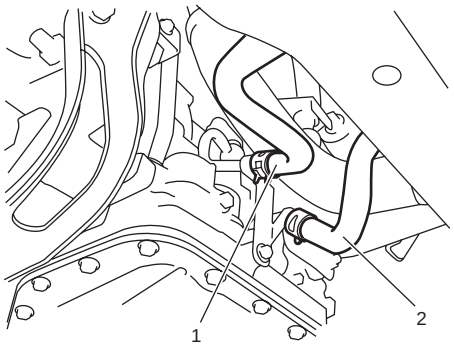
11) If the vehicle is equipped with air bag system, connect negative cable at battery and enable air bag system, referring to “Enabling Air Bag System: in Section 8B”.

A/T Fluid Cooler Hoses Replacement

S4RS0A5106022

The rubber hoses for the A/T fluid cooler should be checked at specified interval. If replacing them, be sure to note the following.

- to replace clamps at the same time
- to insert hose as far as its limit mark
- to clamp clamps securely

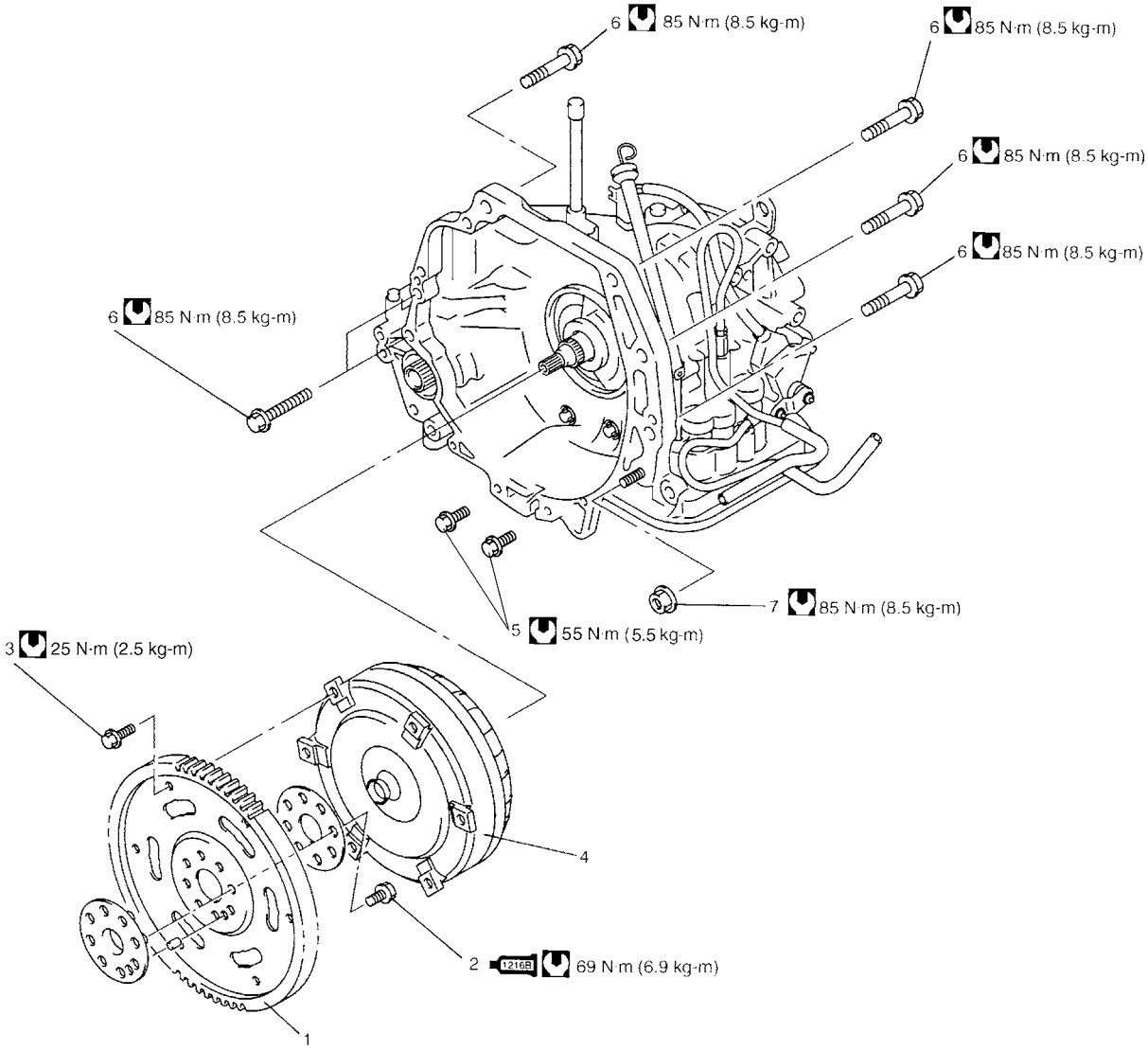


I4RS0A510057-

1.	Inlet hose (Outlet from A/T fluid cooler)
2.	Outlet hose (Inlet to A/T fluid cooler)

Automatic Transaxle Unit Components

S4RS0A5106023



I4RS0A510035-

	1. Drive plate		5. Transaxle stiffener bolt
1216B	2. Drive plate bolt : Apply sealant 99000-31230 to thread.		6. Transaxle and engine fastening bolt
	3. Drive plate to torque converter bolt		7. Transaxle and engine fastening nut
	4. Torque converter		: Tightening torque

Automatic Transaxle Unit Dismounting and Remounting

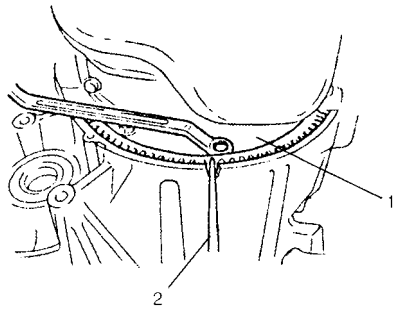
S4RS0A5106024

Dismounting

1) Take down transaxle with engine. For its procedure, refer to “Engine Assembly Removal and Installation: in Section 1D”.
2) Remove transaxle housing lower plates (1).

I4RS0A150004-

3) Remove drive plate to torque converter bolts (1) engage flat head rod or the like (2) with drive plate ring gear.



I3RM0B510047-

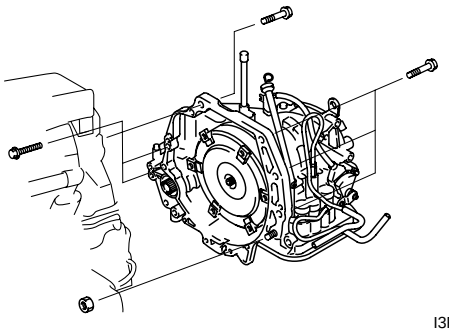
4) Remove starting motor.
5) Remove bolts and nut fastening engine and transaxle, then detach transaxle from engine.

WARNING:

Be sure to keep transaxle with torque converter horizontal or facing up throughout the work. Should it be tilted with torque converter down, converter may fall off and cause personal injury.

NOTE:

When detaching transaxle from engine, move it in parallel with crankshaft and use care so as not to apply excessive force to drive plate and torque converter.



I3RM0B510049-

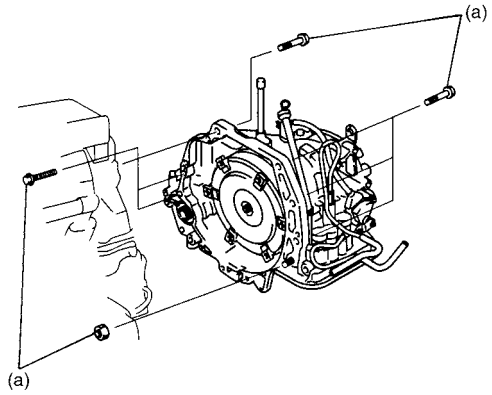
Remounting

1) Make sure that torque converter is installed correctly to transaxle.
   Refer to “Automatic Transaxle Unit Assembly: ”.
2) Attach transaxle to engine.

WARNING:

Be sure to keep transaxle with torque converter horizontal or facing up throughout the work. Should it be tilted with torque converter down, converter may fall off and cause personal injury.

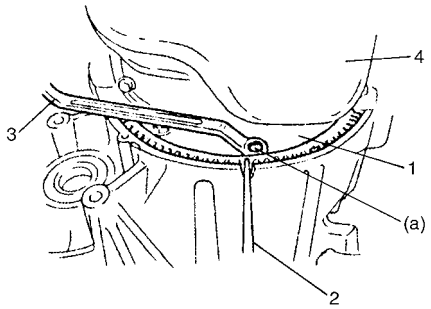
Tightening torque
Transaxle and engine fastening bolt and nut
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I3RM0B510050-

3) Tighten drive plate to torque converter bolts. Align bolt hole of drive plate and torque converter then tighten bolts through torque converter housing lower plate opening.
Lock drive plate (1) by engaging flat head rod or the like (2) with drive plate gear.

Tightening torque
Drive plate to torque converter bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

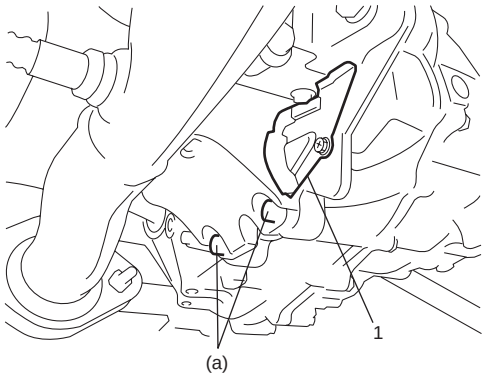


I3RM0B510051-

3. Wrench	4. Engine oil pan

4) Tighten transaxle stiffener bolts to specified torque.
5) Install transaxle housing lower plates (1).

Tightening torque
Transaxle stiffener bolt (a): 55 N·m (5.5 kg-m, 40 lb-ft)



I4RS0A510056-

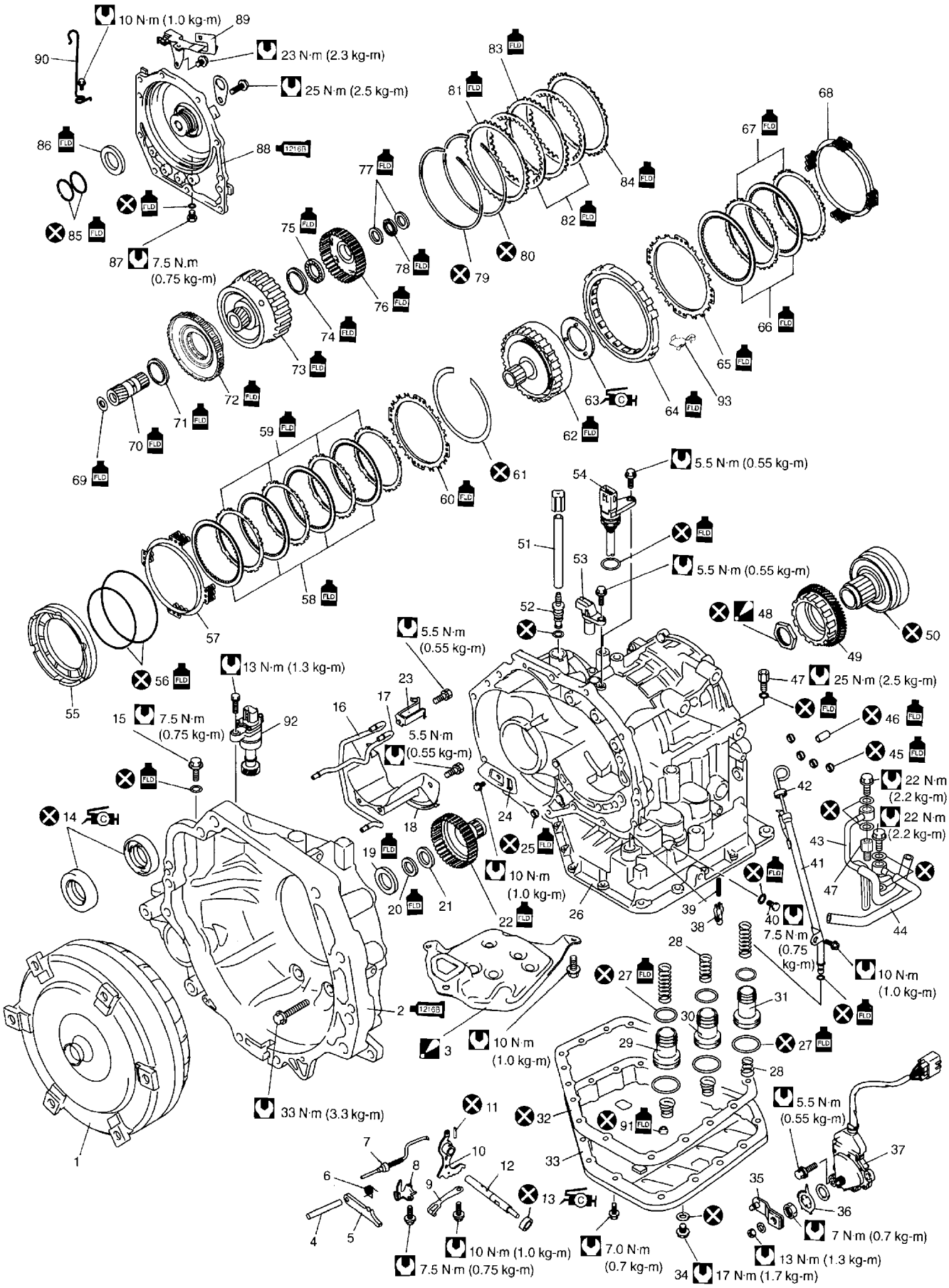
6) Install starter motor.

Tightening torque
Starter motor bolt and nut: 50 N·m (5.0 kg-m, 36.5 lb-ft)

7) Remount engine with transaxle assembly to vehicle. Refer to “Engine Assembly Removal and Installation: in Section 1D” for its procedure.

Automatic Transaxle Assembly Components

S4RS0A5106025



I3RM0B510053-

1. Torque converter	33. Oil pan	65. 2nd brake retaining plate
1216B 2. Torque converter housing : Apply sealant 99000-31230 to mating surface to transaxle case.	34. A/T fluid drain plug	66. 2nd brake disc
3. Oil strainer assembly : Replace oil strainer when overhauling.	35. Manual select lever	67. 2nd brake separator plate
4. Parking lock pawl shaft	36. Lock washer	68. 2nd brake return spring subassembly
5. Parking lock pawl	37. Transmission range sensor	69. Front sun gear thrust bearing race
6. Parking lock pawl return spring	38. Cooler check valve	70. Front planetary sun gear
7. Parking lock pawl rod	39. Spring	71. Planetary gear thrust bearing
8. Parking lock pawl bracket	40. Transaxle case plug	72. One-way clutch No.1 assembly
9. Manual detent spring	41. Fluid filler tube	73. Rear planetary sun gear subassembly
10. Manual valve lever	42. Fluid level gauge	74. Rear sun gear thrust bearing race
11. Manual valve lever pin	43. Fluid cooler inlet pipe	75. Rear sun gear thrust bearing
12. Manual shift shaft	44. Fluid cooler outlet pipe	76. Forward clutch hub
C 13. Manual shift shaft oil seal : Apply grease 99000-25030 to oil seal lip.	45. 2nd brake gasket	77. Intermediate shaft thrust bearing race
C 14. Differential side oil seal : Apply grease 99000-25030 to oil seal lip.	46. Brake drum gasket	78. Intermediate shaft thrust bearing
15. Torque converter housing plug	47. Pipe union	79. 2nd brake piston snap ring
16. Lubrication LH tube	48. Reduction drive gear nut : After tightening nut so as rotational torque of reduction drive gear to be in specified value, caulk nut securely.	80. O/D and 2nd coast brake retaining plate snap ring
17. Lubrication RH tube	49. Reduction drive gear	81. O/D and 2nd coast brake retaining plate
18. Fluid reservoir RH plate	50. Planetary ring gear subassembly	82. O/D and 2nd coast brake disc
19. Input shaft front thrust bearing	51. Breather hose	83. O/D and 2nd coast brake separator plate
20. Input shaft rear thrust bearing	52. Breather union	84. O/D and 2nd coast brake rear plate
21. Input shaft rear thrust bearing race	53. Input shaft speed sensor	85. Rear cover seal ring
22. Direct clutch hub	54. Valve body harness	86. Reverse clutch drum thrust bearing
23. Lubrication tube clamp	55. 1st and reverse brake piston	87. Rear cover plug
24. Fluid reservoir LH plate	56. O-ring	1216B 88. Transaxle rear cover : Apply sealant 99000-31230 to mating surface.
25. Governor apply No.2 gasket	57. 1st and reverse brake return spring subassembly	89. Harness bracket
26. Automatic transaxle case	58. 1st and reverse brake disc	90. Select cable clamp
27. Accumulator piston O-ring	59. 1st and reverse brake separator plate	91. Governor apply No.1 gasket
28. Accumulator spring	60. 1st and reverse brake retaining plate	92. Output shaft speed sensor (VSS)
29. C2 accumulator piston	61. 1st and reverse brake snap ring	93. One-way clutch outer race retainer
30. C1 accumulator piston	62. Planetary gear assembly	: Do not reuse.
31. B1 accumulator piston	C 63. Planetary carrier thrust washer : Apply grease 99000-25030 to slide contact face.	FLD : Apply automatic transaxle fluid.
32. Oil pan gasket	64. One-way clutch No.2 assembly	: Tightening torque

Automatic Transaxle Unit Disassembly

S4RS0A5106026

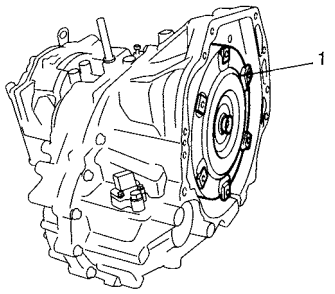
CAUTION:

- **Thoroughly clean transaxle exterior before overhauling it.**
- **Keep working table, tools and hands clean while overhauling.**
- **Use special care to handle aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Keep them always clean.**

1) Remove torque converter (1).

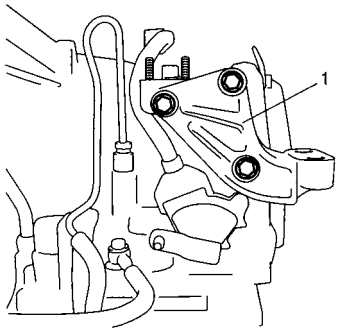
CAUTION:

Remove torque converter as much straight as possible. Leaning it may cause to damage oil seal lip.



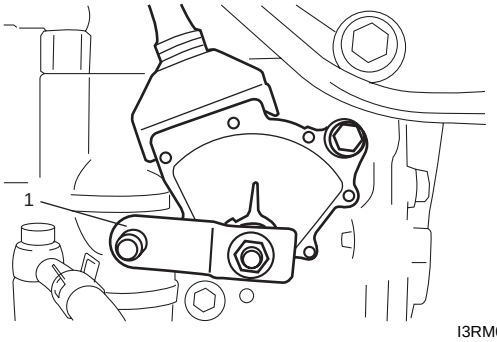
I2RH0B510078-

2) Remove engine mounting LH bracket (1).



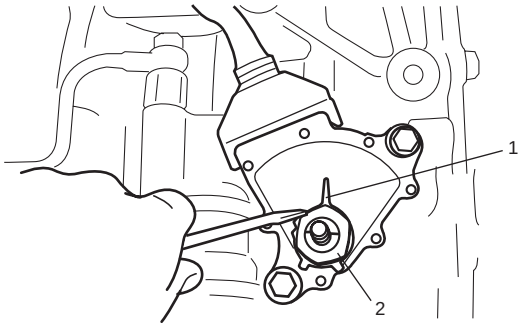
I3RM0B510054-

3) Remove manual select lever (1).



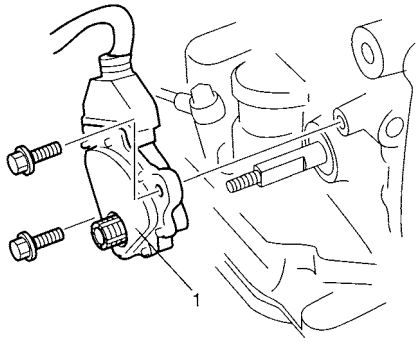
I3RM0B510055-

4) Uncaulk lock washer (1), then remove lock nut (2) and lock washer.



I3RM0B510056-

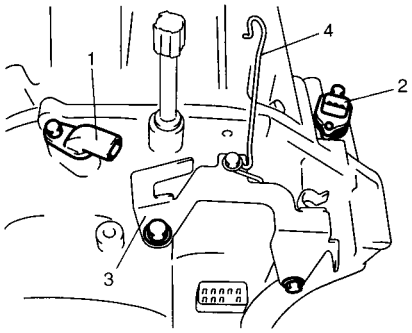
5) Remove transmission range sensor (1).



I3RM0B510057-

6) Remove output shaft speed sensor (VSS) (2) and input shaft speed sensor (1).

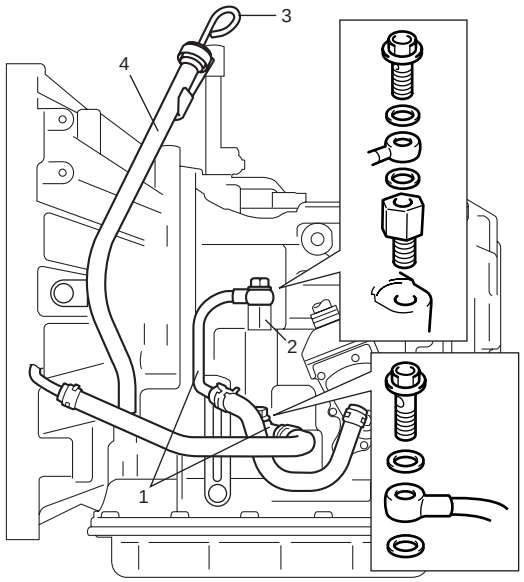
7) Remove harness bracket (3) and select cable clamp (4).



I3RM0B510058-

8) Remove fluid cooler pipes (1) and pipe union (2).

9) Remove fluid level gauge (3) and fluid filler tube (4).

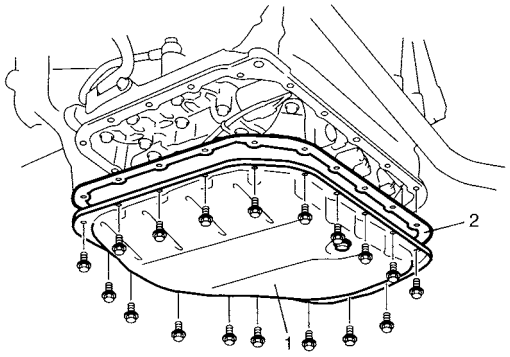


I3RM0B510059-

10) Remove oil pan (1) and oil pan gasket (2).

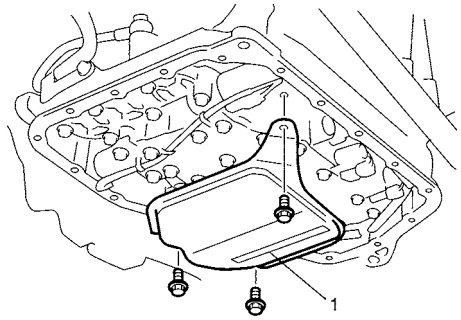
NOTE:

- **For removal of oil pan, do not turn transaxle over as this will contaminate valve body with foreign materials in bottom of oil pan.**
- **When removing oil pan, tap around it lightly with plastic hammer. Do not force it off by using screwdriver or the like.**



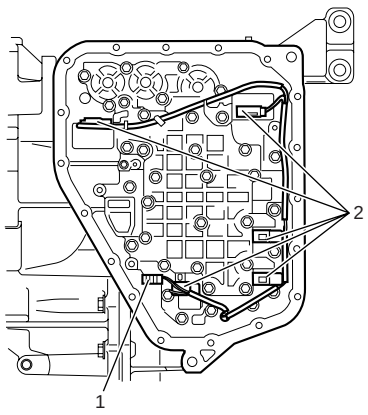
I2RH0B510086-

11) Remove oil strainer assembly (1).



I2RH0B510087-

12) Disconnect connectors (2) from solenoid valves and transmission fluid temperature sensor (1).



I4RS0A510027-

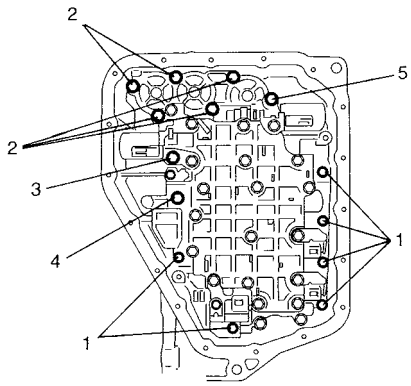
13) Remove valve body assembly bolts.

CAUTION:

Be careful not to let manual valve fall off when removing valve body assembly.

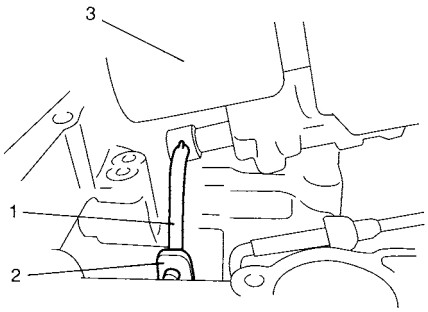
NOTE:

There are five kinds of bolts (bolts A (1), B (2), C (3), D (4) and E (5)) fixing valve body assembly.



I2RH0B510089-

14) Remove manual valve rod (1) from manual valve lever (2), then remove valve body assembly (3).

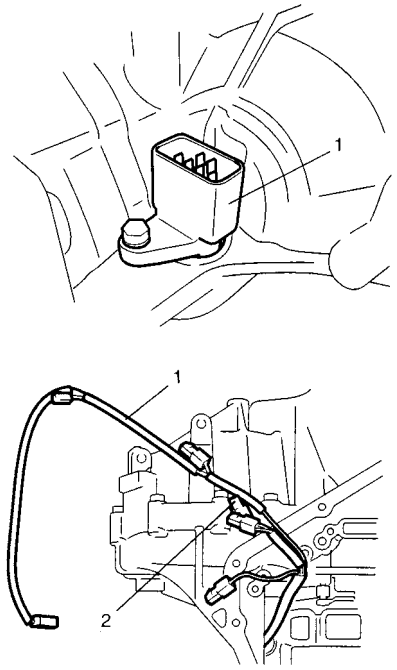


I2RH0B510090-

15) Remove valve body harness (1).

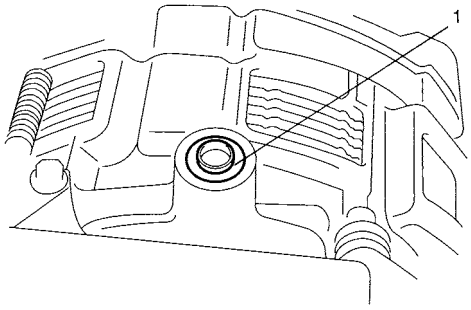
CAUTION:

When pulling valve body harness out of transaxle case, take care not to damage transmission fluid temperature sensor (2) at narrow exit of case.
Careless sensor treatment might cause sensor malfunction.



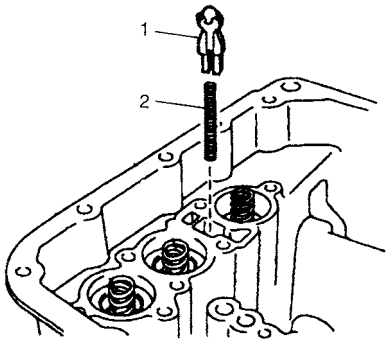
I2RH0B510091-

16) Remove governor apply No.1 gasket (1).



I2RH0B510092-

17) Remove cooler check valve (1) and spring (2).

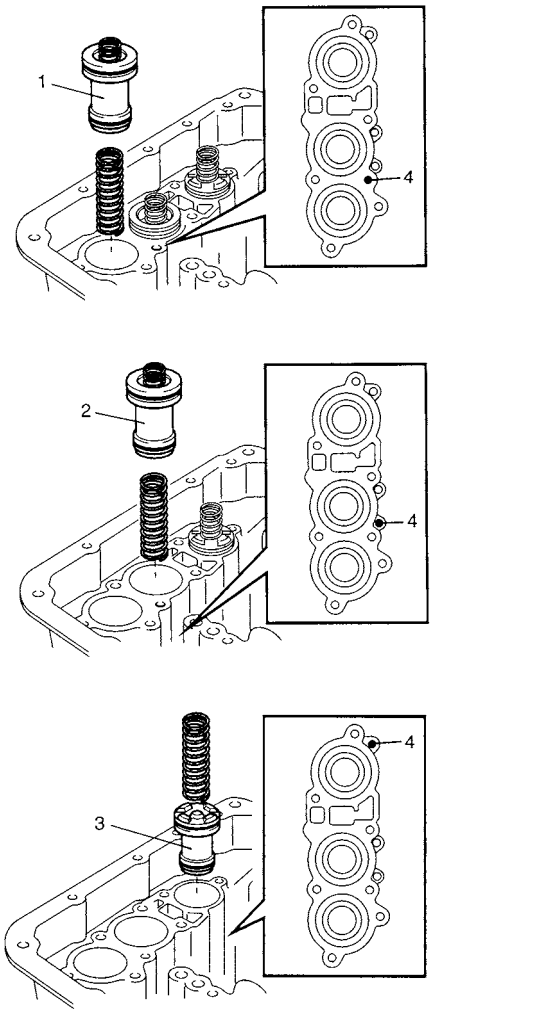


I2RH0B510093-

18) Remove accumulator pistons and springs.
To remove C2 (1), C1 (2) and B1 (3) accumulator pistons and springs, position rag on pistons to catch each piston. To remove pistons, force low-pressure compressed air (1 kg/cm^2, 15 psi, 100 kPa, max) into hole (4) as shown in figure, and pop each piston into rag.

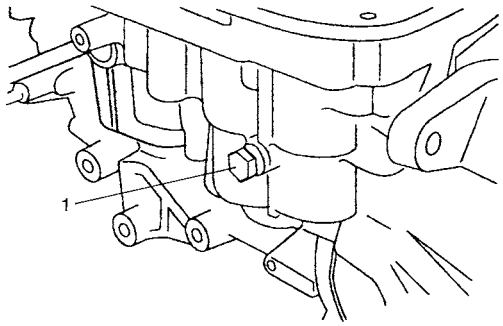
NOTE:

Do not push accumulator pistons with fingers or anything before removing them. Pushing them may cause compressed fluid in accumulator to spew out of hole and get to your face and clothes.



I2RH0B510094-

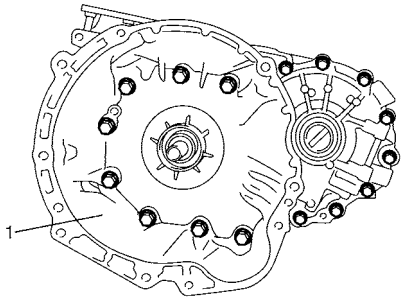
19) Remove transaxle case plug (1).



I2RH0B510095-

20) Remove torque converter housing bolts.

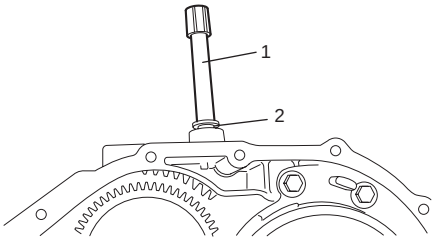
21) Remove torque converter housing (1) while tapping around it lightly with plastic hammer.



I3RM0B510060-

22) Remove breather hose (1).

23) Remove breather union (2).



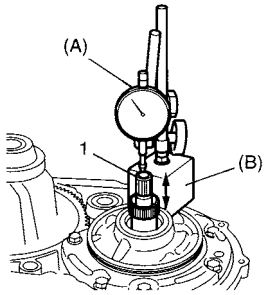
I2RH0B510097-

24) Measure input shaft thrust play.
Apply dial gauge onto input shaft end (1) and measure thrust play of input shaft.
When input shaft thrust play is out of specification, select input shaft front thrust bearing with proper thickness from among the list below and replace it.

Special tool
(A): 09900–20607
(B): 09900-20701

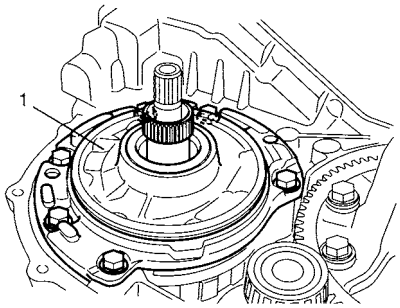
Input shaft thrust play
0.3 – 0.9 mm (0.012 – 0.035 in.)

Available input shaft front thrust bearing thickness
: 0.8, 1.4 mm (0.032, 0.055 in.)



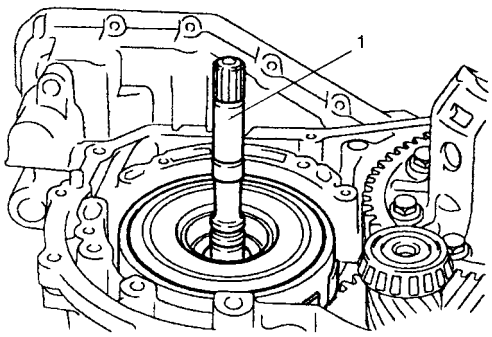
I2RH0B510098-

25) Remove oil pump assembly (1).



I2RH0B510099-

26) Remove direct clutch assembly (1).

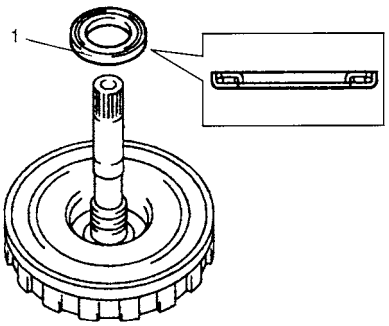


I2RH0B510100-

27) Remove input shaft front thrust bearing (1).

NOTE:

If input shaft front thrust bearing is not found, it may have been taken out with oil pump assembly.

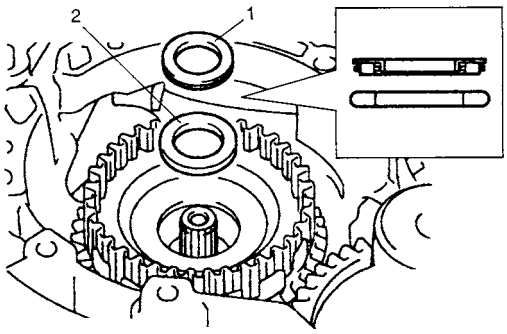


I2RH0B510101-

28) Remove input shaft rear thrust bearing (1) and thrust bearing race (2).

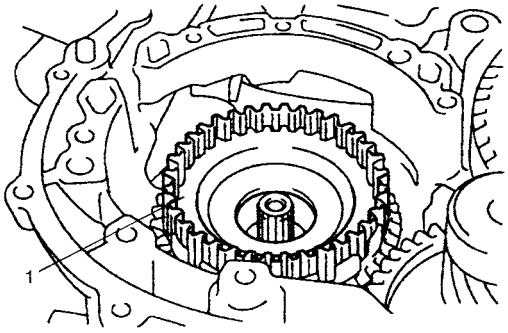
NOTE:

If input shaft rear thrust bearing is not found, it may have been taken out with direct clutch assembly.



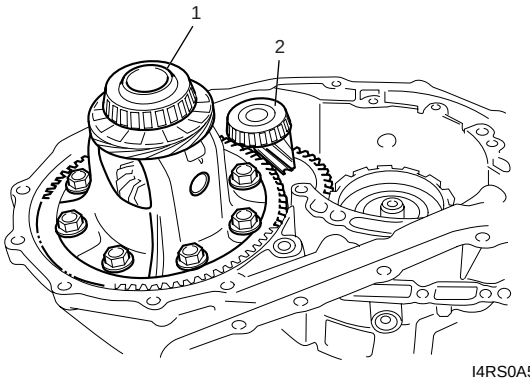
I2RH0B510102-

29) Remove direct clutch hub (1).



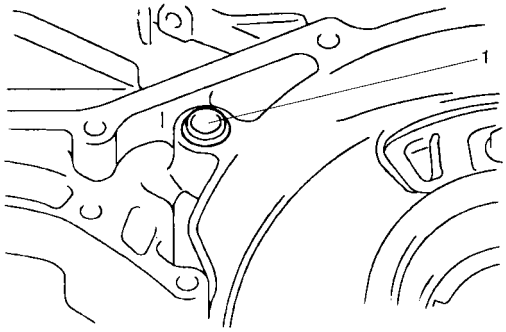
I2RH0B510103-

30) Remove differential assembly (1) and countershaft assembly (2).



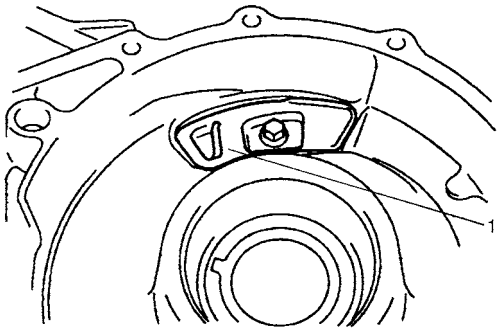
I4RS0A510036-

31) Remove governor apply No.2 gasket (1).



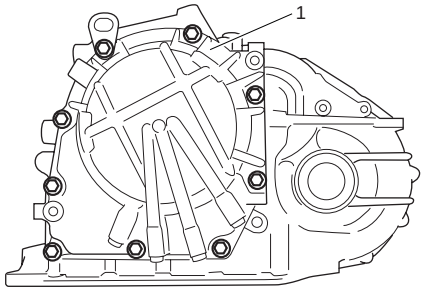
I2RH0B510105-

32) Remove fluid reservoir LH plate (1).



I2RH0B510106-

33) Turn over transaxle and remove rear cover assembly (1).

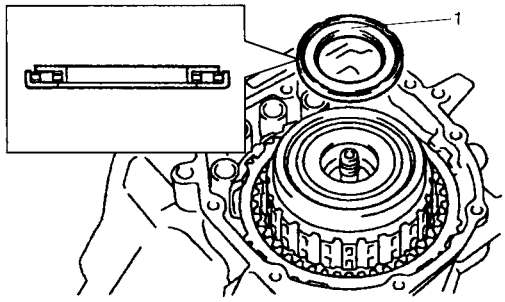


I4RS0A510037-

34) Remove reverse clutch drum thrust bearing (1).

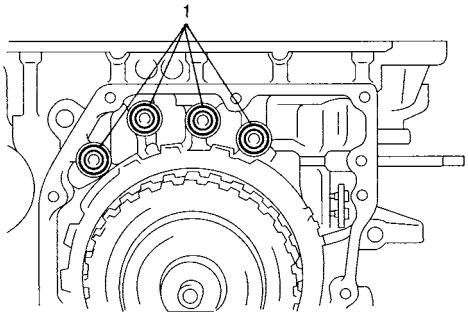
NOTE:

If reverse clutch drum thrust bearing is not found, it may have been taken out with rear cover assembly.



I2RH0B510108-

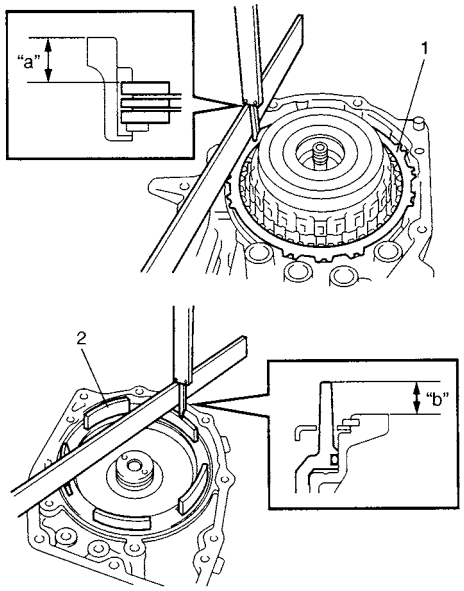
35) Remove 2nd brake gasket (1).



I2RH0B510109-

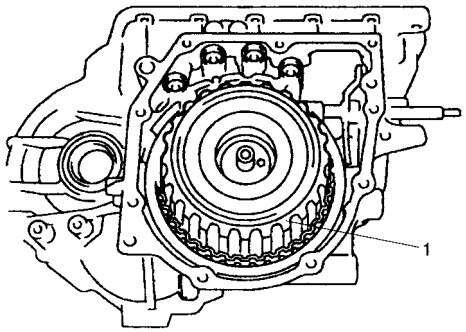
36) Measure O/D and 2nd coast brake piston stroke. If piston stroke exceeds specification, inspect and replace plates and discs.
- Measure dimension “a” from mating surface of transaxle case to O/D and 2nd coast brake rear plate (1) using straightedge and micrometer caliper.
- Measure dimension “b” from O/D and 2nd coast brake piston (2) to rear cover assembly mating surface using straightedge and micrometer caliper.
- Calculate piston stroke from measured value of dimensions “a” and “b”.
- Piston stroke = “a” – “b”

O/D and 2nd coast brake piston stroke
Standard: 0.65 – 1.05 mm (0.026 – 0.041 in.)



I2RH0B510110-

37) Remove forward and reverse clutch assembly (1).

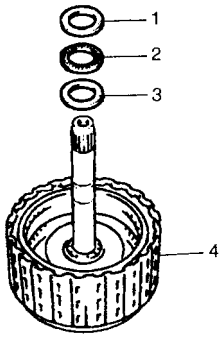


I2RH0B510111-

38) Remove intermediate shaft thrust bearing front race (1), thrust bearing (2) and rear race (3) from forward and reverse clutch assembly (4).

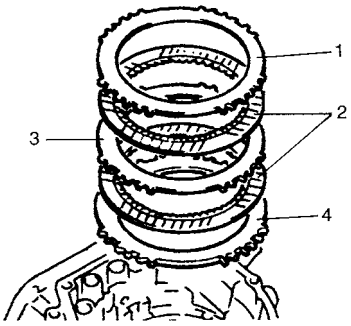
NOTE:

If intermediate shaft thrust bearing and/or races are not found on forward and reverse clutch assembly, they may have been left in transaxle.



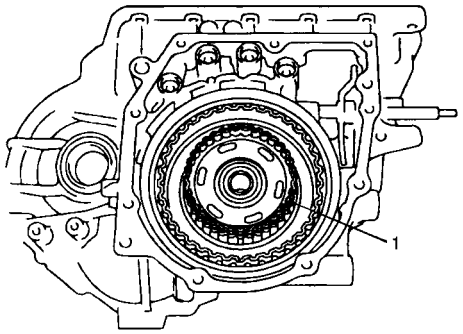
I2RH0B510112-

39) Remove O/D and 2nd coast brake rear plate (1), discs (2), separator plate (3) and retaining plate (4).



I2RH0B510113-

40) Remove forward clutch hub (1).

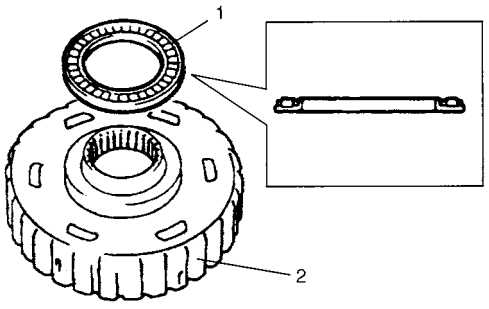


I2RH0B510114-

41) Remove rear sun gear thrust bearing (1) from forward clutch hub (2).

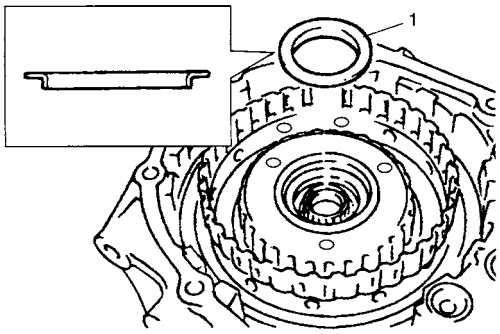
NOTE:

If rear sun gear thrust bearing is not found on forward clutch hub, it may have been left in transaxle.



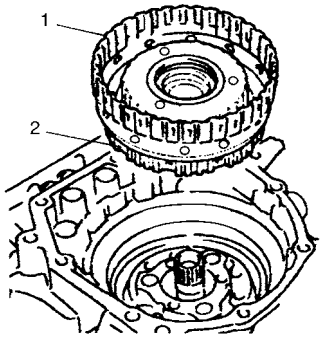
I2RH0B510115-

42) Remove rear sun gear thrust bearing race (1).



I2RH0B510116-

43) Remove rear planetary sun gear subassembly (1) and one-way clutch No.1 assembly (2).



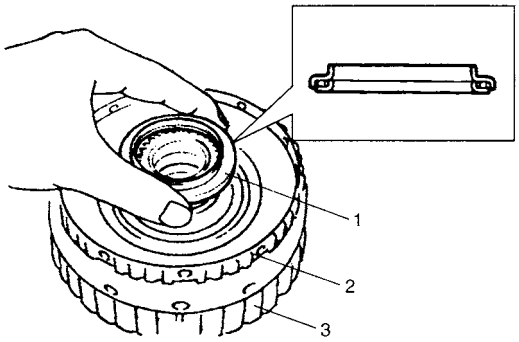
I2RH0B510117-

44) Remove planetary gear thrust bearing (1).

NOTE:

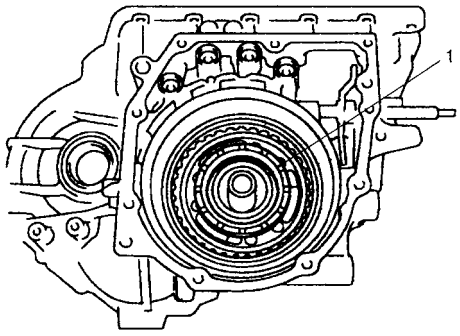
If planetary gear thrust bearing is not found on one-way clutch No.1 assembly, it may have been left in transaxle.

45) Remove one-way clutch No.1 assembly (2) from rear planetary sun gear subassembly (3).



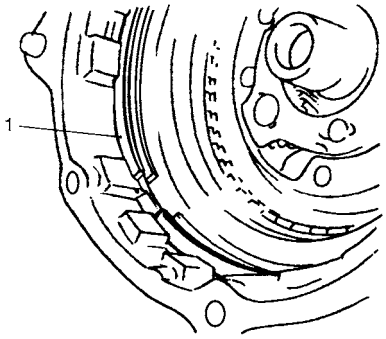
I2RH0B510118-

46) Remove planetary carrier thrust washer (1).



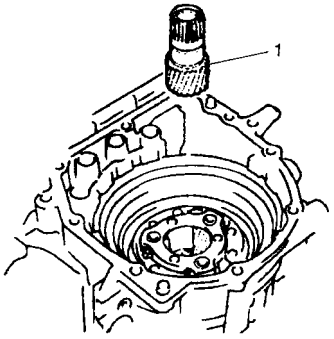
I2RH0B510119-

47) Remove O/D and 2nd coast brake retaining plate snap ring (1).



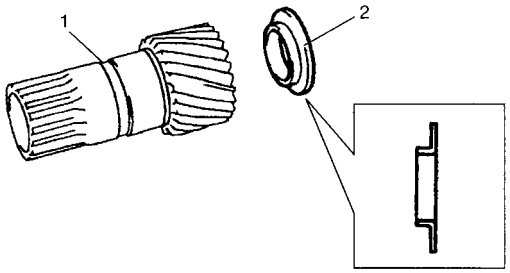
I2RH0B510120-

48) Remove front planetary sun gear (1).



I2RH0B510121-

49) Remove front sun gear thrust bearing race (2) from front planetary sun gear (1).



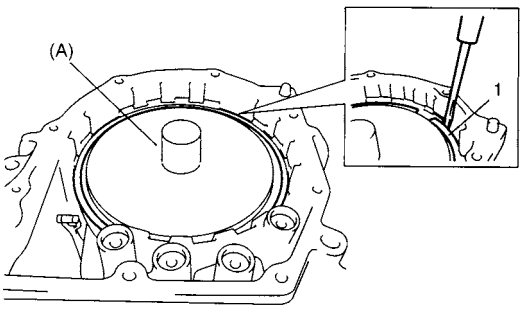
I2RH0B510122-

50) Using special tool and hydraulic press, remove 2nd brake piston snap ring (1).

CAUTION:

Do not press 2nd brake piston assembly in over 0.4 mm (0.016 in.).
Excessive compression may cause damage to piston assembly, return spring, plates and/ or discs.

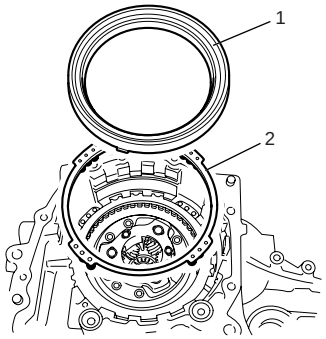
Special tool
(A): 09926–96050



I2RH0B510124-

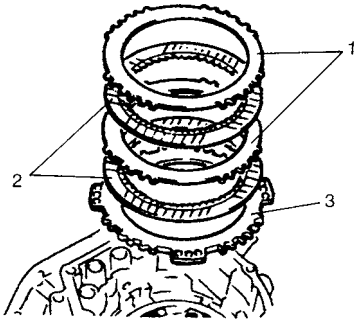
51) Remove 2nd brake piston assembly (1).

52) Remove 2nd brake return spring subassembly (2).



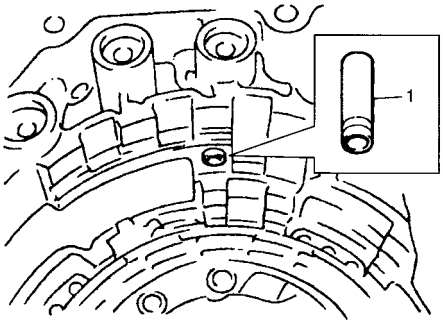
I4RS0A510038-

53) Remove 2nd brake separator plates (1), discs (2) and retaining plate (3).



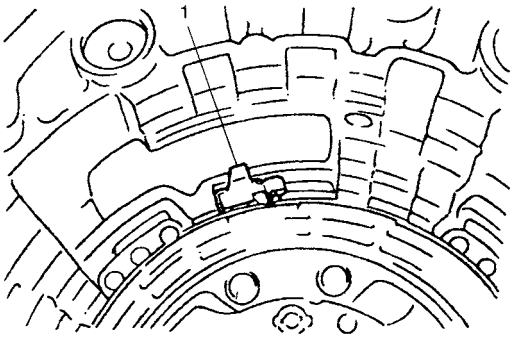
I2RH0B510127-

54) Remove brake drum gasket (1).



I2RH0B510128-

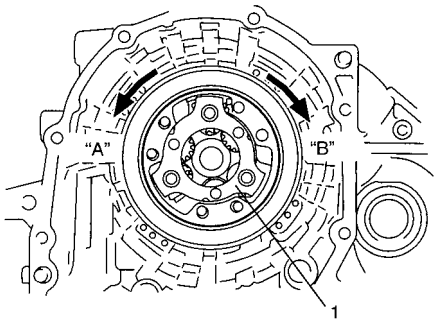
55) Remove one-way clutch outer race retainer (1).



I2RH0B510129-

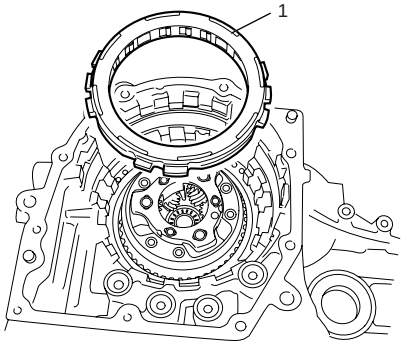
56) Check one-way clutch No.2 as follows.

- Ensure planetary carrier (1) rotates only in counterclockwise direction “A”, never in clockwise direction “B”.
- If the planetary carrier rotates both ways or does not rotate either way, one-way clutch No.2 assembly will need to be replaced with new one-way clutch No.2 assembly.



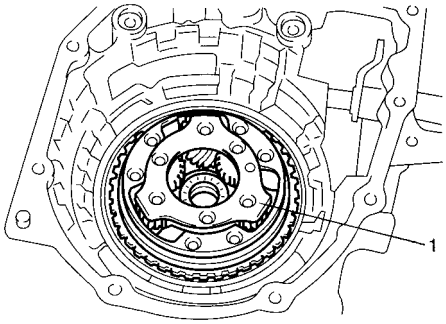
I2RH0B510130-

57) Remove one-way clutch No.2 assembly (1).



I4RS0A510039-

58) Remove planetary gear assembly (1).



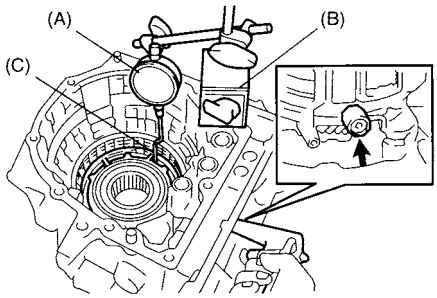
I2RH0B510132-

59) Measure 1st and reverse brake piston stroke. If piston stroke exceeds specified value, disassemble, inspect and replace discs and plates.

- Using special tool, measure 1st and reserve brake piston stroke when compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) is blown through oil hole.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

1st and reverse brake piston stroke
Standard: 0.79 – 1.49 mm (0.031 – 0.059 in.)



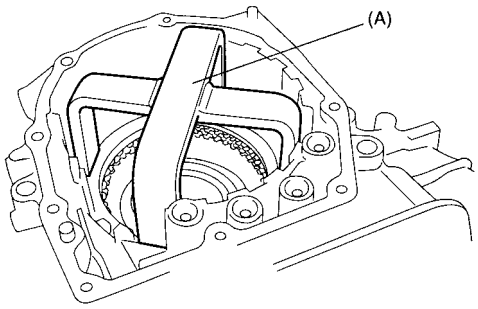
I2RH0B510133-

60) Remove snap ring while the 1st and reverse brake piston return springs are compressed using special tool and hydraulic press.

CAUTION:

Do not press 1st and reverse brake return spring subassembly in over 0.8 mm (0.031 in.).
Excessive compression may cause damage to return spring subassembly, discs, plates and/or piston.

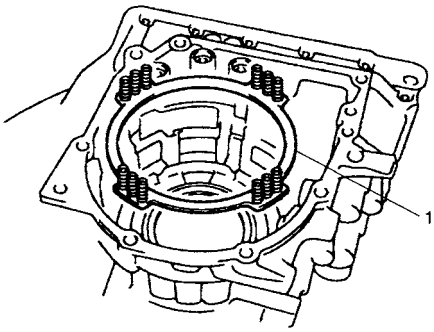
Special tool
(A): 09926–97620



I2RH0B510134-

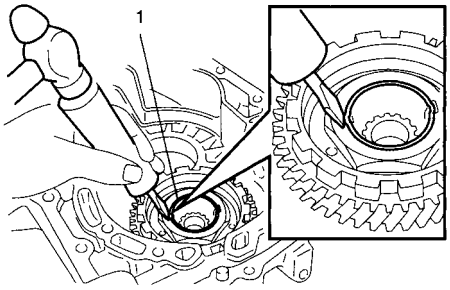
61) Remove 1st and reverse brake retaining plate, discs and separator plates.

62) Remove 1st and reverse brake return spring subassembly (1).



I2RH0B510135-

63) Turn over transaxle and uncaulk reduction drive gear nut (1).

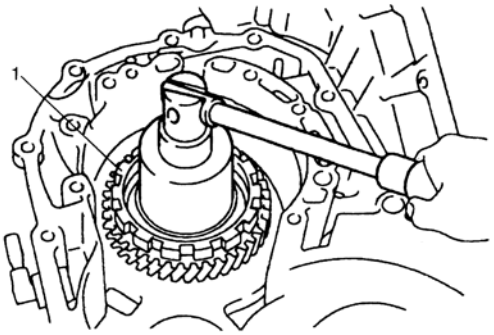


I2RH0B510136-

64) Secure reduction drive gear (1) with parking lock pawl, then remove reduction drive gear nut.

CAUTION:

- **It is recommended that this operation should be carried out on rubber mat to prevent damaging transaxle case.**
- **Never reuse removed nut.**



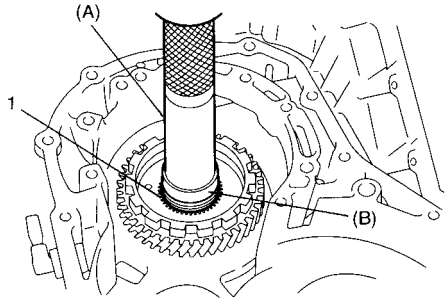
I2RH0B510137-

65) Using special tools and hydraulic press, remove planetary ring gear subassembly (1).

CAUTION:

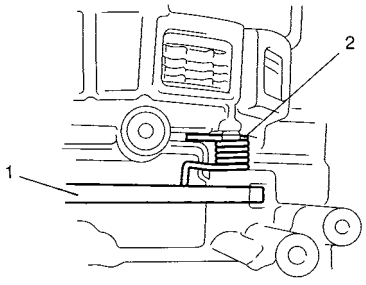
Do not reuse planetary ring gear subassembly. Otherwise it may cause damage to planetary gear unit and/or reduction gears.

Special tool
(A): 09913–84510
(B): 09923–78210



I2RH0B510138-

66) Remove parking lock pawl shaft, then spring (2) and parking lock pawl (1).



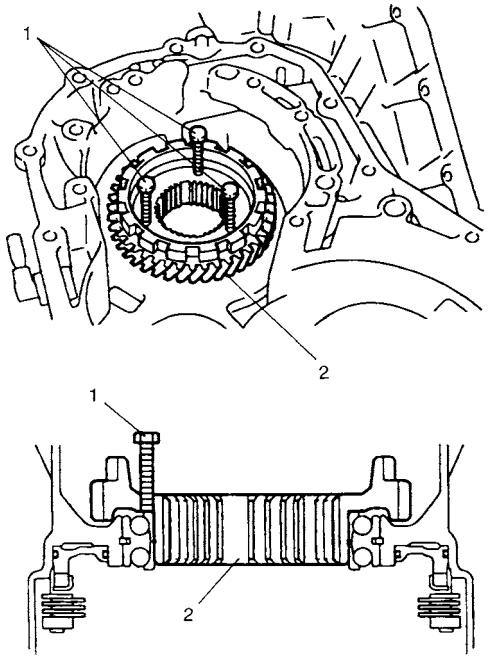
I2RH0B510139-

67) Screwing 3 bolts (1), remove reduction drive gear (2).

CAUTION:

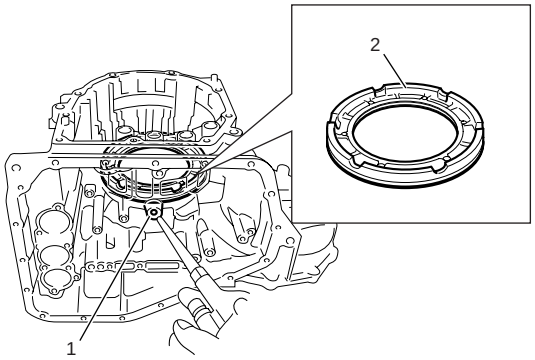
Screw 3 bolts into reduction drive gear uniformly, or reduction drive gear, bearing and transaxle case may be damaged.

Bolt length
30 mm (1.20 in.)



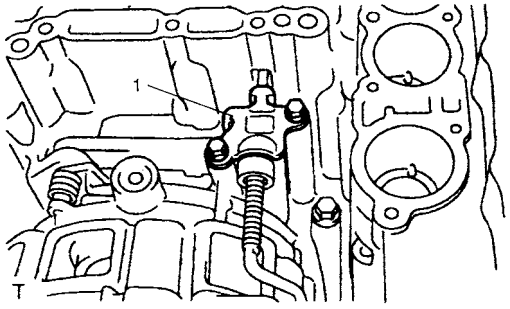
I2RH0B510140-

68) Blowing compressed air from oil hole (1) of oil pump, remove 1st and reverse brake piston (2).



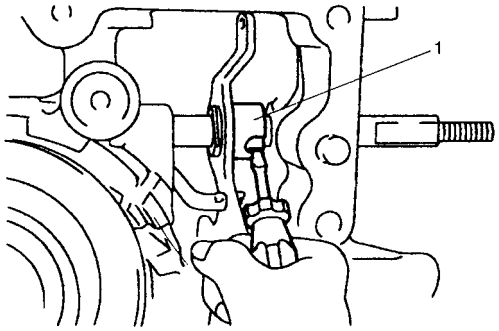
I4RS0A510040-

69) Remove parking lock pawl bracket (1).



I2RH0B510142-

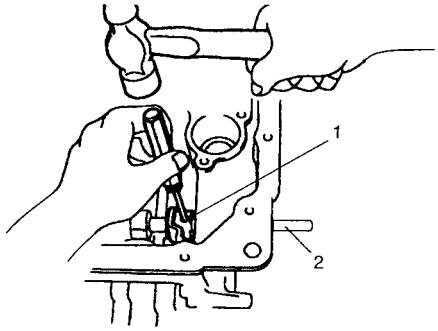
70) With slotted screwdriver, cut and unfold manual valve lever spacer (1) and proceed to remove manual valve lever spacer.



I2RH0B510143-

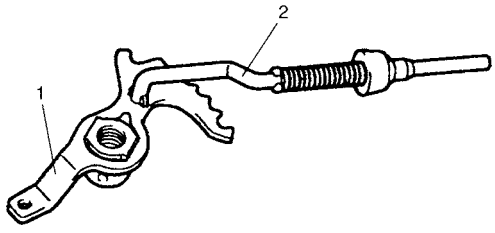
71) Using spring pin remover with 3 mm (0.12 in.) in diameter and hammer, drive out manual valve lever pin (1).

72) Remove manual shift shaft (2).



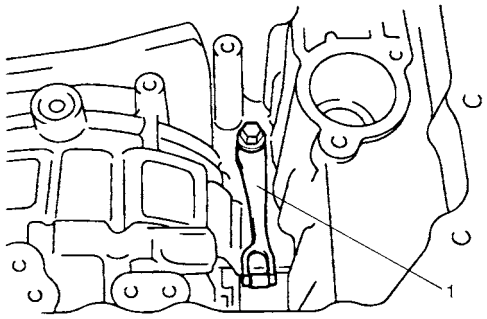
I2RH0B510144-

73) Remove parking lock pawl rod (2) from manual valve lever (1).

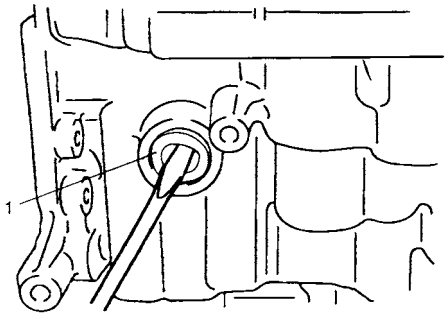


I2RH0B510145-

74) Remove manual detent spring (1).



I2RH0B510146-

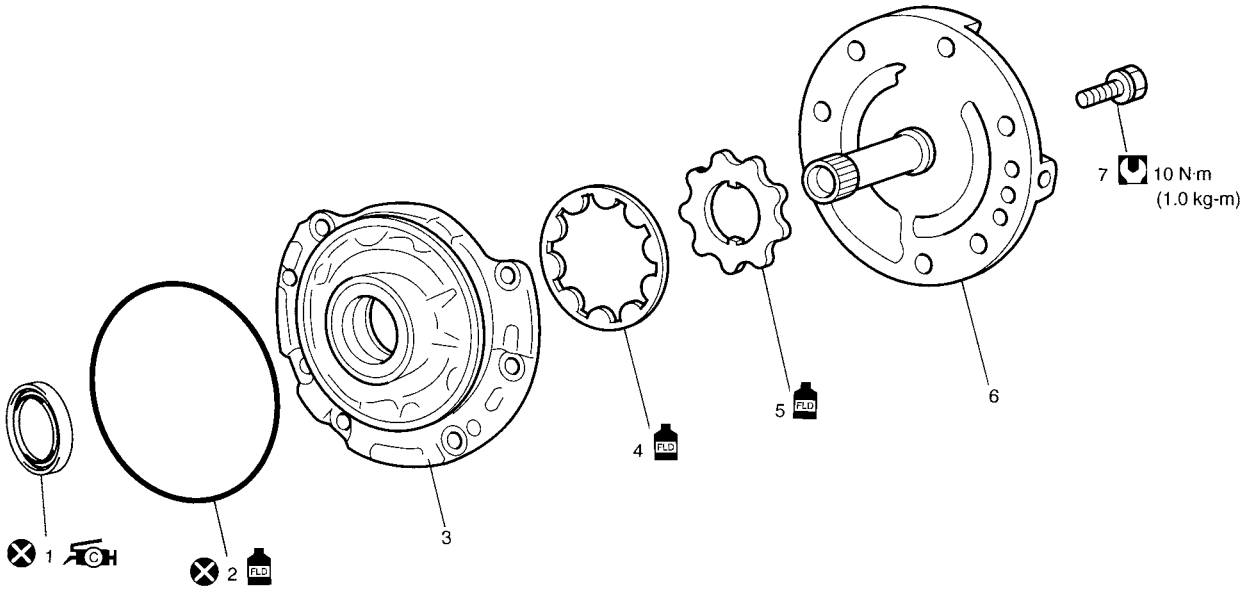


I2RH0B510147-

75) Remove manual shift shaft oil seal (1).

Oil Pump Assembly Components

S4RS0A5106027



I2RH0B510148-

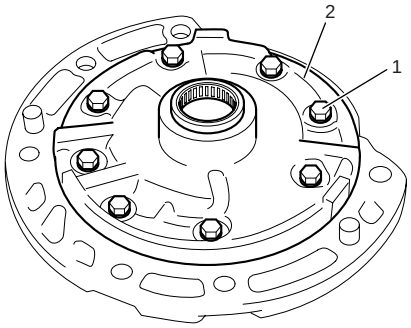
1. Oil seal : Apply grease 99000-25030 to oil seal lip.	5. Oil pump drive gear	: Apply automatic transaxle fluid.
2. O-ring	6. Stator shaft assembly	: Tightening torque
3. Oil pump body	7. Oil pump subassembly bolts	: Do not reuse.
4. Oil pump driven gear		

Oil Pump Assembly Disassembly and Reassembly

S4RS0A5106028

Disassembly

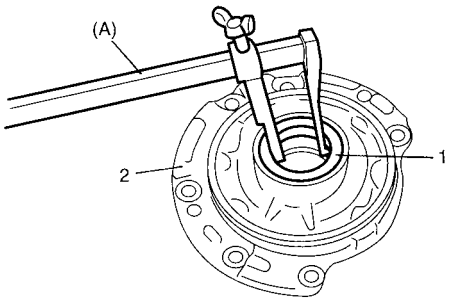
1) Remove O-ring from pump body.
2) Remove 8 oil pump subassembly bolts (1) and stator shaft assembly (2).



I4RS0A510041-

3) Remove oil seal (1) using special tool.

Special tool
(A): 09913–50121



I2RH0B510150-

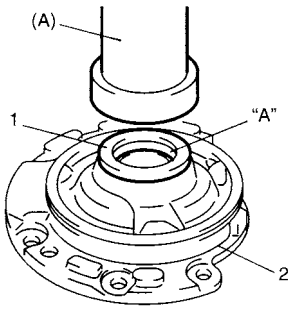
2. Oil pump body

Reassembly

1) Install new oil pump body oil seal (1).
Use special tool and hammer to install it, and then apply grease to its lip portion.

Special tool
(A): 09913–85210

"A": Grease 99000–25030

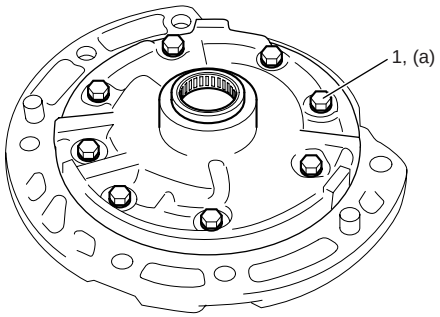


I2RH0B510151-

2. Oil pump body

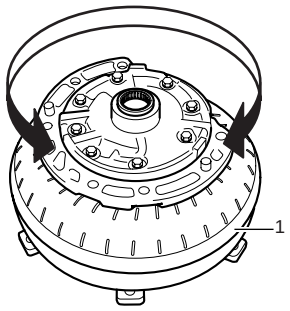
2) Install driven gear and drive gear to oil pump body after applying A/T fluid.
3) Install stator shaft assembly to oil pump body and tighten 8 pump subassembly bolts (1) to specification.

Tightening torque
Oil pump subassembly bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A510042-

4) After applying A/T fluid to new O-ring, install it to oil pump body.
5) Check drive gear for smooth rotation by using torque converter (1).



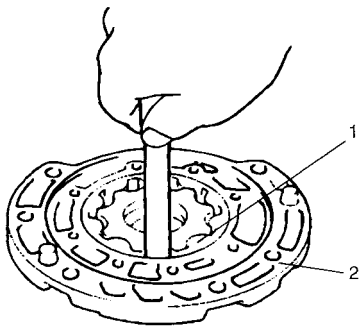
I4RS0A510043-

Oil Pump Assembly Inspection

S4RS0A5106029

1) Check body clearance of driven gear (1).
Push driven gear to one side of oil pump body (2). Using a feeler gauge, measure clearance between driven gear and body. If clearance exceeds its standard value, replace oil pump assembly.

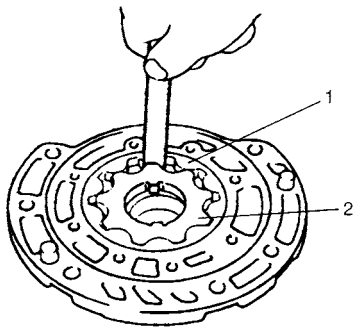
Clearance between oil pump driven gear and oil pump body
Standard: 0.10 – 0.17 mm (0.0039 – 0.0067 in.)



I2RH0B510154-

2) Check tip clearance of both drive and driven gears.
Using a feeler gauge, measure clearance between drive and driven gear tips. If clearance exceeds its standard value, replace oil pump assembly.

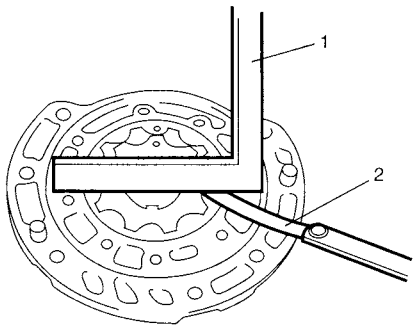
Tip clearance between oil pump drive gear and oil pump driven gear
Standard: 0.07 – 0.15 mm (0.0028 – 0.0059 in.)



I2RH0B510155-

3) Check side clearance of both gears.
Using a straightedge (1) and a feeler gauge (2), measure side clearance between gears and pump body.
If clearance exceeds its standard value, replace oil pump assembly.

Side clearance between gears and oil pump body
Standard: 0.02 – 0.05 mm (0.0008 – 0.0019 in.)

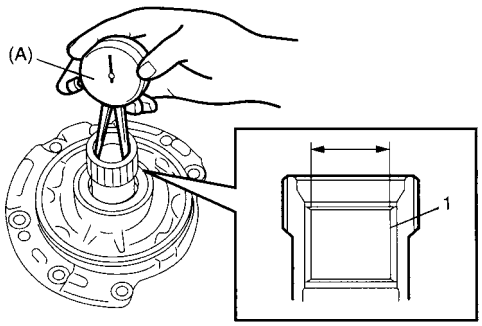


I2RH0B510156-

4) Using special tool, measure stator shaft bush (1) bore.
If measured stator shaft bush bore is out of specifications, replace oil pump assembly with new one.

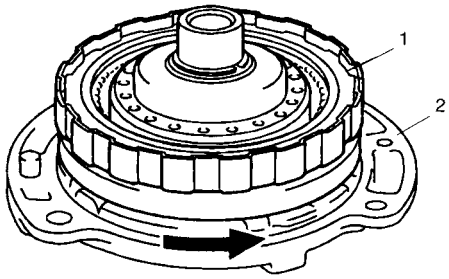
Special tool
(A): 09900–20605

Stator shaft bush bore
Standard: 18.424 – 18.450 mm (0.7254 – 0.7264 in.)



I2RH0B510157-

5) Install direct clutch assembly (1) to stator shaft assembly (2), then ensure that direct clutch assembly turns smoothly.
If unsmooth rotation or noise are found in oil pump assembly, replace oil pump assembly with new one. This check should also be done to input shaft assembly and replace input shaft assembly if necessary.

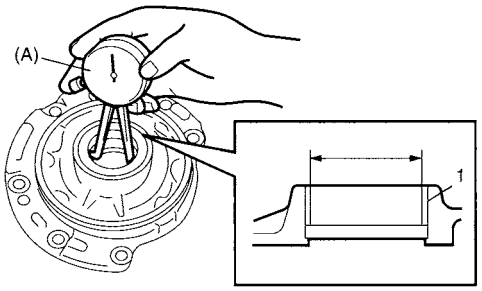


I2RH0B510158-

6) Using special tool, measure oil pump body bush bore.
If measured oil pump body bush (1) bore is out of specifications, replace oil pump assembly with new one. Torque converter also needs to be checked. Replace torque converter, if necessary.

Special tool
(A): 09900–20605

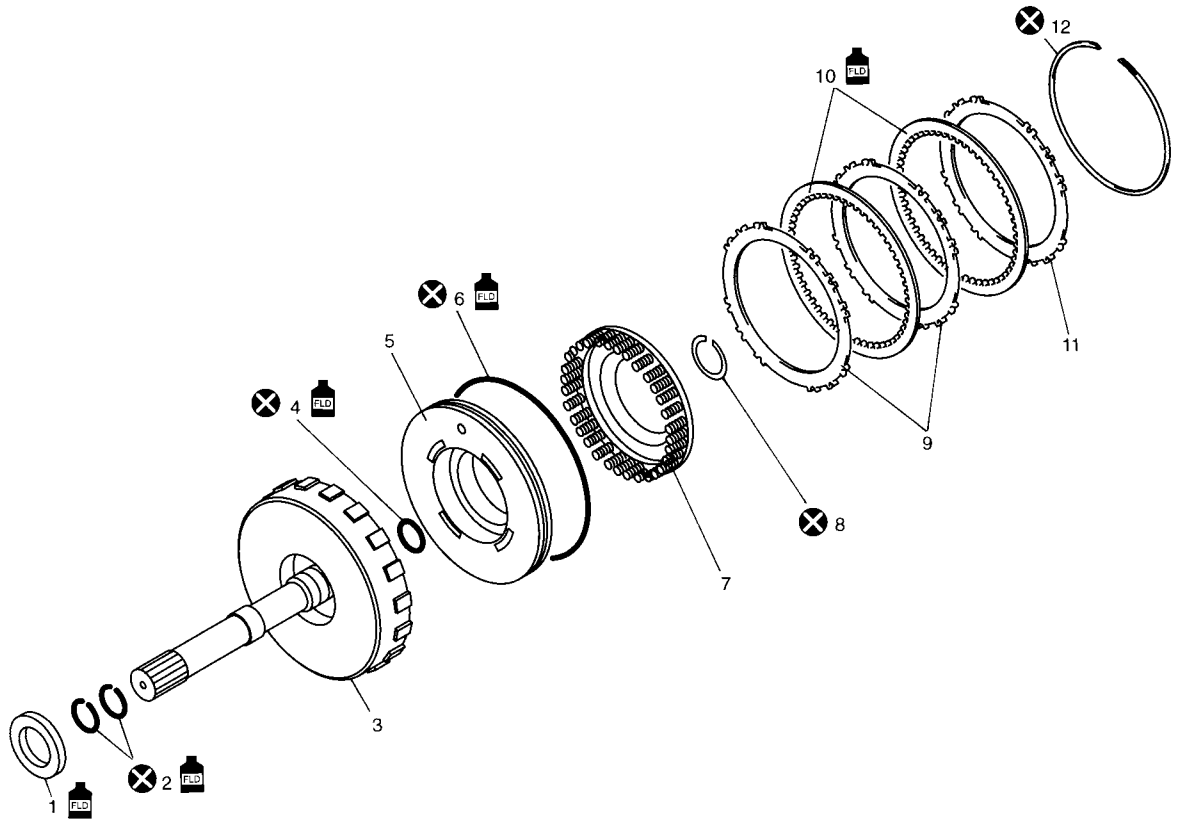
Oil pump body bush bore
Standard: 38.113 – 38.138 mm (1.5005 – 1.5015 in.)



I2RH0B510159-

Direct Clutch Assembly Components

S4RS0A5106030



I2RH0B510160-

1. Input shaft front thrust bearing	6. Outer O-ring	11. Direct clutch retaining plate
2. Input shaft seal ring	7. Direct clutch return spring subassembly	12. Plate snap ring
3. Input shaft subassembly	8. Shaft snap ring	FLD : Apply automatic transaxle fluid.
4. Inner O-ring	9. Direct clutch separator plate	⊗ : Do not reuse.
5. Direct clutch piston	10. Direct clutch disc	

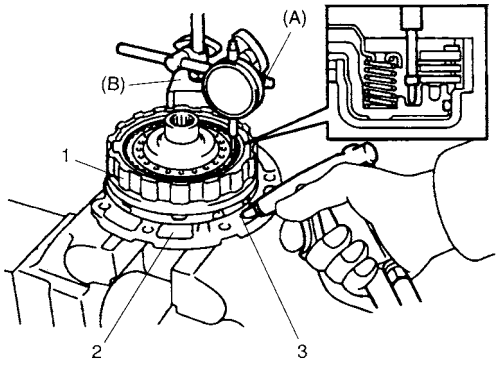
Direct Clutch Assembly Preliminary Check

S4RS0A5106031

Install direct clutch assembly (1) to oil pump assembly (2) blow in air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) through oil hole (3) of oil pump assembly with special tool attached on upper surface of direct clutch piston, and measure piston stroke of direct clutch.
If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool
(A): 09900–20607
(B): 09900–20701

Direct clutch piston stroke
0.4 – 0.7 mm (0.016 – 0.027 in.)



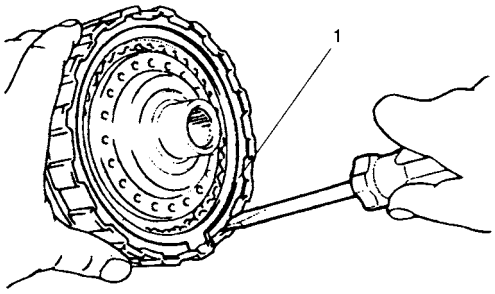
I2RH0B510161-

Direct Clutch Assembly Disassembly and Reassembly

S4RS0A5106032

Disassembly

1) Remove plate snap ring (1) then remove direct clutch retaining plate, discs and separator plates.



I2RH0B510162-

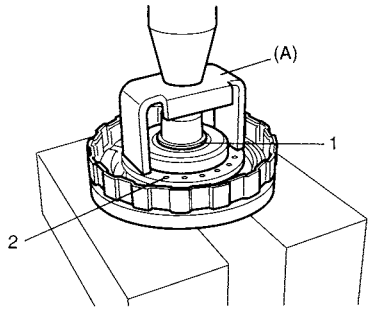
2) Using special tool and hydraulic press, remove shaft snap ring (1).

Special tool
(A): 09926–98310

CAUTION:

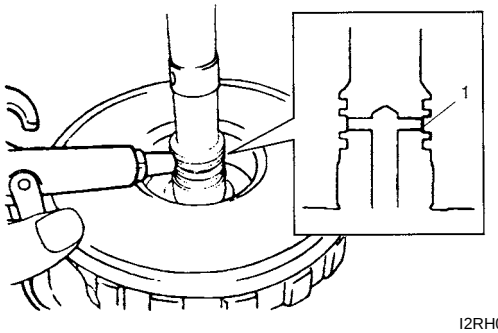
Do not press direct clutch return spring subassembly in over 0.7 mm (0.027 in.). Excessive compression may cause damage to direct clutch return spring subassembly and/or piston.

3) Remove direct clutch return spring assembly (2).



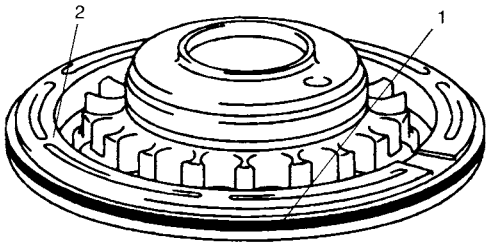
I2RH0B510163-

4) Using a finger to block oil hole (1), apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to opposite hole, which will assist in removal of the clutch piston.



I2RH0B510164-

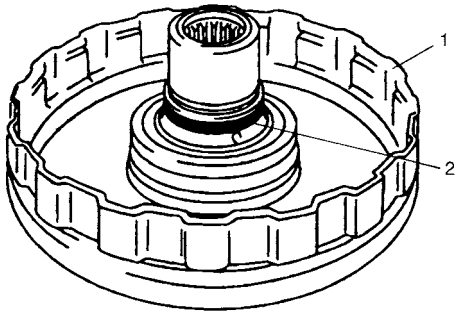
5) Remove outer O-ring (1).



I2RH0B510165-

2. Direct clutch piston

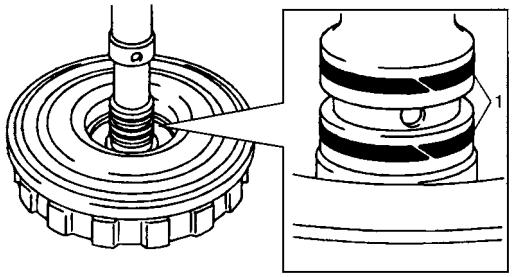
6) Remove inner O-ring (2).



I2RH0B510166-

1. Input shaft subassembly

7) Remove input shaft seal rings (1).



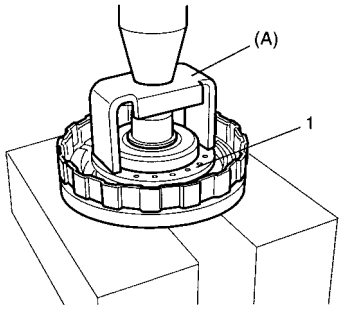
I2RH0B510167-

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

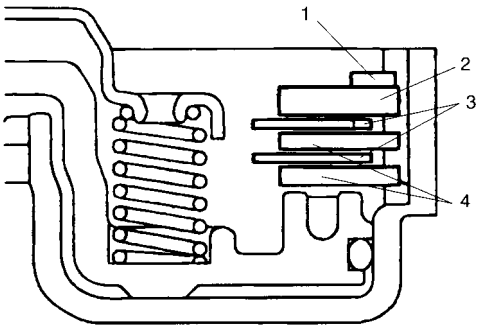
- Use new seal ring and O-ring. Apply A/T fluid before installation.
- Do not damage direct clutch return spring subassembly (1) and piston by pressing in direct clutch return spring subassembly passing through its original installing position over 0.7 mm (0.027 in.).

Special tool
(A): 09926–98310



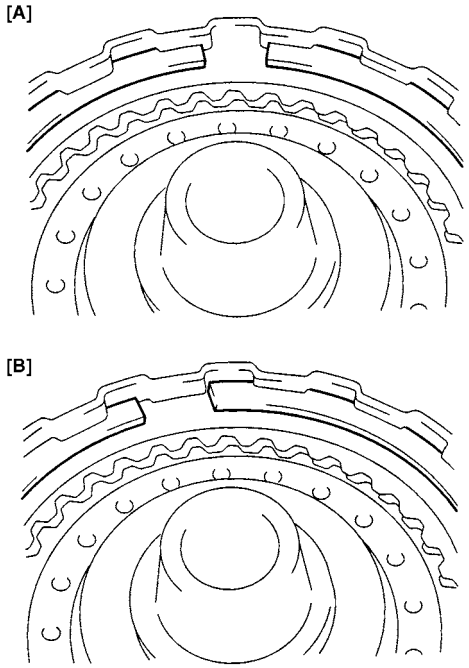
I2RH0B510168-

- Apply A/T fluid to direct clutch separator plates (4), discs (3) and retaining plate (2).
- Install direct clutch separator plates (4), discs (3), retaining plate (2) and snap ring (1) to input shaft subassembly.



I2RH0B510169-

- Install plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510170-

[A]: Correct	[B]: Incorrect

- After assembly, measure direct clutch piston stroke.

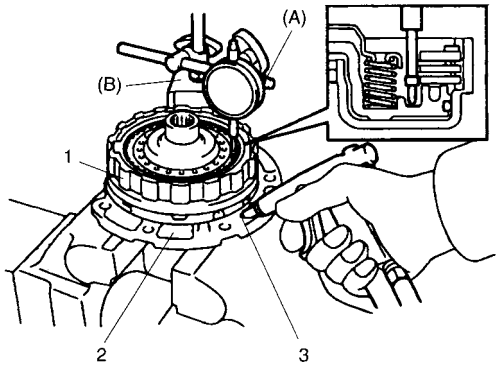
Special tool
(A): 09900–20607
(B): 09900–20701

Direct clutch piston stroke
0.4 – 0.7 mm (0.016 – 0.027 in.)

When piston stroke is out of specification, select direct clutch retaining plate with suitable thickness from among the following table and replace it.

Available direct clutch retaining plate thickness

Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.2 mm (0.126 in.)	2
3.4 mm (0.134 in.)	3
2.8 mm (0.110 in.)	4



I2RH0B510171-

1. Direct clutch assembly	3. Oil hole
2. Oil pump assembly	

Direct Clutch Assembly Inspection

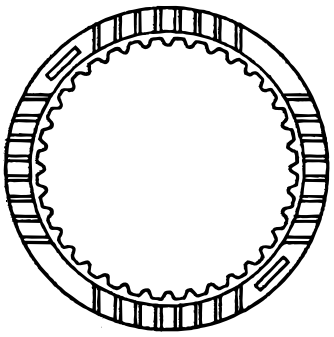
S4RS0A5106033

Clutch Discs, Plates and Retaining Plate

Check that sliding surfaces of discs, separator plates and retaining plate are not worn hard or burnt. If necessary, replace.

NOTE:

- **If disc lining is exfoliated, discolored, replace all discs.**
- **Before assembling new discs, soak them in A/T fluid for at least two hours.**



I2RH0B510172-

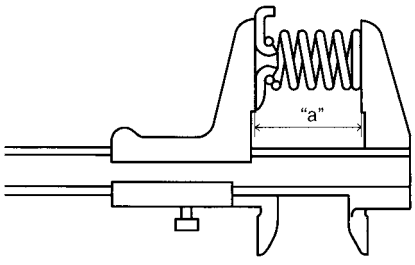
Direct Clutch Return Spring Subassembly

Measure free length of direct clutch return spring.

Direct clutch return spring free length
"a": 36.04 mm (1.419 in.)

NOTE:

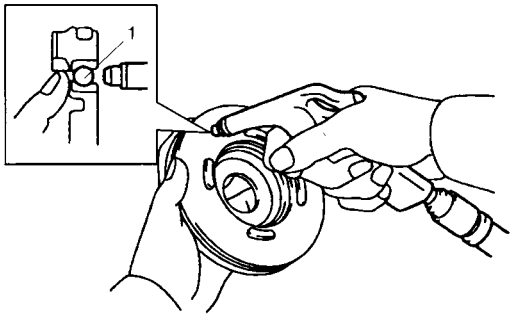
Do not apply excessive force when measuring spring free length. Perform measurement at several points.



I2RH0B510173-

Direct Clutch Piston

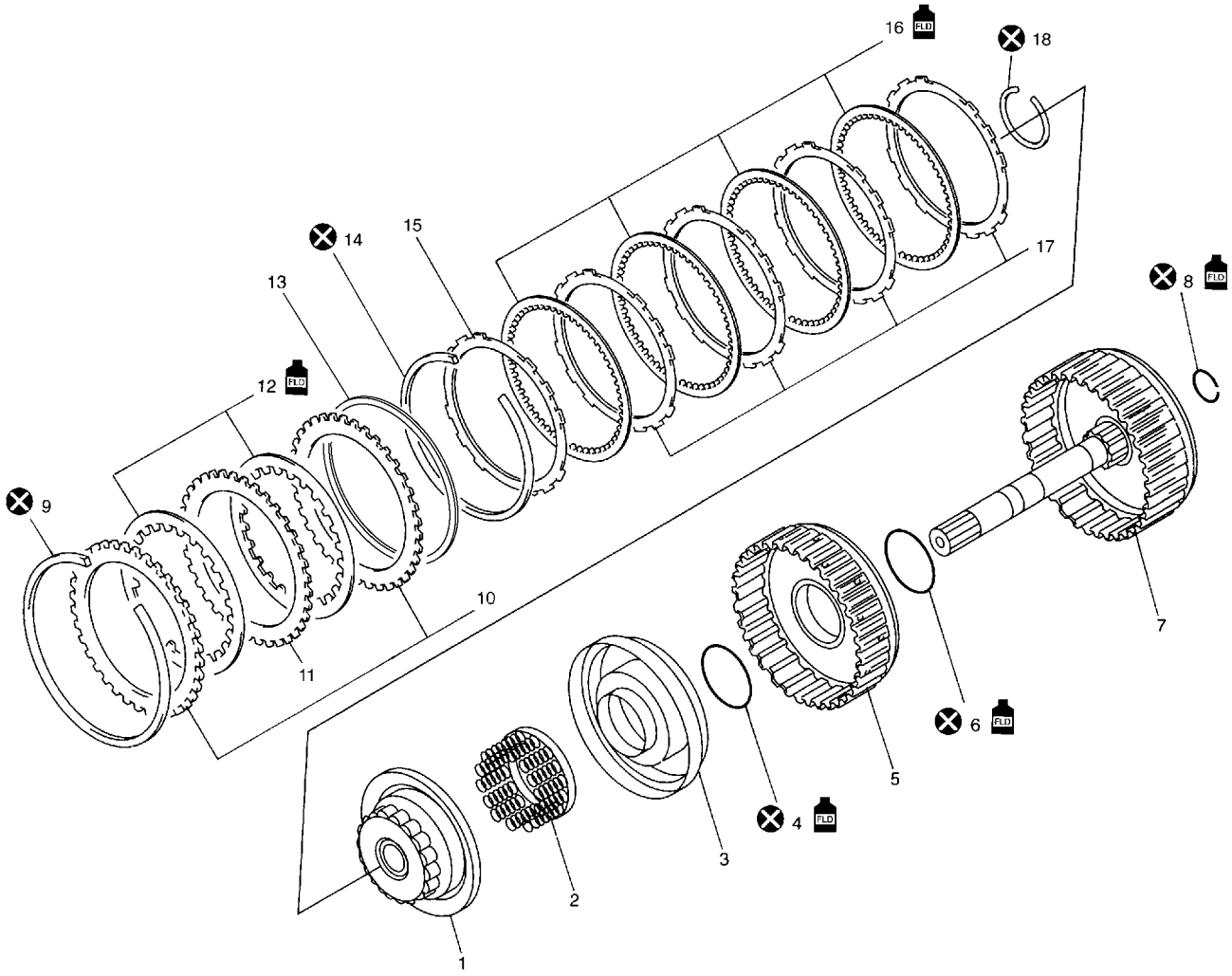
Shake direct clutch piston lightly and check that check ball (1) is not stuck.
Blow in low pressure air (Max. 100 kPa, 1 kg/cm^2, 15 psi) to check ball to check that there is no leakage.



I2RH0B510174-

Forward and Reverse Clutch Assembly Components

S4RS0A5106034



I3RM0B510061-

1. Forward clutch balancer	8. Intermediate shaft seal ring	15. Forward clutch retaining plate
2. Forward clutch return spring subassembly	9. Reverse clutch plate snap ring	16. Forward clutch disc
3. Forward clutch piston	10. Reverse clutch retaining plate	17. Forward clutch separator plate
4. Forward clutch piston O-ring	11. Reverse clutch separator plate	18. Balancer snap ring
5. Forward clutch drum	12. Reverse clutch disc	FLD : Apply automatic transaxle fluid.
6. Forward clutch drum O-ring	13. Reverse clutch cushion plate	: Do not reuse.
7. Intermediate shaft subassembly	14. Forward clutch plate snap ring	

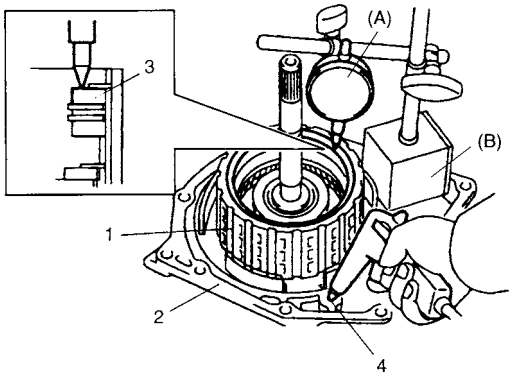
Forward and Reverse Clutch Assembly Preliminary Check

S4RS0A5106035

1) Install forward and reverse clutch assembly (1) to transaxle rear cover (2), blow in compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) through oil hole (4) of transaxle rear cover with the special tool attached on the upper surface of reverse clutch retaining plate (3), and measure reverse clutch piston stroke.
   If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool
(A): 09900–20607
(B): 09900–20701

Reverse clutch piston stroke
1.20 – 1.60 mm (0.047 – 0.063 in.)

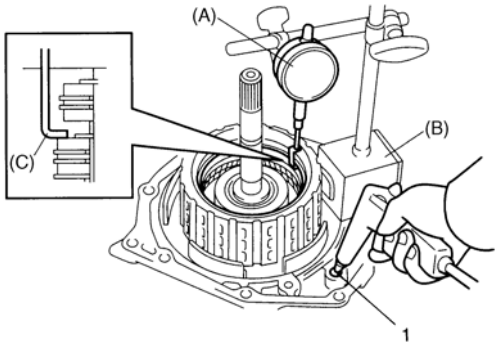


I2RH0B510176-

2) Blow compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) through oil hole (1) of transaxle rear cover with the special tool attached on the upper surface of forward clutch retaining plate, and measure forward clutch piston stroke.
If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

Forward clutch piston stroke
1.30 – 1.50 mm (0.051 – 0.059 in.)



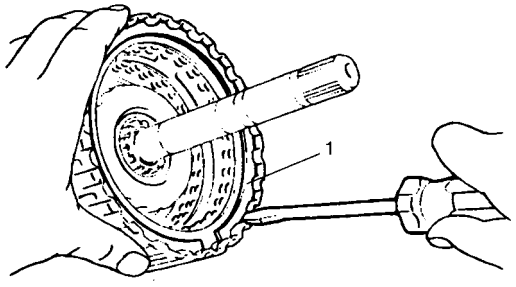
I2RH0B510177-

Forward and Reverse Clutch Assembly Disassembly and Reassembly

S4RS0A5106036

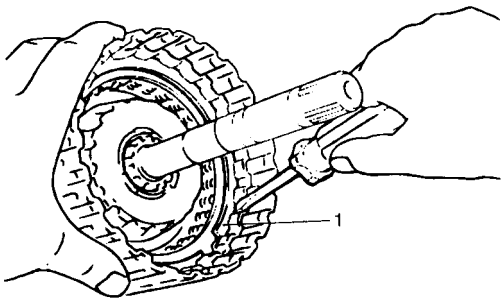
Disassembly

1) Remove reverse clutch plate snap ring (1) and take out reverse clutch retaining plate, discs, separator plates and clutch cushion plate from intermediate shaft subassembly.



I2RH0B510178-

2) Remove forward clutch plate snap ring (1) and take out forward clutch retaining plate, discs and separator plates from forward clutch drum.



I2RH0B510179-

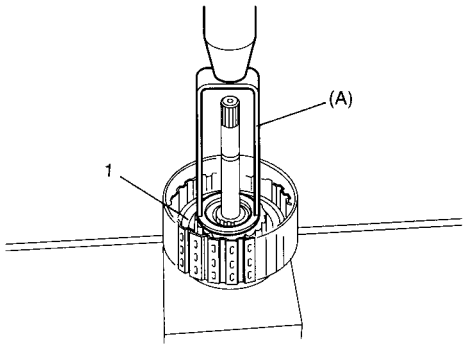
3) Remove balancer snap ring by using special tool and hydraulic press.

Special tool
(A): 09926–97610

CAUTION:

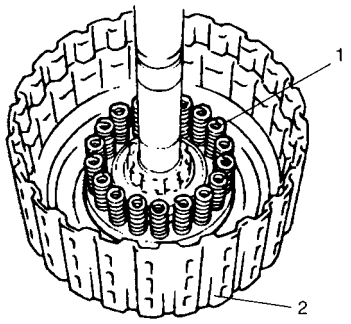
Do not press forward clutch return spring subassembly in over 1.5 mm (0.059 in.). Excessive compression may cause damage to return spring subassembly and/or balancer.

4) Remove forward clutch balancer (1).



I2RH0B510180-

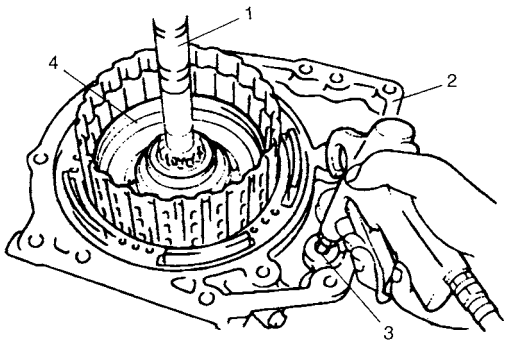
5) Remove forward clutch return spring subassembly (1).



I2RH0B510181-

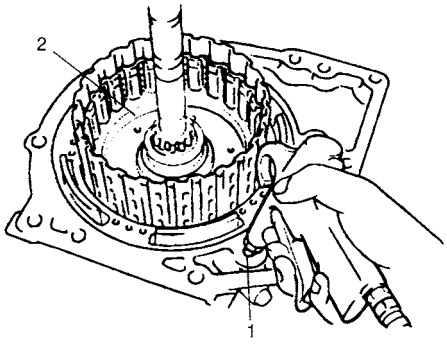
2. Intermediate shaft subassembly

6) Install intermediate shaft subassembly (1) to transaxle rear cover (2). Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (3) of transaxle rear cover to remove forward clutch piston (4).



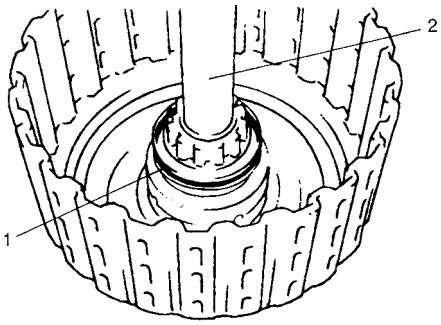
I2RH0B510182-

7) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (1) of transaxle rear cover to remove forward clutch drum (2).



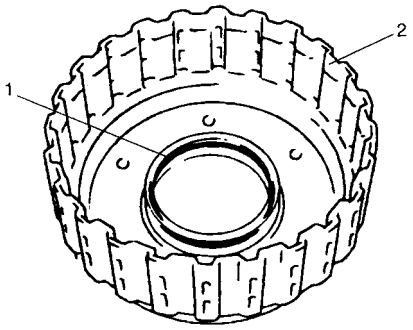
I2RH0B510183-

8) Remove forward clutch piston O-ring (1) from intermediate shaft subassembly (2).



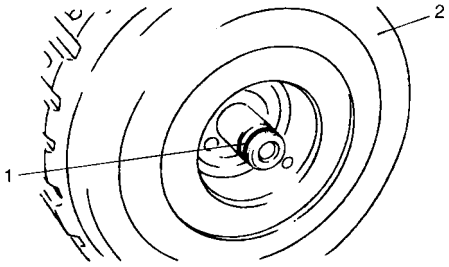
I2RH0B510184-

9) Remove forward clutch drum O-ring (1) from forward clutch drum (2).



I2RH0B510185-

10) Remove intermediate shaft seal ring (1) from intermediate shaft subassembly (2).



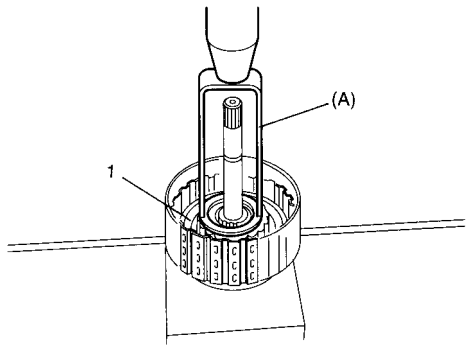
I2RH0B510186-

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

- Before assembling, apply automatic transaxle fluid to component parts.
- Replace O-rings and seal ring with new ones.
- Do not damage forward clutch return spring subassembly and balancer (1) by pressing forward clutch return spring subassembly passing through its original installing position over 1.5 mm (0.059 in.).

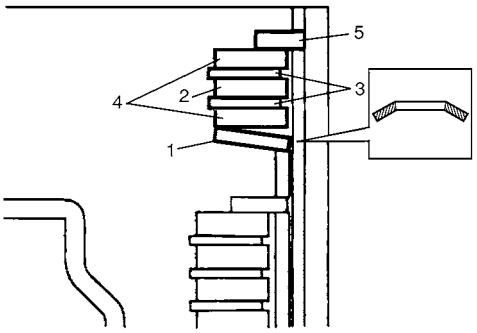
Special tool
(A): 09926–97610



I2RH0B510180-

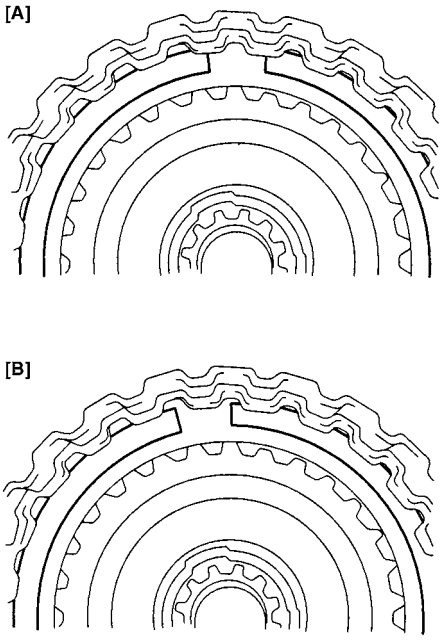
•

- Apply A/T fluid to forward clutch separator plates (1), discs (2) and retaining plate (3).
- Install forward clutch separator plates (1), discs (2) and retaining plate (3), then snap ring (4) to forward clutch drum.



I3RM0B510062-

- Install forward clutch plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510188-

[A]: Correct	[B]: Incorrect

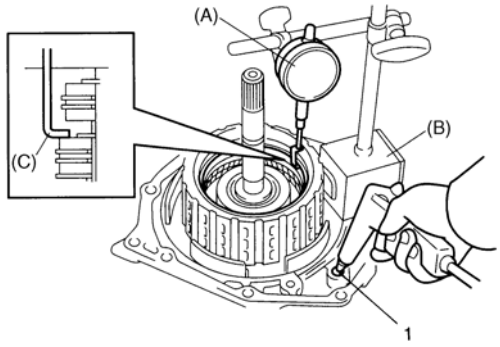
- Measure forward clutch piston stroke in the same manner as “Forward and Reverse Clutch Assembly Preliminary Check: ”.
  When piston stroke is out of specification, select forward clutch retaining plate with proper thickness from among the following table and replace it.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

Forward clutch piston stroke
1.30 – 1.50 mm (0.051 – 0.059 in.)

Available forward clutch retaining plate thickness

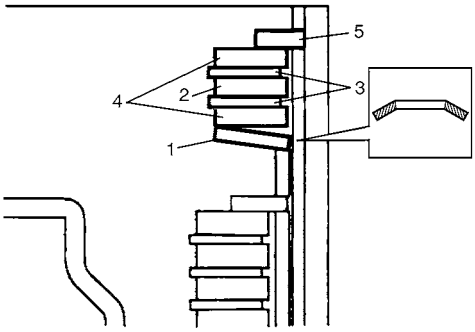
Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.1 mm (0.122 in.)	5
3.2 mm (0.126 in.)	2
3.3 mm (0.130 in.)	6
3.4 mm (0.134 in.)	3
3.5 mm (0.138 in.)	7
3.6 mm (0.142 in.)	4



I2RH0B510177-

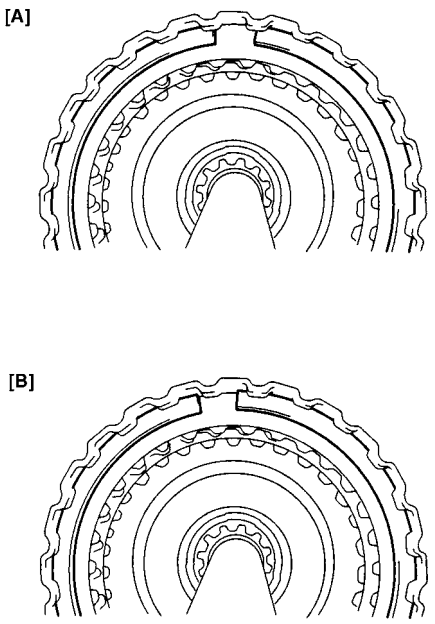
1. Oil hole

- Install reverse clutch cushion plate (1) in correct direction as shown in figure.
- Apply A/T fluid to reverse clutch cushion plate (1), reverse clutch separator plate (2), discs (3) and retaining plate (4).
- Install reverse clutch cushion plate (1), reverse clutch separator plate (2), discs (3), retaining plate (4) and then snap ring (5) to intermediate shaft subassembly.



I3RM0B510062-

- Install reverse clutch plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510190-

[A]: Correct	[B]: Incorrect

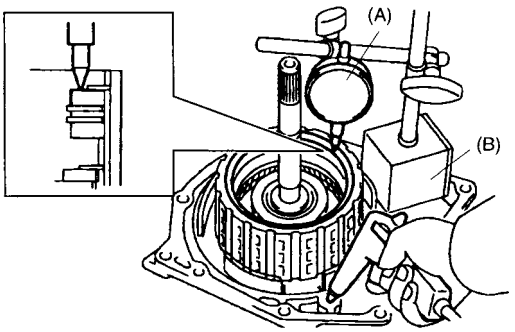
- Measure reverse clutch piston stroke in the same manner as “Forward and Reverse Clutch Assembly Preliminary Check: ”.
  When piston stroke is out of specification, select reverse clutch retaining plate with proper thickness from among the following table and replace it.

  Special tool
  (A): 09900–20607
  (B): 09900–20701

  Reverse clutch piston stroke
  1.20 – 1.60 mm (0.047 – 0.063 in.)

Available reverse clutch retaining plate thickness

Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.2 mm (0.126 in.)	2
3.4 mm (0.134 in.)	3
3.6 mm (0.142 in.)	4



I2RH0B510191-

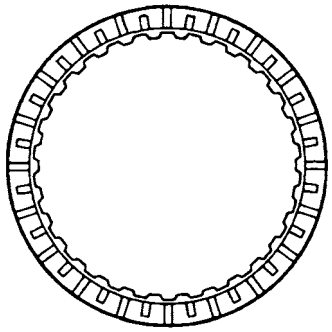
Forward and Reverse Clutch Assembly Inspection

S4RS0A5106037

Clutch, Discs, Separator Plates and Retaining Plate
Check that sliding surfaces of discs, separator plates and retaining plate are not worn hard or burnt. If necessary, replace.

NOTE:

- **If disc lining is exfoliated or discolored, replace all discs.**
- **Before assembling new discs, soak them in A/T fluid for at least two hours.**



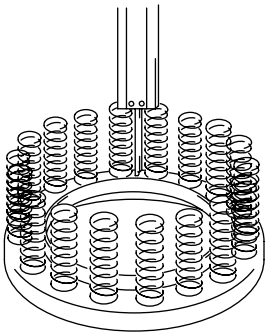
I2RH0B510192-

Forward Clutch Return Spring Subassembly
Measure free length of forward clutch return spring.

Forward clutch return spring free length
23.04 mm (0.907 in.)

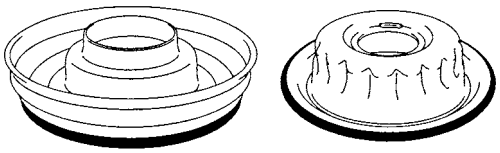
NOTE:

Do not apply excessive force when measuring spring free length. Perform measurement at several points.



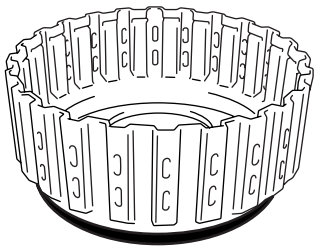
I2RH0B510193-

Forward Clutch Piston Lip and Forward Clutch Balancer Lip
Check each lip for wear, deformation, cut and/or hardening. If necessary, replace.



I2RH0B510194-

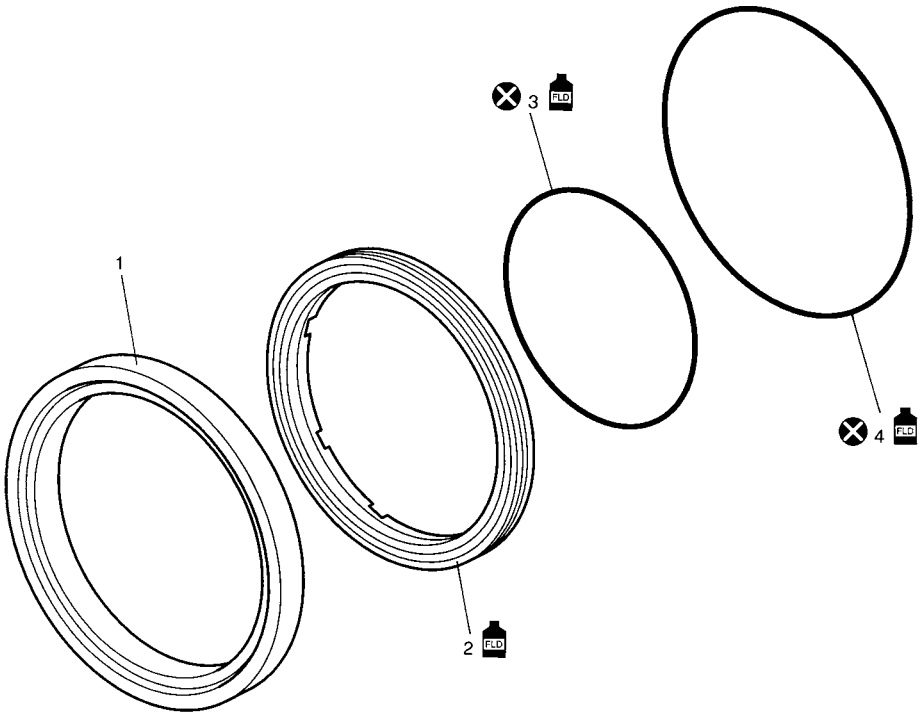
Forward Clutch Drum Lip
Check each lip for wear, deformation, cut and/or hardening. If necessary, replace.



I2RH0B510195-

2nd Brake Piston Assembly Components

S4RS0A5106038



I2RH0B510196-

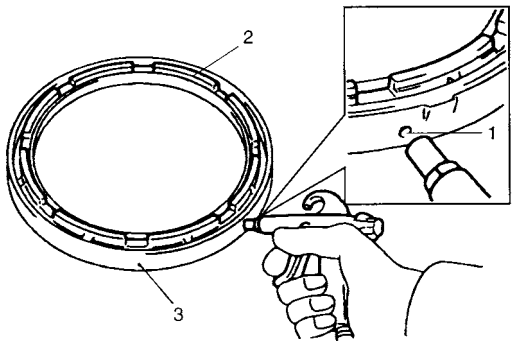
1. 2nd brake cylinder	4. Outer O-ring
2. 2nd brake piston	FLD : Apply automatic transaxle fluid.
3. Inner O-ring	⊗ : Do not reuse.

2nd Brake Piston Assembly Disassembly and Reassembly

S4RS0A5106040

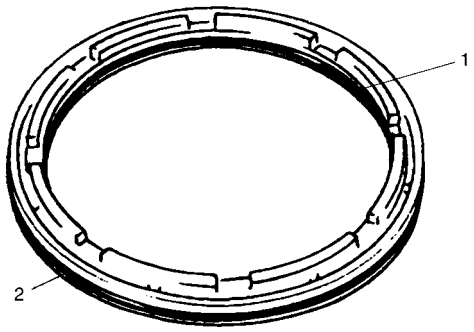
Disassembly

1) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (1) of 2nd brake cylinder (3) to remove 2nd brake piston (2).



I2RH0B510197-

2) Remove inner O-ring (1) and outer O-ring (2).

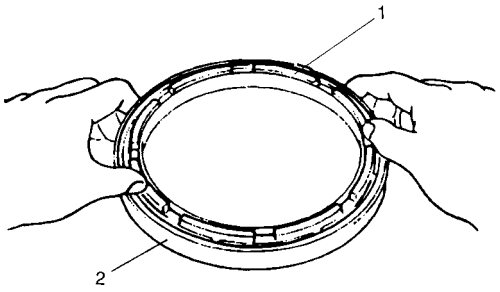


I2RH0B510198-

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

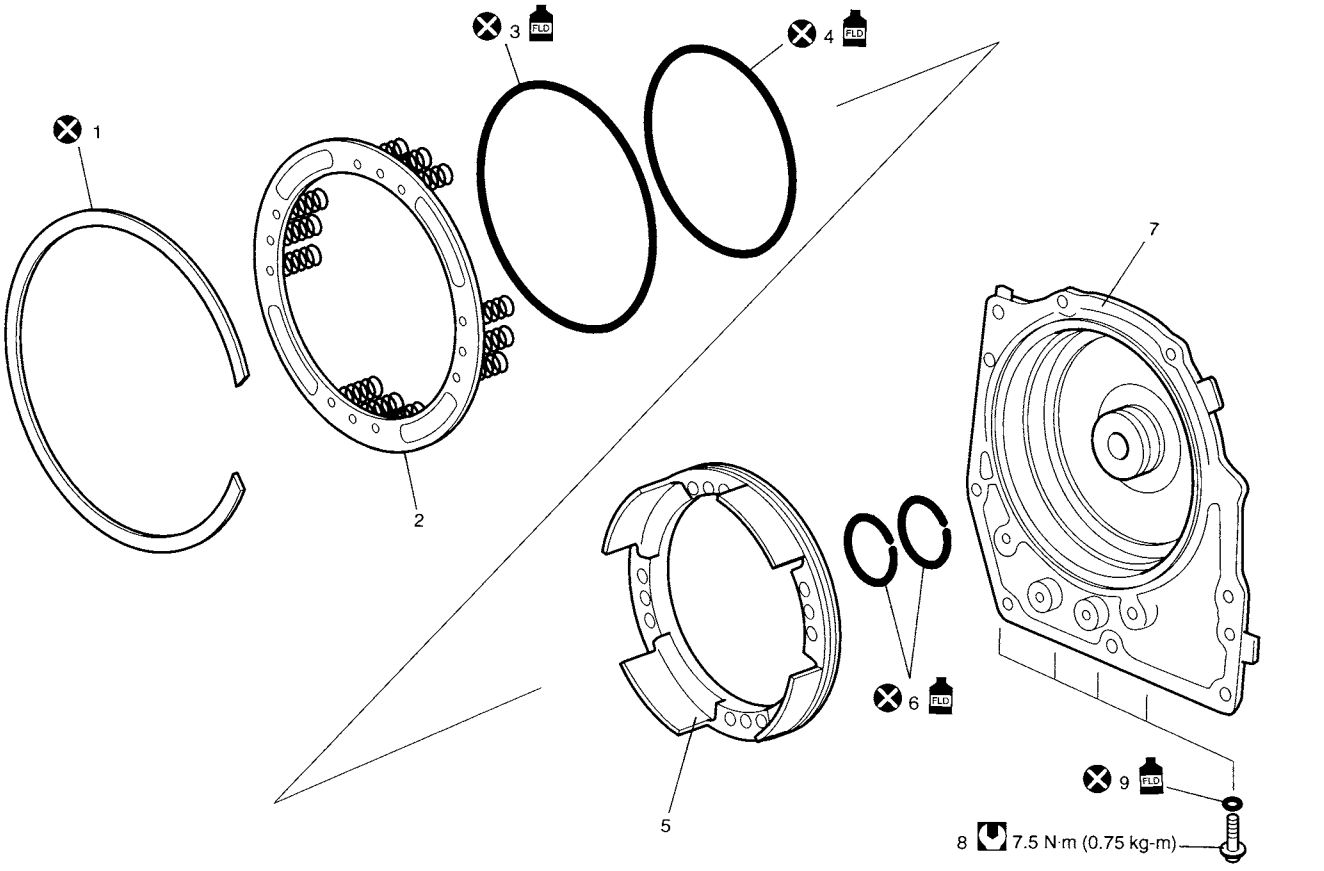
- Use new O-rings. Apply A/T fluid to the O-rings, before installation.
- Install 2nd brake piston (1) to which A/T fluid is applied to 2nd brake cylinder (2).
  Do not damage O-ring when installing 2nd brake piston.



I2RH0B510199-

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components

S4RS0A5106042



I2RH0B510200-

1. Snap ring	5. O/D and 2nd coast brake piston	9. Rear cover plug O-ring
2. O/D and 2nd coast brake return spring subassembly	6. Rear cover seal ring	FLD : Apply automatic transaxle fluid.
3. O/D and 2nd coast brake piston front O-ring	7. Transaxle rear cover	⊗ : Do not reuse.
4. O/D and 2nd coast brake piston rear O-ring	8. Rear cover plug	: Tightening torque

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Disassembly and Reassembly

S4RS0A5106044

Disassembly

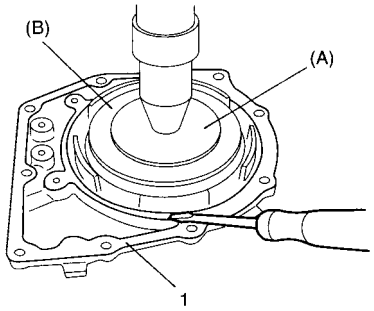
1) Remove snap ring by using special tools and hydraulic press.

Special tool
(A): 09926–96030
(B): 09946–06710

CAUTION:

Do not press O/D and 2nd coast brake return spring subassembly in over 1.0 mm (0.039 in.).
Excessive compression may cause damage to O/D and 2nd coast brake return spring subassembly and/or piston.

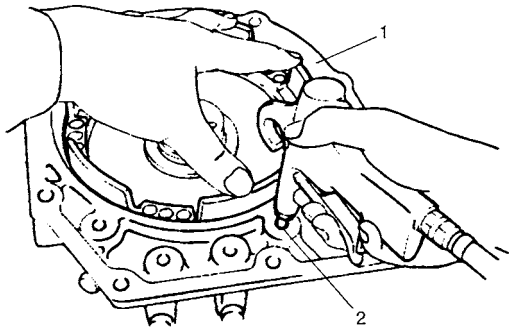
2) Remove O/D and 2nd coast brake return spring assembly.



I2RH0B510201-

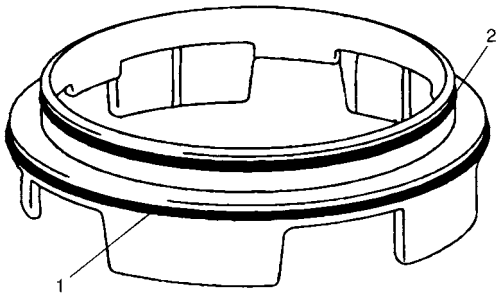
1. Transaxle rear cover

3) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (2) of transaxle rear cover (1) to remove O/D and 2nd coast brake piston.



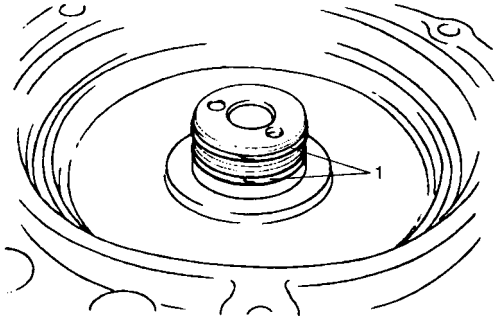
I2RH0B510202-

4) Remove O/D and 2nd coast brake piston front O-ring (1) and rear O-ring (2).



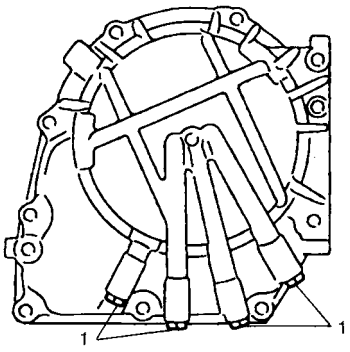
I2RH0B510203-

5) Remove rear cover seal rings (1).



I2RH0B510204-

6) Remove rear cover plugs (1).



I2RH0B510205-

Reassembly

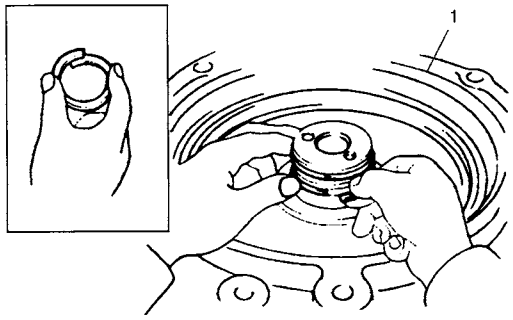
Reverse disassembly procedure for assembly, noting the following points.

- Use new seal rings and O-rings. Apply A/T fluid to seal rings and O-rings before installation.
- Tighten rear cover plugs to specified torque.

  Tightening torque
  Rear cover plug: 7.5 N·m (0.75 kg-m, 5.5 lb-ft)

- Before installing rear cover seal ring, apply A/T fluid to ring.
  First, tighten seal ring to 5 mm (0.197 in.), then install seal ring.

- Do not open rear cover seal ring too wide to attach.

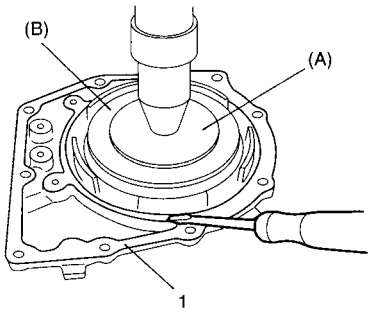


I2RH0B510206-

1. Transaxle rear cover

- Do not damage O/D and 2nd coast brake return spring subassembly and piston by pressing in O/D and 2nd coast brake return spring subassembly passing through its original installing position over 1.0 mm (0.039 in.).

Special tool
(A): 09926–96030
(B): 09946–06710



I2RH0B510201-

1. Transaxle rear cover

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Inspection

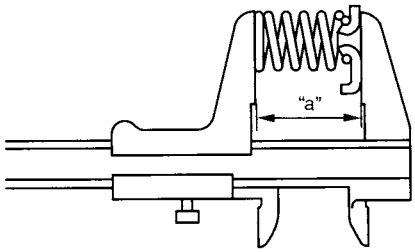
S4RS0A5106045

O/D and 2nd Coast Brake Return Spring Subassembly
Measure free length of O/D and 2nd coast brake return spring.

Free length of O/D and 2nd coast brake return spring "a": 18.99 mm (0.748 in.)

NOTE:

- **Do not apply excessive force when measuring spring free length.**
- **Perform measurement at several points.**

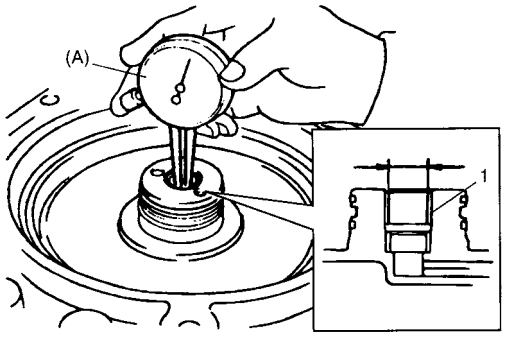


I2RH0B510207-

Transaxle Rear Cover Bush
Measure transaxle rear cover bush bore by using special tool.
If measured transaxle rear cover bush bore is out of specifications, replace transaxle rear cover with new one. In replacement, intermediate shaft subassembly also needs to be checked. Replace intermediate shaft subassembly, if necessary.

Special tool
(A): 09900–20605

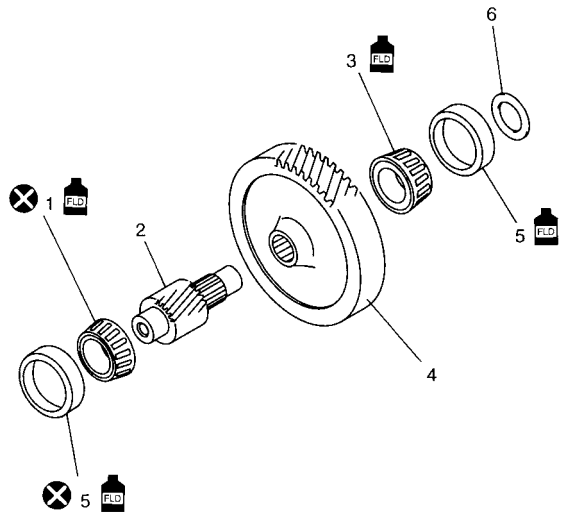
Transaxle rear cover bush bore
Standard: 13.94 – 13.96 mm (0.549 – 0.550 in.)



I2RH0B510208-

Countershaft Assembly Components

S4RS0A5106048



I2RH0B510209-

1. Countershaft RH bearing	5. Bearing cap
2. Countershaft	6. Countershaft bearing shim
3. Countershaft LH bearing	FLD : Apply automatic transaxle fluid.
4. Reduction driven gear	: Do not reuse.

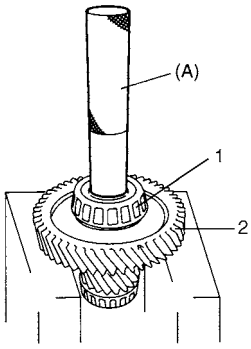
Countershaft Assembly Disassembly and Reassembly

S4RS0A5106049

Disassembly

1) Remove countershaft LH bearing (1) and reduction driven gear (2) at once by using special tool and hydraulic press.

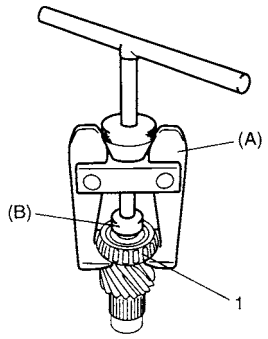
Special tool
(A): 09925–98221



I2RH0B510210-

2) Remove countershaft RH bearing (1) by using special tools.

Special tool
(A): 09913–61510
(B): 09926–58010



I2RH0B510211-

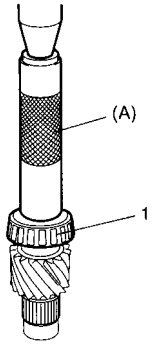
Reassembly

1) Install new countershaft RH bearing (1) by using special tool and hydraulic press.

Special tool
(A): 09913–84510

NOTE:

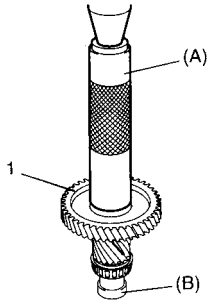
Replace countershaft RH bearing together with bearing cup as a set.



I2RH0B510212-

2) Install reduction driven gear (1) with special tools and hydraulic press.

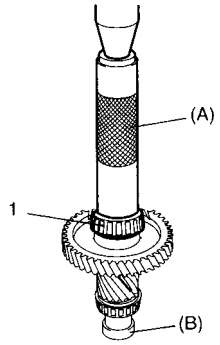
Special tool
(A): 09913–84510
(B): 09925–88210



I2RH0B510213-

3) Install countershaft LH bearing (1) with special tools and hydraulic press.

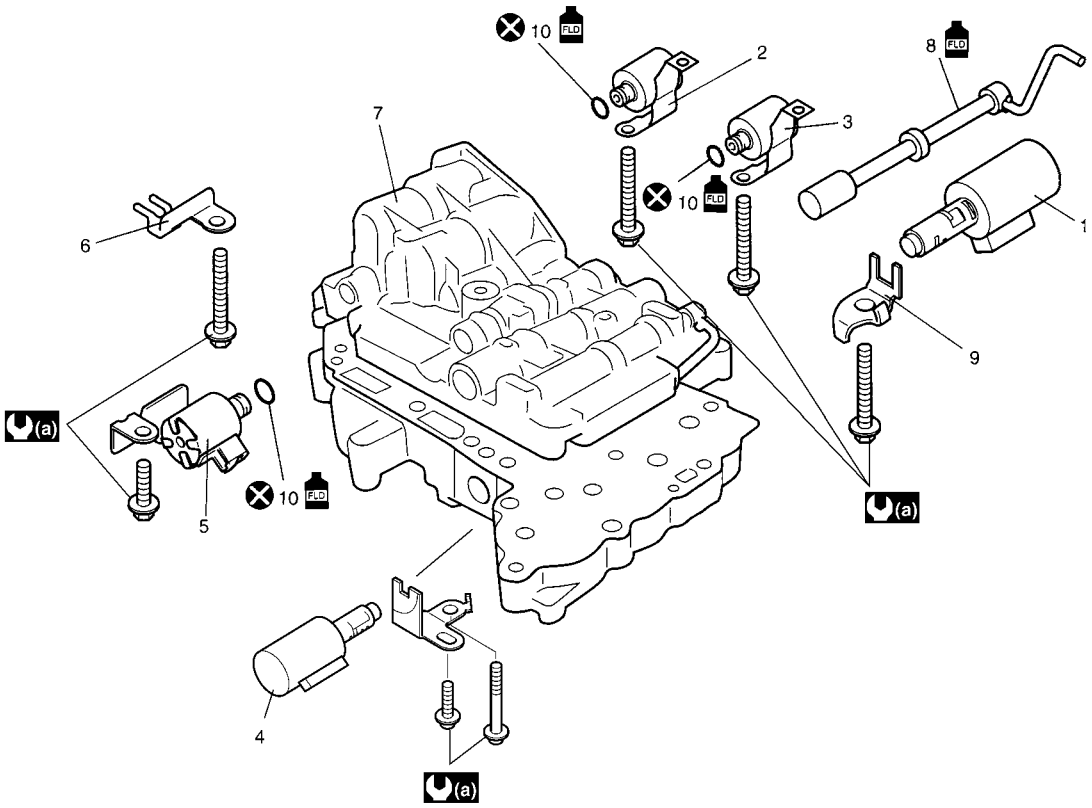
Special tool
(A): 09913–84510
(B): 09925–88210



I2RH0B510214-

Valve Body Assembly Components

S4RS0A5106050



I4RS0A510044-

1. Pressure control solenoid valve	6. Temperature sensor clamp	: Apply automatic transaxle fluid.
2. Shift solenoid valve-A (No.1)	7. Valve body assembly	: Tightening torque
3. Shift solenoid valve-B (No.2)	8. Manual valve	: Do not reuse.
4. TCC pressure control solenoid valve	9. Solenoid lock plate	
5. Timing solenoid valve	10. O-ring	

Valve Body Assembly Disassembly and Reassembly

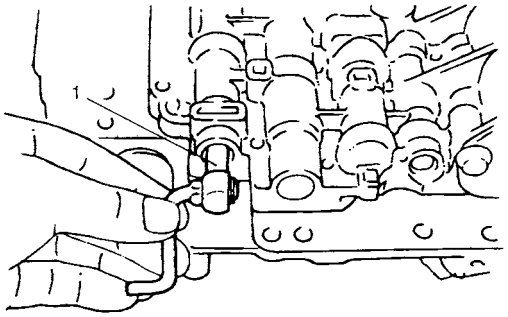
S4RS0A5106051

CAUTION:

When replacing pressure control solenoid valve and/or TCC pressure control solenoid valve, it is strictly required to replace it together with valve body assembly as a set. Replacing pressure control solenoid valve and/or TCC pressure control solenoid valve independently may cause excessive shift shock.

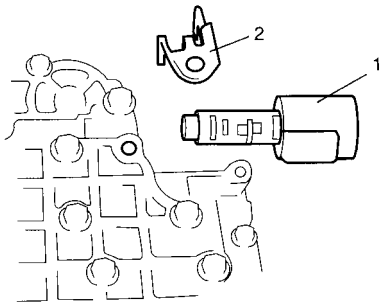
Disassembly

1) Pull out manual valve (1).



I2RH0B510216-

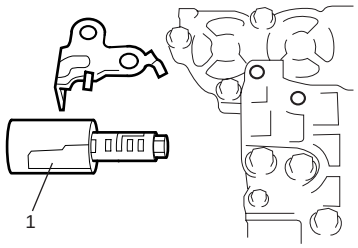
2) Remove pressure control solenoid valve (1).



I2RH0B510217-

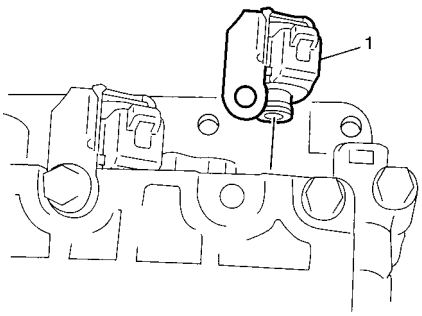
2. Solenoid lock plate

3) Remove TCC pressure control solenoid valve (1).



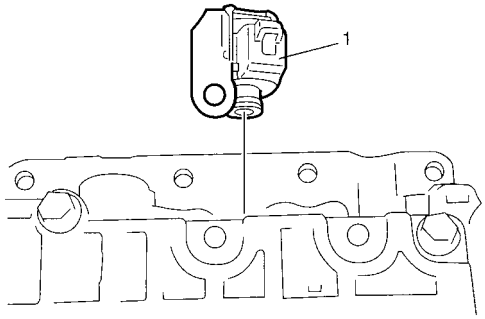
I4RS0A510045-

4) Remove shift solenoid valve-A (1).



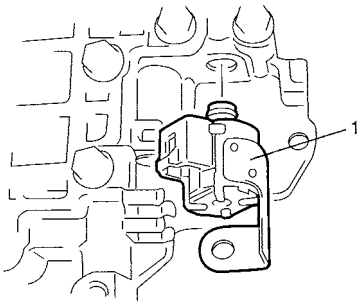
I2RH0B510219-

5) Remove shift solenoid valve-B (1).



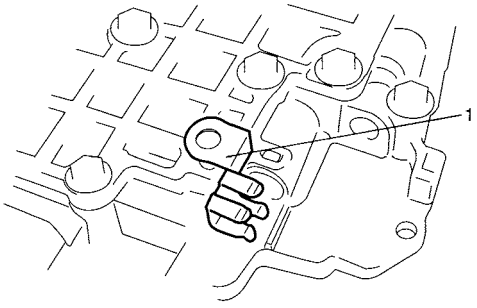
I2RH0B510220-

6) Remove timing solenoid valve (1).



I2RH0B510221-

7) Remove temperature sensor clamp (1).



I2RH0B510222-

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

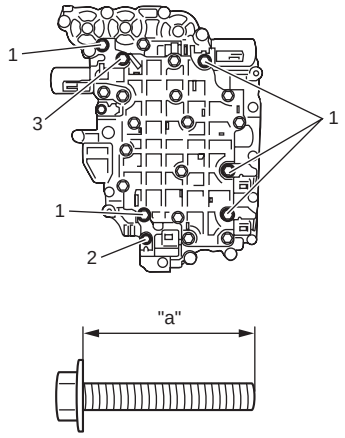
- Shift solenoid valve-A and -B are identical
- After applying A/T fluid to new O-rings, fit them to solenoid valves, then install solenoid valves to valve body.
- Tighten solenoid valve bolts to specified torque

Tightening torque

Solenoid valve bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

Solenoid valve bolt specification

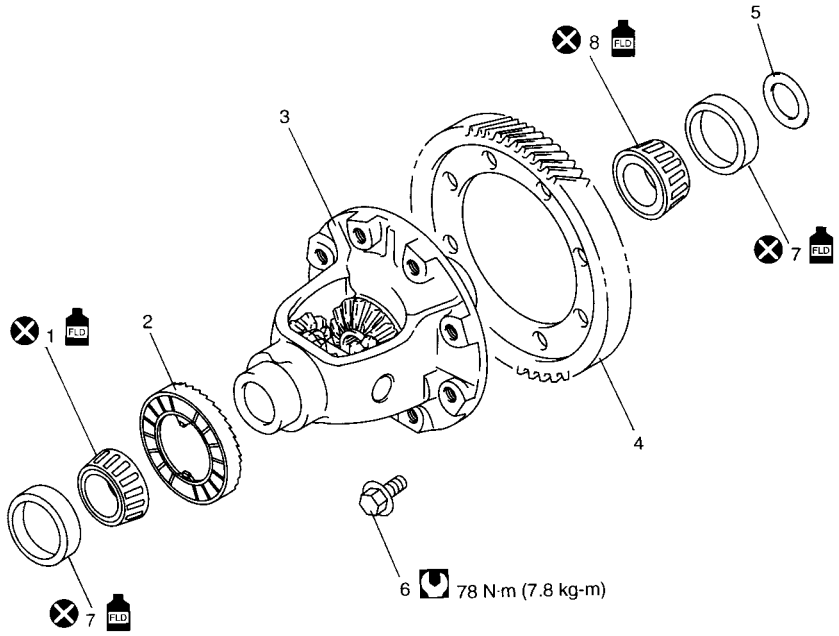
Bolt	Length “a”	Pieces
A (1)	49 mm (1.93 in.)	5
B (2)	20 mm (0.79 in.)	1
C (3)	60 mm (2.36 in.)	1



I4RS0A510046-

Differential Assembly Components

S4RS0A5106052



I2RH0B510224-

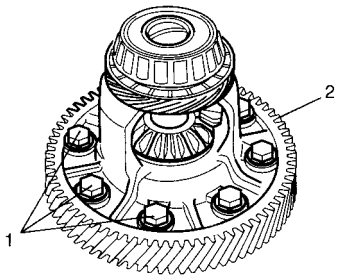
1. Differential side RH bearing	5. Side bearing shim	: Apply automatic transaxle fluid.
2. Output shaft speed sensor (VSS) drive gear	6. Final gear bolt	: Tightening torque
3. Differential case subassembly	7. Side bearing cup	: Do not reuse.
4. Final gear	8. Differential side LH bearing	

Differential Assembly Disassembly and Reassembly

S4RS0A5106053

Disassembly

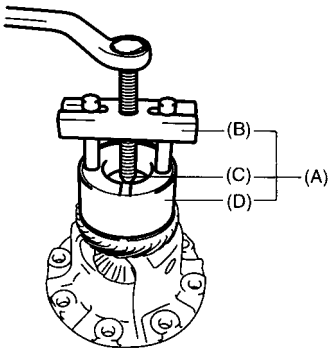
1) Remove final gear bolts (1), and then final gear (2).



I2RH0B510225-

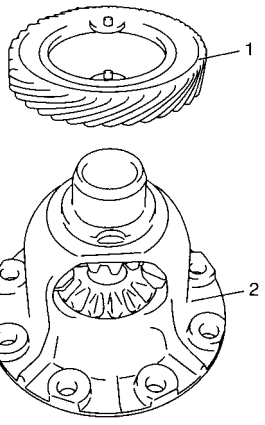
2) Remove differential side RH bearing by using special tools.

Special tool
(A): 09926–37610
(B): 09926–37610–001
(C): 09926–37610–003
(D): 09926–37610–002



I2RH0B510226-

3) Remove output shaft speed sensor (VSS) drive gear (1).

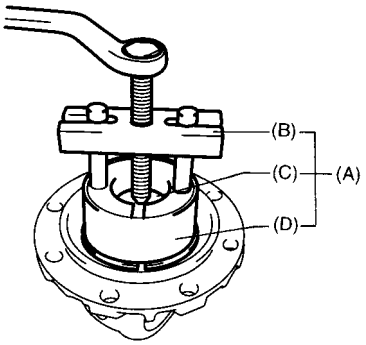


I2RH0B510227-

2. Differential case subassembly

4) Remove differential side LH bearing by using special tools.

Special tool
(A): 09926–37610
(B): 09926–37610–001
(C): 09926–37610–003
(D): 09926–37610–002



I2RH0B510228-

Reassembly

WARNING:

- **When taking warmed final driven gear out of vessel, use tongs or the like. Taking out it with bare hand will cause severe burn.**
- **While installing warmed final driven gear, use oven glove such as leather glove. Picking up it with bare hand may cause burn.**

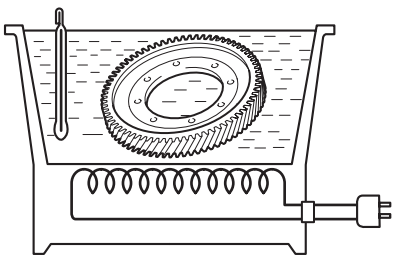
CAUTION:

Do not leave final driven gear in boiling water for longer than 5 min. Overheating the gear may cause strength reduction of gear.

1) Put final driven gear in water vessel, heat and remove when it boils, then remove moisture.

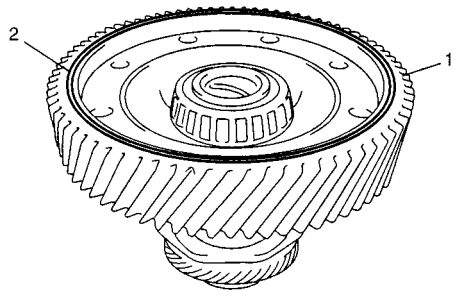
NOTE:

After removing moisture on final driven gear, install final driven gear to differential case as quickly as possible.



I2RH0B510229-

2) As shown in figure, facing groove (2) side upward, install final driven gear (1) to differential case.



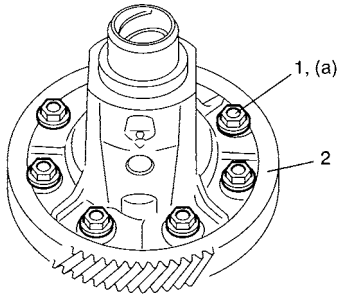
I2RH0B510230-

3) Tighten final gear bolts (1) to specified torque.

NOTE:

To avoid rust, apply A/T fluid to final driven gear after installation.

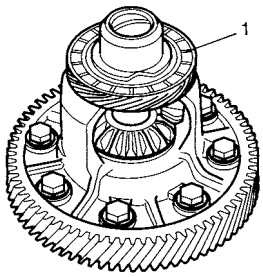
Tightening torque
Final gear bolt (a): 78 N·m (7.8 kg-m, 56.5 lb-ft)



I2RH0B510231-

2. Final driven gear

4) After applying A/T fluid to output shaft speed sensor (VSS) drive gear (1), install output shaft speed sensor drive gear.



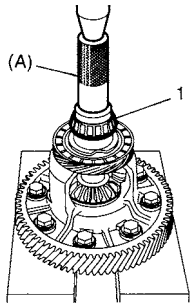
I2RH0B510232-

5) Install new differential side RH bearing (1) by using special tool and hydraulic press.

NOTE:

Replace differential side RH bearing together with bearing cup as a set.

Special tool
(A): 09913–70123



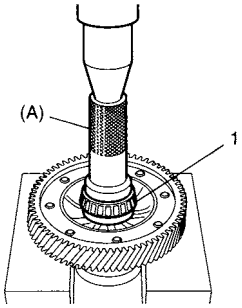
I2RH0B510233-

6) Install new differential side LH bearing (1) by using special tool and hydraulic press.

NOTE:

Replace differential side LH bearing together with bearing cup as a set.

Special tool
(A): 09913–70123



I2RH0B510234-

Differential Assembly Inspection

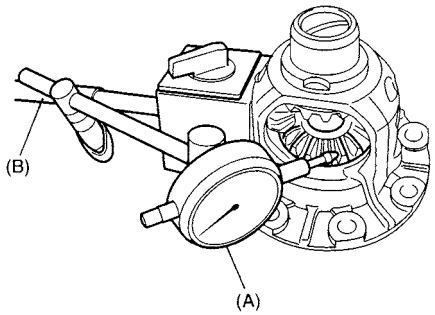
S4RS0A5106054

1) Hold differential case subassembly with soft jawed vice and set special tools as shown.

Special tool
(A): 09900–20607
(B): 09900–20701

2) Measure differential gear thrust play.

Differential gear thrust play
Standard: 0.06 – 0.22 mm (0.002 – 0.009 in.)



I2RH0B510235-

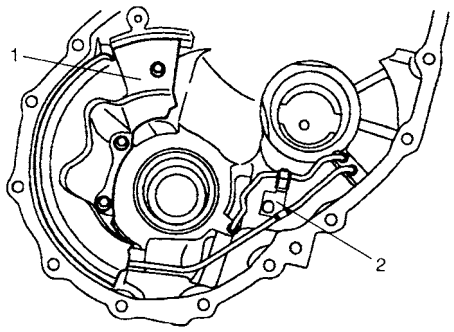
3) If thrust play is out of specification, replace differential case subassembly.

Torque Converter Housing Disassembly and Reassembly

S4RS0A5106055

Disassembly

1) Remove fluid reservoir RH plate (1) and lubrication tube clamp (2).

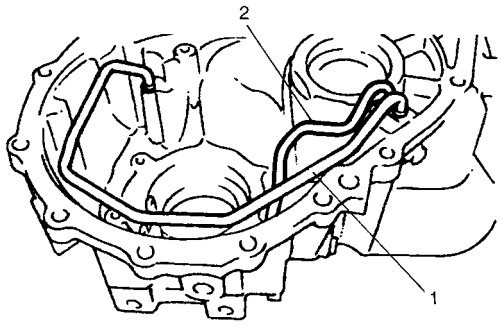


I2RH0B510236-

2) Remove lubrication LH tube (1) and RH tube (2).

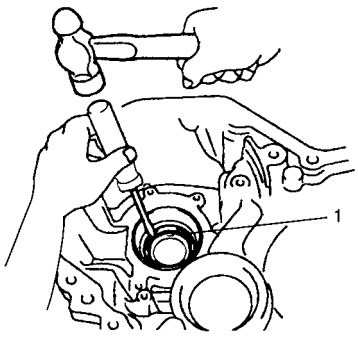
NOTE:

Do not bend lubrication tube with excessive force.



I2RH0B510237-

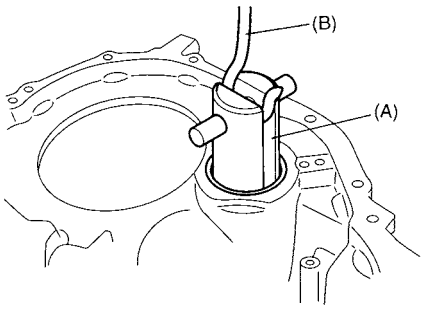
3) Remove differential side oil seal (1).



I2RH0B510238-

4) Remove countershaft RH bearing cup by using special tools.

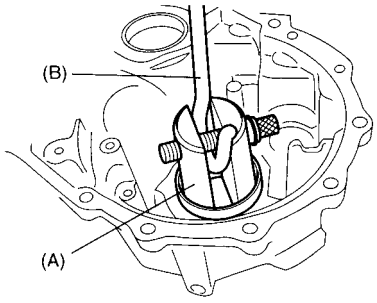
Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510239-

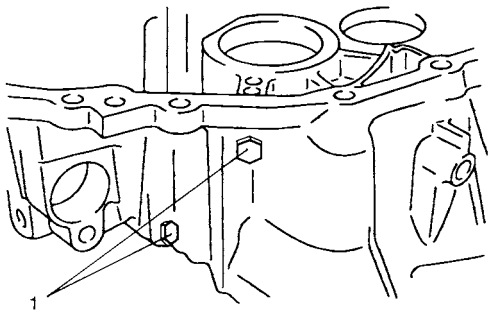
5) Remove differential side RH bearing cup by using special tools.

Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510240-

6) Remove torque converter case plugs (1).

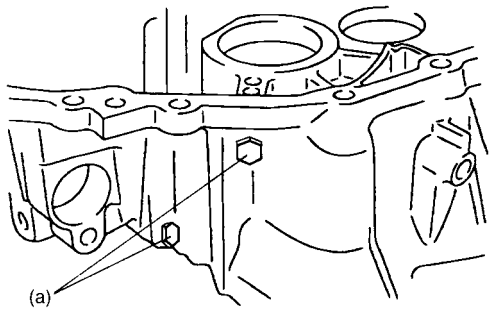


I2RH0B510241-

Reassembly

1) After applying A/T fluid to new O-rings, fit them to housing plugs. Finally install plugs to torque converter housing.

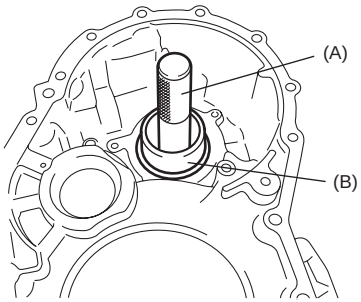
Tightening torque
Torque converter housing plug (a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



I2RH0B510242-

2) Using special tools, assemble differential side RH bearing cup.

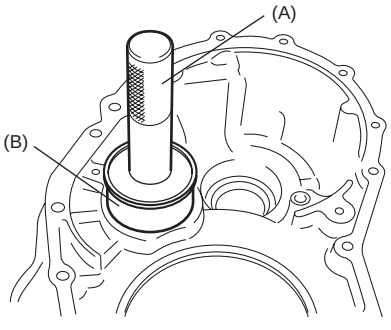
Special tool
(A): 09924–74510
(B): 09944–88220



I3RM0B510063-

3) Using special tool, install countershaft RH bearing cup.

Special tool
(A): 09924–74510
(B): 09944–88220



I3RM0B510064-

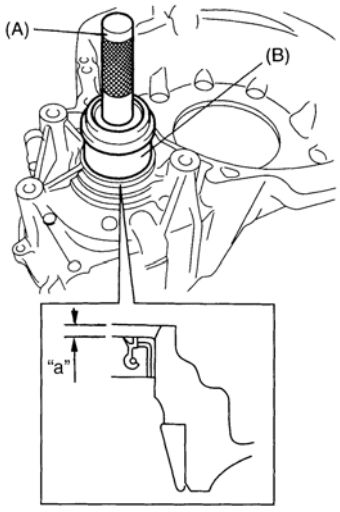
4) Using special tools, install new differential side oil seal to torque converter housing.

Special tool
(A): 09924–74510
(B): 09944–88220

Differential side oil seal installing depth "a": 2.6 – 3.6 mm (0.10 – 0.14 in.)

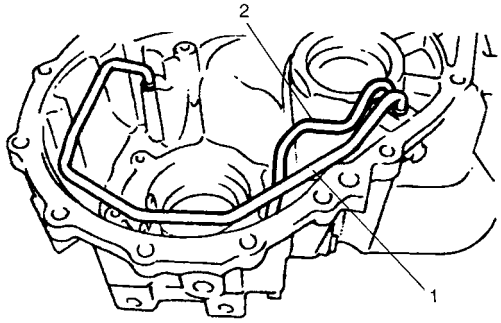
5) Apply grease to oil seal lip.

: Grease 99000–25030



I2RH0B510245-

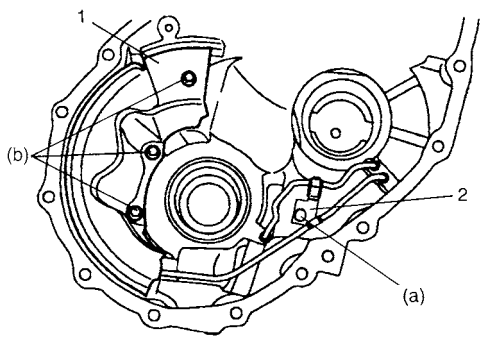
6) Install lubrication LH tube (1) and RH tube (2).



I2RH0B510237-

7) Install fluid reservoir RH plate (1) and lubrication tube clamp (2).

Tightening torque
Lubrication tube clamp bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)
Fluid reservoir RH plate bolt (b): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



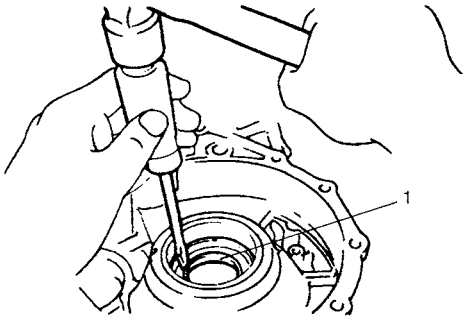
I2RH0B510246-

Transaxle Case Disassembly and Reassembly

S4RS0A5106057

Disassembly

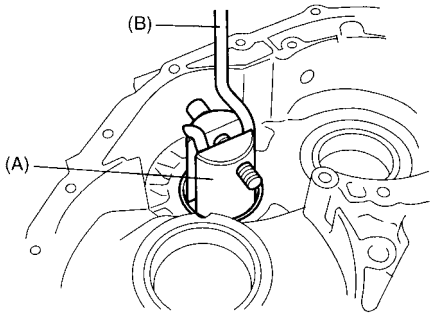
1) Remove differential side oil seal (1).



I2RH0B510247-

2) Remove countershaft LH bearing cup and shim with special tools.

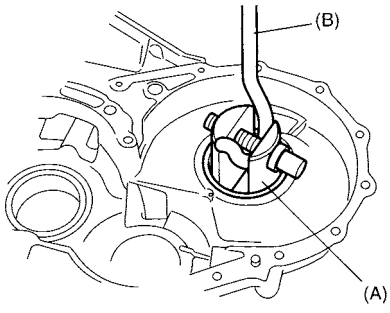
Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510248-

3) Remove differential side LH bearing cup and shim with special tools.

Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510249-

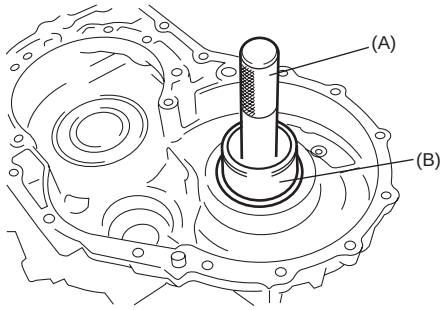
Reassembly

1) Using special tools, assemble shim and differential side LH bearing cup.

NOTE:

Use shim with same thickness as the removed one.

Special tool
(A): 09924–74510
(B): 09944–88220



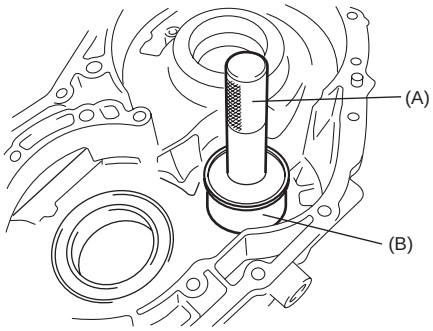
I3RM0B510065-

2) Using special tools, assemble shim and countershaft LH bearing cup.

NOTE:

Use shim with same thickness as the removed one.

Special tool
(A): 09924–74510
(B): 09944–88220



I3RM0B510066-

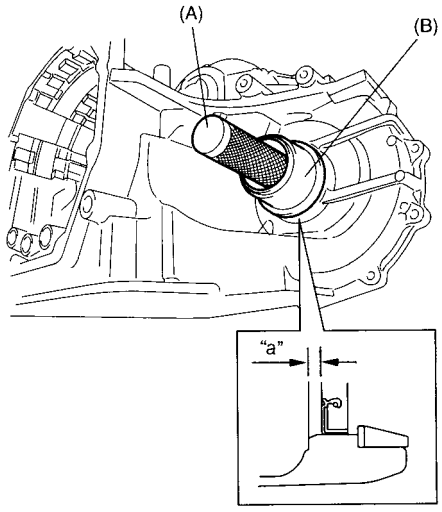
3) Install new differential side oil seal to transaxle case by using special tools.

Special tool
(A): 09924–74510
(B): 09944–88220

Differential side oil seal installing depth
"a": 3.8 – 4.8 mm (0.15 – 0.19 in.)

4) Apply grease to oil seal lip.

: Grease 99000–25030



I2RH0B510252-

Automatic Transaxle Unit Inspection and Adjustment

S4RS0A5106063

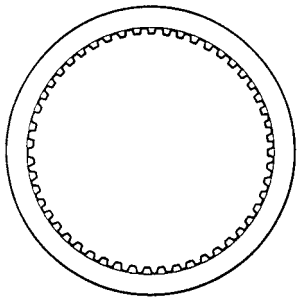
Inspection

Brake discs

Dry and inspect them for pitting, burn flaking, significant wear, glazing, cracking, charring and chips or metal particles imbedded in lining.
If discs show any of the above conditions, replacement is required.

NOTE:

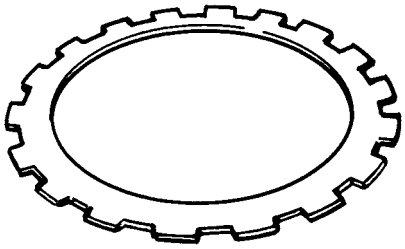
- **If disc lining is exfoliated or discolored, replace all discs.**
- **Before assembling new discs, soak them in A/T fluid for at least two hours.**



I2RH01510147-

Brake separator plates and retaining plates

Dry plates and check for discoloration. If plate surface is smooth and even color smear is indicated, plate should be reused. If severe heat spot discoloration or surface scuffing is indicated, plate must be replaced.



I2RH0B510253-

Brake return spring subassembly

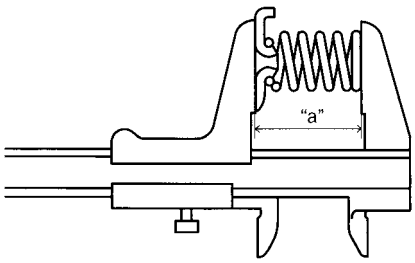
Measure brake return springs.
Evidence of extreme heat or burning in the area of clutch may have caused springs to take heat set and would require their replacement.

Free length of 1st & reverse brake return spring
"a": 21.71 mm (0.855 in.)

Free length of 2nd brake return spring
"a": 15.85 mm (0.624 in.)

NOTE:

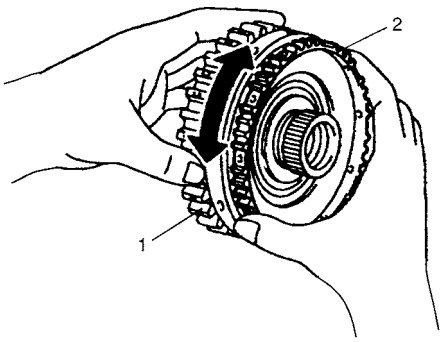
- **Do not apply excessive force when measuring spring free length.**
- **Perform measurement at several points.**



I2RH0B510173-

One-way clutch No.1 assembly

1) Install one-way clutch No.1 assembly (2) to rear planetary sun gear subassembly (1).
2) Securing rear planetary sun gear subassembly, ensure that one-way clutch No.1 assembly rotates only in one direction.
   If the one-way clutch rotates in both directions or it does not rotate in either direction, replace it with new one.



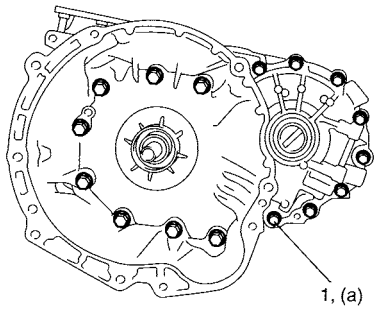
I2RH0B510254-

Adjustment

Differential side bearing preload

1) After applying A/T fluid to differential assembly, fit it to transaxle case.
2) Install torque converter housing to transaxle case, then tighten bolts (1) to specified torque.

Tightening torque
Torque converter housing bolt (a): 33 N·m (3.3 kg-m, 24.0 lb-ft)

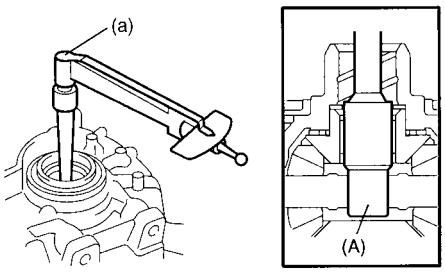


I2RH0B510255-

3) Measure bearing preload (a) by using a special tool.

Special tool
(A): 09928–06050

Differential side bearing preload (a) measured as starting torque
In the case of new bearing: 0.78 – 1.37 N·m (7.9 – 13.9 kg-cm, 0.58 – 1.01 lb-ft)
In the case of reused bearing: 0.39 – 0.69 N·m (3.9 – 6.9 kg-cm, 0.29 – 0.51 lb-ft)



I2RH0B510256-

4) If bearing preload is out of specification, select shim with suitable thickness from among the list below and replace it. Then adjust differential side bearing preload within specification.

Available shim thickness

Thickness	Identification mark
1.80 mm (0.070 in.)	A
1.85 mm (0.072 in.)	B
1.90 mm (0.074 in.)	C
1.95 mm (0.076 in.)	D
2.00 mm (0.078 in.)	E
2.05 mm (0.080 in.)	F
2.08 mm (0.081 in.)	G
2.11 mm (0.083 in.)	H
2.14 mm (0.084 in.)	J
2.17 mm (0.085 in.)	K
2.20 mm (0.087 in.)	L
2.23 mm (0.088 in.)	M
2.26 mm (0.089 in.)	N
2.29 mm (0.090 in.)	P
2.32 mm (0.091 in.)	Q
2.35 mm (0.092 in.)	R
2.40 mm (0.094 in.)	S
2.45 mm (0.096 in.)	T
2.50 mm (0.098 in.)	U
2.55 mm (0.100 in.)	V
2.60 mm (0.102 in.)	W
2.65 mm (0.104 in.)	X
2.70 mm (0.106 in.)	Y

NOTE:

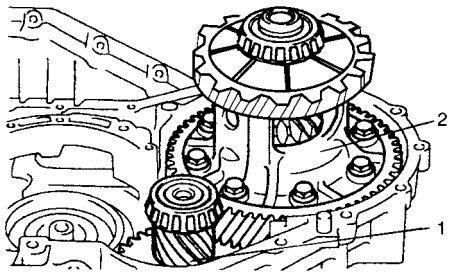
Record measured differential side bearing, because it is necessary to adjust countershaft bearing preload.

5) Remove differential assembly.

Countershaft bearing preload

1) After applying A/T fluid to countershaft assembly (1) and differential assembly (2), fit them.
2) Install torque converter housing to transaxle case, then tighten bolts to specified torque.

Tightening torque
Torque converter housing bolt: 33 N·m (3.3 kg-m, 24.0 lb-ft)



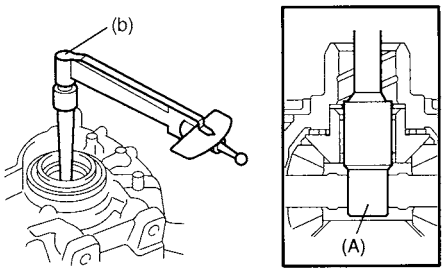
I2RH0B510257-

3) Measure bearing preload (b) by using special tool.

Special tool
(A): 09928–06050

Countershaft bearing preload	=	(b) – Differential side bearing preload (a)

Countershaft bearing preload (b) measured as starting torque
In the case of new bearing: 0.33 – 0.76 N·m (3.3 – 7.6 kg-cm, 0.24 – 0.55 lb-ft)
In the case of reused bearing: 0.17 – 0.38 N·m (1.7 – 3.8 kg-cm, 0.12 – 0.28 lb-ft)



I3RM0B510067-

4) If bearing preload is out of specification, select shim with suitable thickness from among the list below and replace it. Then adjust countershaft bearing preload within specification.

Available shim thickness

Thickness	Identification mark
1.70 (0.066 in.)	1
1.75 (0.068 in.)	2
1.80 (0.070 in.)	3
1.85 (0.072 in.)	4
1.90 (0.074 in.)	5
1.93 (0.075 in.)	6
1.96 (0.077 in.)	7
1.99 (0.078 in.)	A
2.02 (0.079 in.)	B
2.05 (0.080 in.)	C
2.08 (0.081 in.)	D
2.11 (0.083 in.)	E
2.14 (0.084 in.)	F
2.17 (0.085 in.)	G
2.20 (0.086 in.)	H
2.25 (0.088 in.)	K
2.30 (0.090 in.)	L
2.35 (0.092 in.)	M
2.40 (0.094 in.)	N
2.45 (0.096 in.)	P
2.50 (0.098 in.)	Q
2.55 (0.100 in.)	R
2.60 (0.102 in.)	S
2.65 (0.104 in.)	U
2.70 (0.106 in.)	W

5) Remove differential assembly and countershaft assembly.

Automatic Transaxle Unit Assembly

S4RS0A5106058

CAUTION:

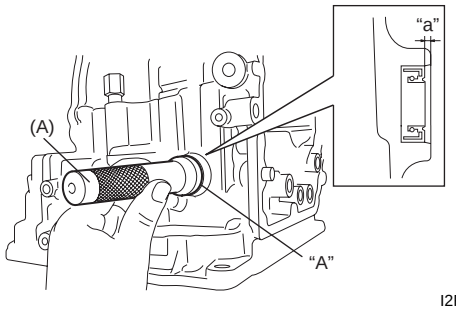
- **Automatic transaxle consists of highly precise parts. As even flaw in small part may cause oil leakage or decrease in function, check each part carefully before installation.**
- **Clean all parts with compressed air. Never use wiping cloths or rags.**
- **Before assembling new clutch or brake discs, soak them in automatic transaxle fluid for at least 2 hours.**
- **Be sure to use new gaskets and O-rings.**
- **Lubricate O-rings with automatic transaxle fluid.**
- **Apply automatic transaxle fluid on sliding or rotating surfaces of the parts before assembly.**
- **Use Suzuki Super Grease "C" to retain parts in place.**
- **Be sure to install thrust bearings and races in correct direction and position.**
- **Make sure that snap ring ends are not aligned with one of cutouts and are installed in groove correctly.**
- **Do not use adhesive cements on gaskets and similar parts.**
- **Be sure to torque each bolt and nut to specification.**

1) Install new manual shift shaft oil seal to transaxle case.
Use special tool and hammer to install it, and then apply grease to its lip.

Special tool
(A): 09925–98210

"A": Grease 99000–25030

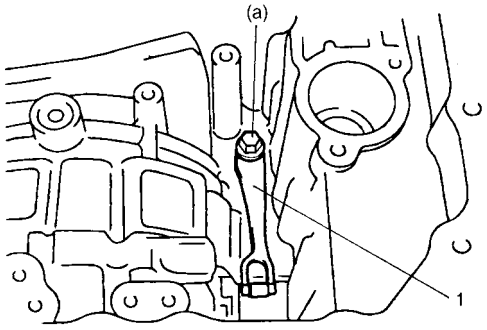
Manual shift shaft oil seal installing depth
"a": 0.75 – 1.25 mm (0.03 – 0.05 in.)



I2RH0B510258-

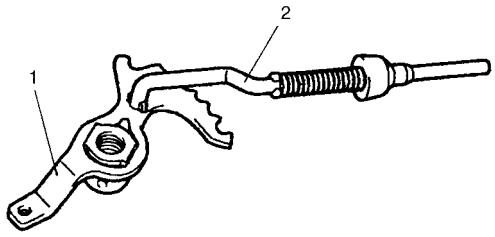
2) Install manual detent spring (1) to transaxle case and tighten manual detent spring bolt to specified torque.

Tightening torque
Manual detent spring bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



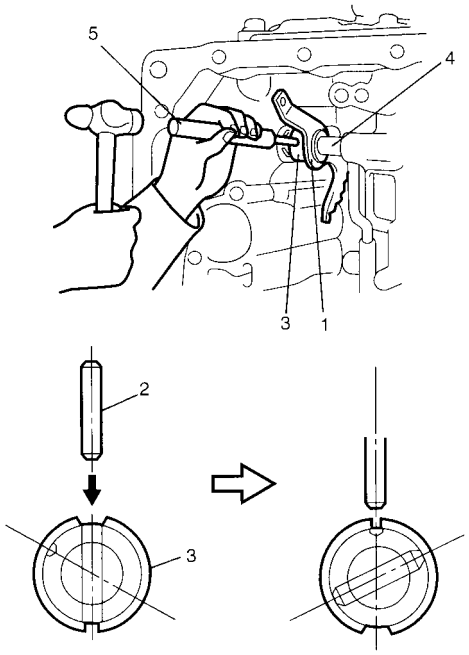
I2RH0B510259-

3) Install parking lock pawl rod (2) to manual valve lever (1).



I2RH0B510260-

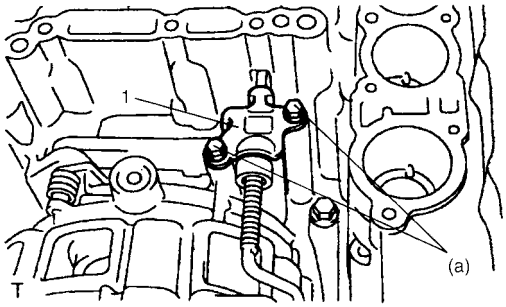
4) After applying A/T fluid to new manual valve lever (1), install new manual shift shaft (4), new spacer (3) and manual valve lever to transaxle case.
5) After installing manual valve lever pin (2) by using spring pin remover with 3 mm (0.12 in.) in diameter (5) and hammer, turn spacer to set the position as shown in figure. Then caulk spacer with a punch.



I2RH0B510261-

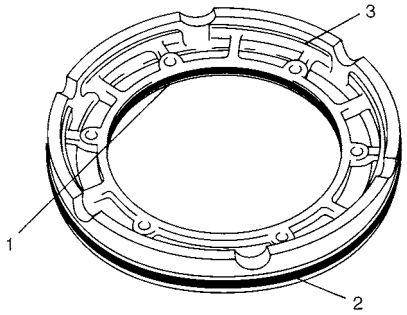
6) Install parking lock pawl bracket (1) to transaxle case.

Tightening torque
Parking lock pawl bracket bolt (a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



I2RH0B510262-

7) After applying A/T fluid to new O-rings, install them to 1st and reverse brake piston (3).



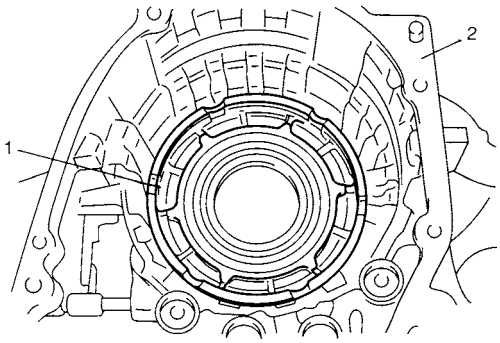
I2RH0B510263-

1. Inner O-ring	2. Outer O-ring

8) Install 1st and reverse brake piston (1) to transaxle case (2).

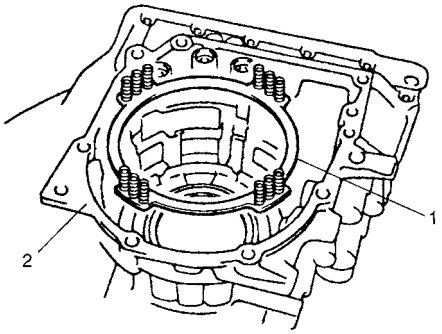
NOTE:

Be careful not to damage O-ring when installing 1st and reverse brake piston.



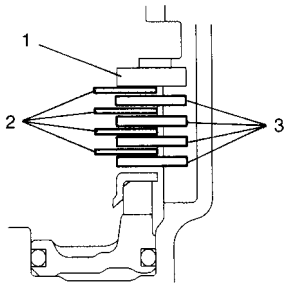
I2RH0B510264-

9) Install 1st and reverse brake return spring subassembly (1) to transaxle case (2).



I2RH0B510265-

10) Apply A/T fluid to 1st and reverse brake discs (2), separator plates (3) and retaining plate (1), then install them to transaxle case.



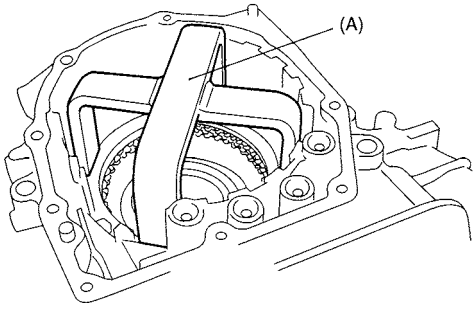
I2RH0B510266-

11) Compress 1st and reverse brake return spring using special tool and hydraulic press, then attach snap ring.

CAUTION:

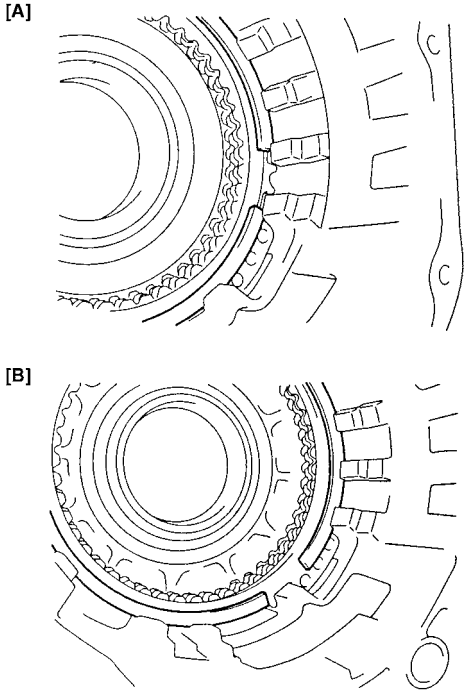
Do not damage 1st and reverse brake return spring subassembly discs, plates and piston by pressing in 1st and reverse brake return spring subassembly passing through its original installing position over 0.8 mm (0.031 in.).

Special tool
(A): 09926–97620



I2RH0B510267-

12) Install 1st and reverse brake plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



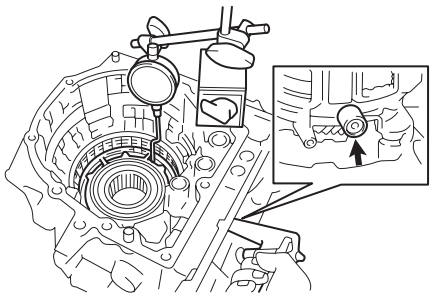
I2RH0B510268-

[A]: Correct	[B]: Incorrect

13) Using special tools, measure 1st and reverse brake piston stroke when compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) is brown through oil hole.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

1st and reverse brake piston stroke
Standard: 0.791 – 1.489 mm (0.0311 – 0.0586 in.)



I2RH0B510269-

14) Install reduction drive gear (1) to transaxle case (3) by using special tools and hydraulic press.

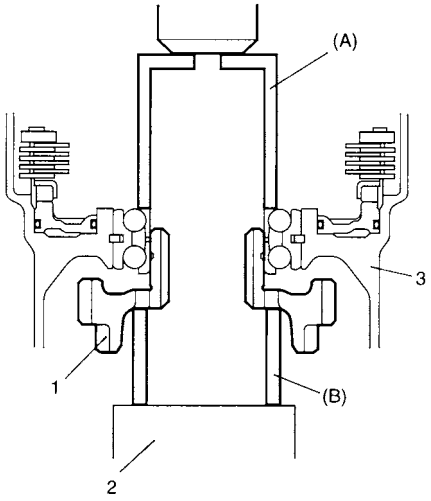
CAUTION:

- **Do not use transaxle case as groundwork to press fit reduction drive gear.**
- **Do not give load more than 20 kN (2000 kg, 4410 lb) with hydraulic press. Otherwise, it may result in damaging reduction drive gear bearing.**

NOTE:

When replacing reduction drive gear, replace it together with reduction driven gear as a set.

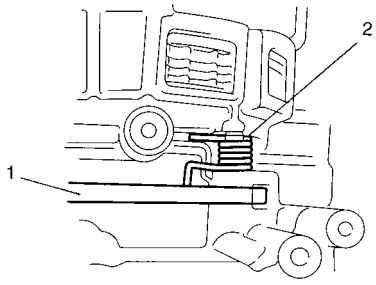
Special tool
(A): 09951–18210
(B): 09944–78210



I2RH0B510270-

2. Stand that can slightly lift transaxle case.

15) Install parking lock pawl (1) and spring (2). Apply A/T fluid to parking lock pawl shaft, then insert it into transaxle case.



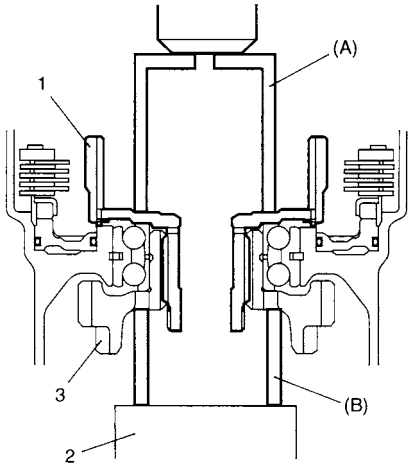
I2RH0B510271-

16) Install new planetary ring gear subassembly (1) to reduction drive gear (3) by using special tools and hydraulic press.

CAUTION:

- **Do not reuse planetary ring gear subassembly. Otherwise it may cause damage to planetary gear unit and/or reduction gears.**
- **Do not use transaxle case as groundwork to press fit planetary ring gear subassembly.**
- **Do not give load more than 20 kN (2000 kg, 4410 lb) with hydraulic press. Otherwise, it may result in damaging reduction drive gear bearing.**

Special tool
(A): 09951–18210
(B): 09944–78210



I2RH0B510272-

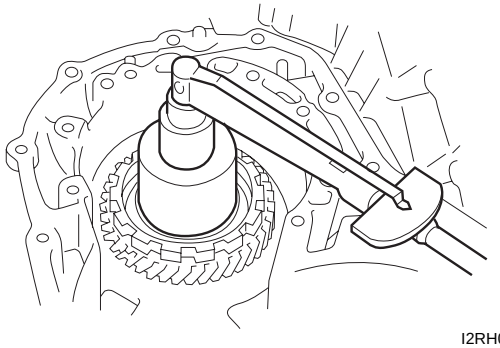
2. Stand that can slightly lift transaxle case.

17) Using a small torque wrench, while turning to counter drive gear 100 rpm and measure the preload.

CAUTION:

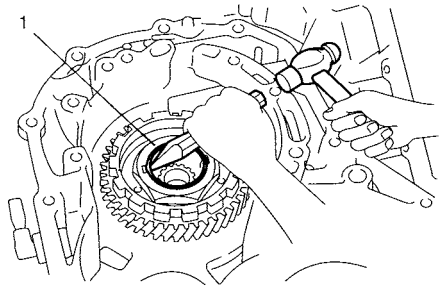
- **Do not tighten nut over the specifications so that reduction drive gear nut would not be broken.**
- **Carry out this procedure on rubber mat in order not to damage transaxle case.**

Reduction drive gear bearing preload measured as starting torque
Standard: 0.05 – 0.35 N·m (0.5 – 3.5 kg-cm, 0.036 – 0.253 lb-ft)



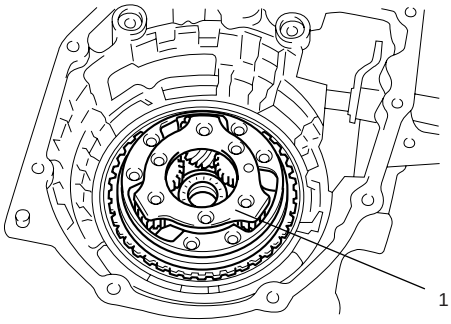
I2RH0B510273-

18) Caulk reduction drive gear nut (1).



I2RH0B510274-

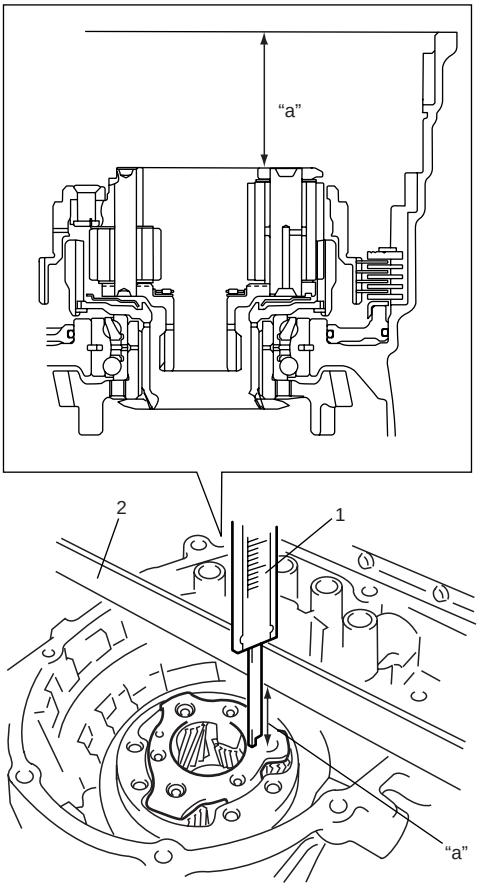
19) Apply A/T fluid to planetary gear assembly (1), then fit it to planetary ring gear assembly.



I2RH0B510275-

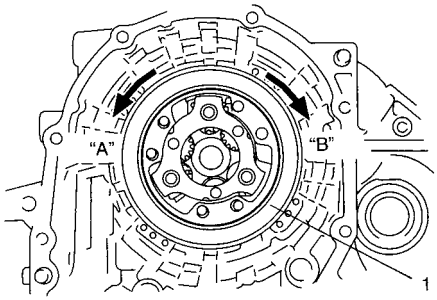
20) Check for correct installation of planetary gear assembly as follows.
Measure the distance “a” by using micrometer caliper (1) and straightedge (2). If measured value is out of specification, remove planetary gear assembly and reinstall it properly.

Distance between planetary gear assembly and mating surface of transaxle case
“a”: More than 49.9 m (1.965 in.)



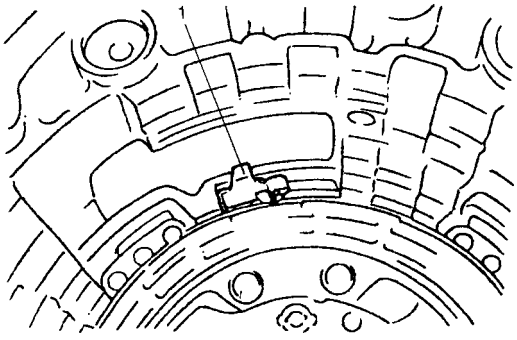
I2RH0B510276-

21) Apply A/T fluid to one-way clutch No.2 assembly (1), then install it to planetary gear assembly. After that, ensure that planetary carrier rotates only in counterclockwise direction “A”, not in clockwise direction “B”.



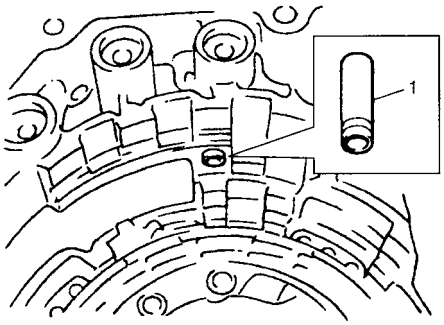
I2RH0B510277-

22) Install one-way clutch outer race retainer (1).



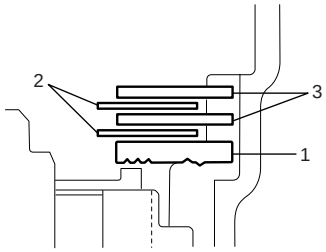
I2RH0B510278-

23) Apply A/T fluid to new brake drum gasket (1), then install it to transaxle case.



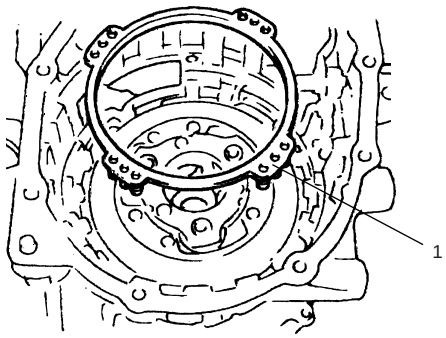
I2RH0B510279-

24) Apply A/T fluid to 2nd brake retaining plate (1), discs (2) and separator plates (3), then install them to transaxle case.



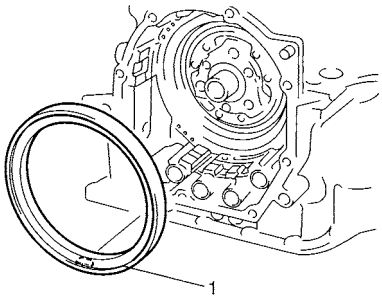
I2RH0B510280-

25) Install 2nd brake return spring subassembly (1) to transaxle case.



I2RH0B510281-

26) Apply A/T fluid to 2nd brake piston assembly (1), and align the projection of 2nd brake piston assembly with the groove of transaxle case, then put together.



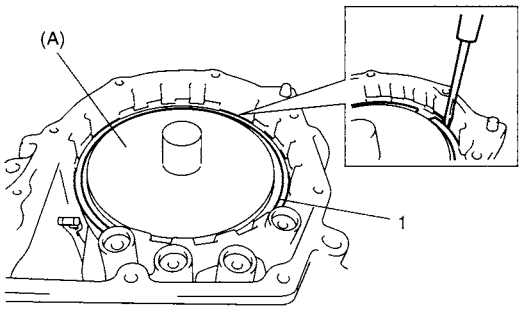
I2RH0B510282-

27) Install 2nd brake piston snap ring (1) by using special tool and hydraulic press.

CAUTION:

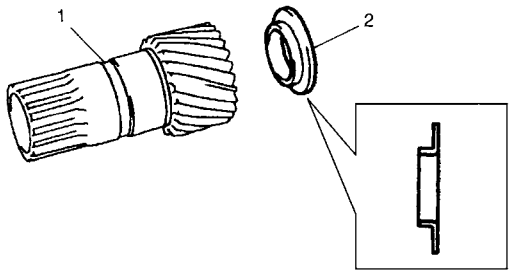
Do not damage 2nd brake piston assembly, return spring subassembly, plates and discs by pressing in 2nd brake assembly passing through its original installing position over 0.4 mm (0.016 in.).

Special tool
(A): 09926–96050



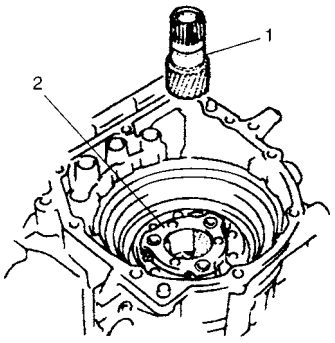
I2RH0B510283-

28) After applying A/T fluid to front sun gear thrust bearing race (2), install it to front planetary sun gear (1).



I2RH0B510285-

29) Apply A/T fluid to front planetary sun gear (1) and install it to planetary gear assembly (2).

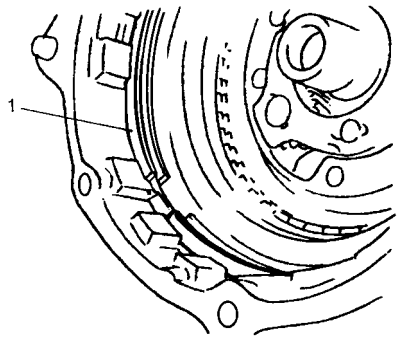


I2RH0B510286-

30) Install O/D and 2nd coast brake retaining plate snap ring (1).

CAUTION:

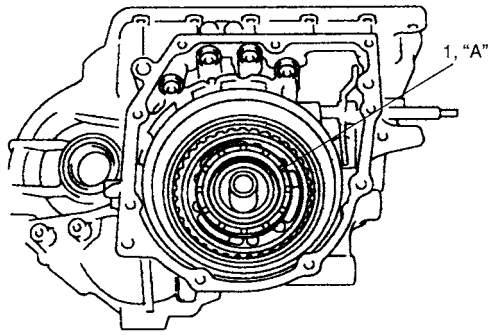
Be sure to install O/D and 2nd coast brake retaining plate snap ring correctly in groove of transaxle case.



I2RH0B510287-

31) After applying grease to slide contact face of planetary carrier thrust washer (1), install it to planetary gear assembly.

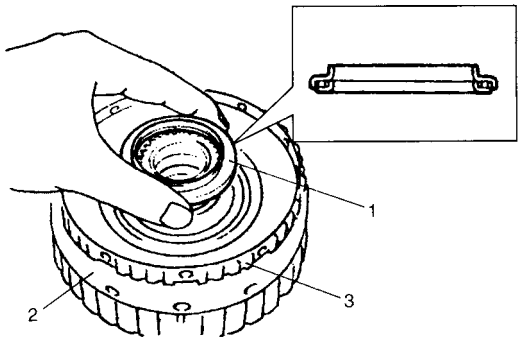
"A": Grease 99000–25030



I2RH0B510288-

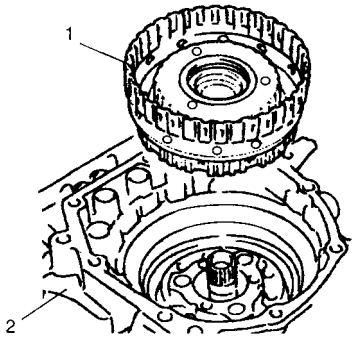
32) Apply A/T fluid to one-way clutch No.1 assembly (3) and install one-way clutch No.1 assembly (3) to rear planetary sun gear subassembly (2).

33) Apply A/T fluid to planetary gear thrust bearing (1), then install it to one-way clutch No.1 assembly (3).



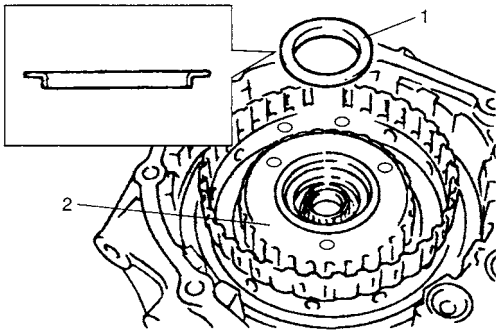
I2RH0B510289-

34) After applying A/T fluid to rear planetary sun gear subassembly and one-way clutch No.1 assembly (1), install them in transaxle case (2).



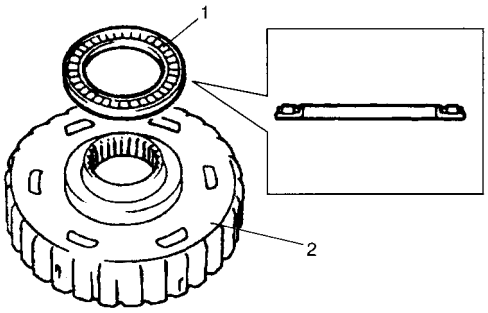
I2RH0B510290-

35) After applying A/T fluid to rear sun gear thrust bearing race (1), install it to rear planetary sun gear (2).



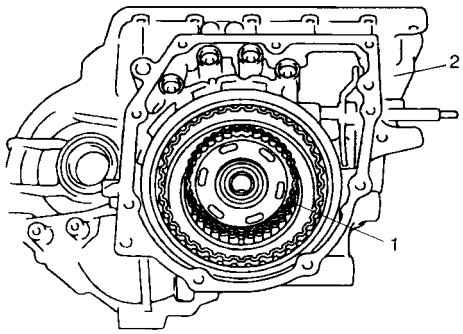
I2RH0B510291-

36) After applying A/T fluid to rear sun gear thrust bearing (1), install it to forward clutch hub (2).



I2RH0B510292-

37) After applying A/T fluid to forward clutch hub (1), install it in transaxle case (2).

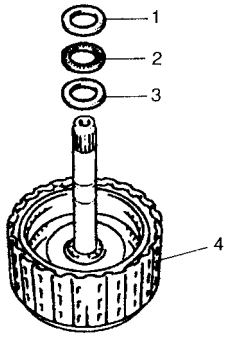


I2RH0B510293-

38) After applying A/T fluid to intermediate shaft thrust bearing rear race (3), thrust bearing (2) and front race (1), install them to forward and reverse clutch assembly (4).

Bearing race dimension

	Front race	Rear race
Outside diameter	30.6 mm (1.20 in.)	28.2 mm (1.11 in.)
Thickness	2.0 mm (0.08 in.)	2.0 mm (0.08 in.)

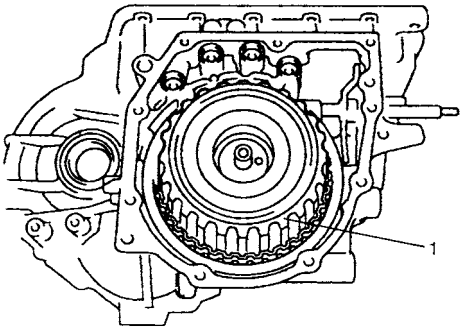


I2RH0B510294-

39) Apply A/T fluid to forward and reverse clutch assembly (1).
Install forward and reverse clutch assembly while rotating clockwise and counterclockwise frequently to fit clutch discs to mating hubs.

NOTE:

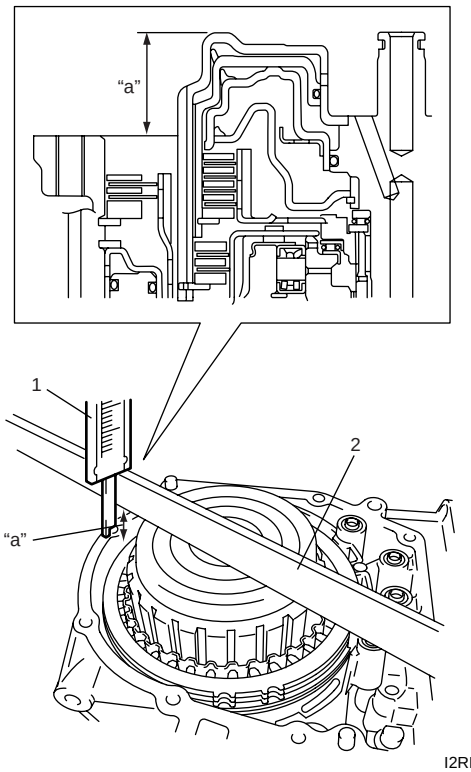
Before installation, align teeth of forward and reverse clutch discs to facilitate installation.



I2RH0B510295-

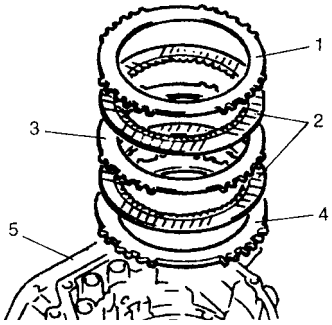
40) Check for correct installation of forward and reverse clutch assembly as follows.
Measure distance “a” by using micrometer caliper (1) and straightedge (2). If out of specification, remove forward and reverse clutch assembly, forward clutch hub, rear planetary sun gear subassembly and one-way clutch No.1 assembly, and reinstall them properly.

Distance between forward and reverse clutch assembly and mating surface of transaxle case
“a”: 27.1 – 29.4 mm (1.067 – 1.157 in.)



I2RH0B510296-

41) After applying A/T fluid to O/D and 2nd coast brake retaining plate (4), separator plate (3), discs (2) and rear plate (1), install them to transaxle case (5).



I2RH0B510297-

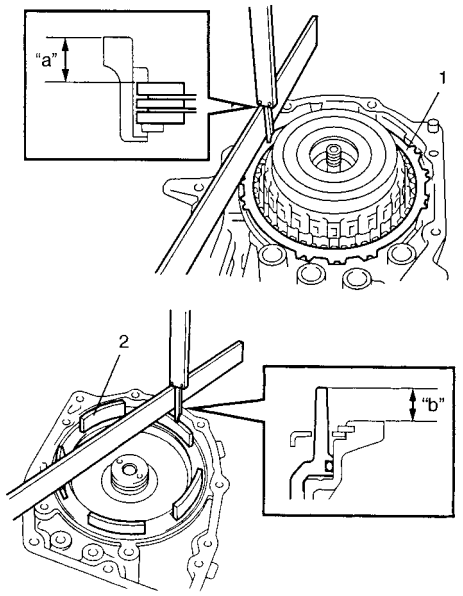
42) Measure O/D and 2nd coast brake piston stroke.
- Measure dimension “a” from end face of transaxle case to O/D and 2nd coast brake rear plate (1) using straightedge and micrometer caliper.
- Measure dimension “b” from O/D and 2nd coast brake piston (2) to rear cover assembly mating surface using straightedge and micrometer caliper.
- Calculate piston stroke from measured value of dimensions “a” and “b”.
- Piston stroke = “a” – “b”

O/D and 2nd coast brake piston stroke
Standard: 0.65 – 1.05 mm (0.026 – 0.041 in.)

When piston stroke is out of specification, select O/D and 2nd coast brake rear plate with proper thickness from among the following table and replace it.

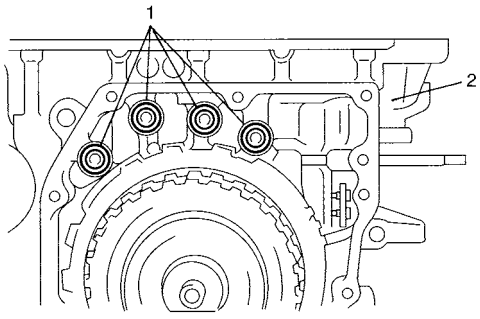
Available O/D and 2nd coast brake rear plate thickness

Thickness	Identification mark
1.8 mm (0.071 in.)	1
2.0 mm (0.079 in.)	2
2.2 mm (0.087 in.)	3
2.4 mm (0.094 in.)	4
2.6 mm (0.102 in.)	5



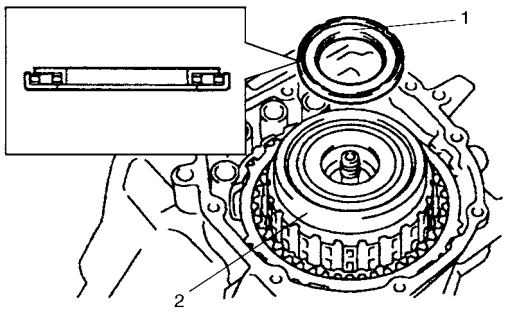
I2RH0B510298-

43) After applying A/T fluid to new 2nd brake gaskets (1), install them to transaxle case (2).



I2RH0B510299-

44) After applying A/T fluid to reverse clutch drum thrust bearing (1), install it to forward and reverse clutch assembly (2).

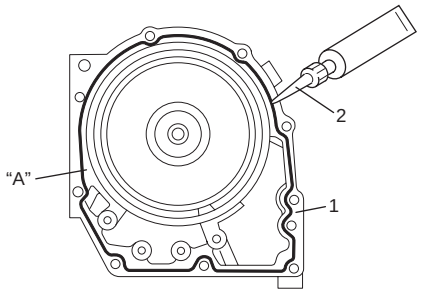


I2RH0B510300-

45) Remove sealant attached to mating surface of transaxle rear cover (1) completely.

46) Apply sealant to mating surface of transaxle rear cover (1) by using a nozzle (2) as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter.

"A": Sealant 99000–31230



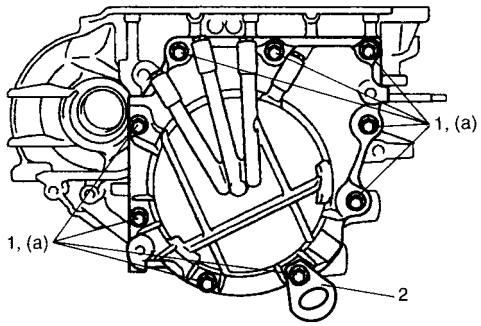
I2RH0B510301-

47) Install transaxle rear cover assembly on transaxle case.

48) Install hook (2) to location shown in figure.

49) Tighten rear cover bolts (1).

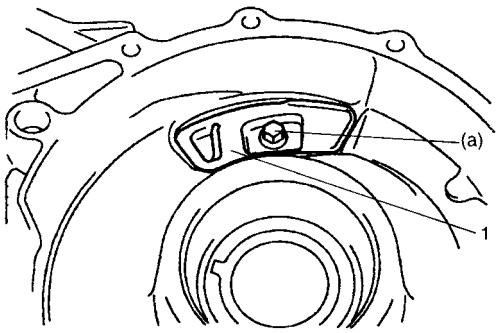
Tightening torque
Rear cover bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I3RM0B510068-

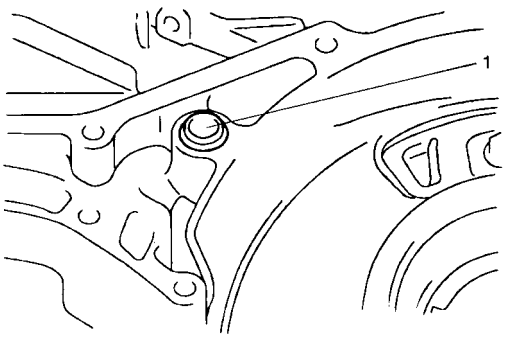
50) Install fluid reservoir LH plate (1).

Tightening torque
Fluid reservoir LH plate bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



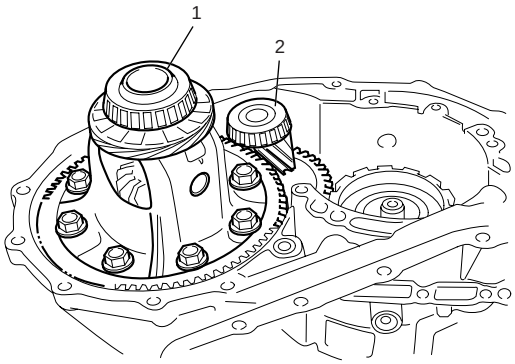
I2RH0B510303-

51) After applying A/T fluid to new governor apply No.2 gasket (1), install it to transaxle case.



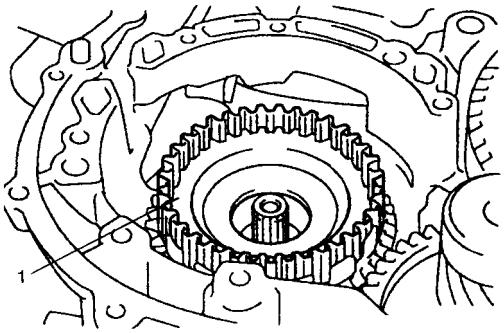
I2RH0B510304-

52) After applying A/T fluid to differential assembly (1) and countershaft assembly (2), install them to transaxle case.



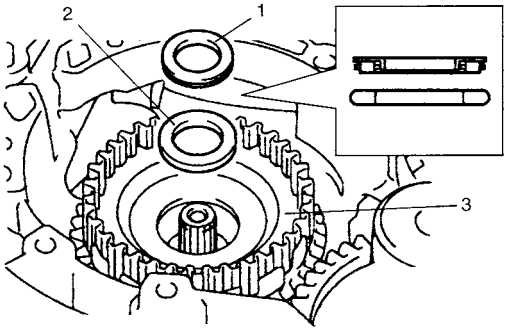
I4RS0A510036-

53) After applying A/T fluid to direct clutch hub (1), install it to planetary gear assembly.



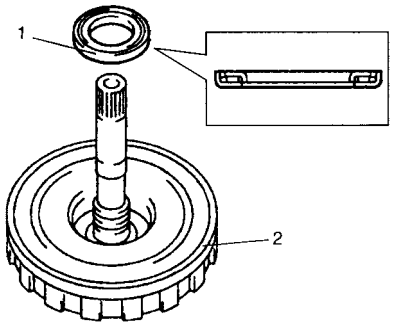
I2RH0B510306-

54) After applying A/T fluid to input shaft rear thrust bearing (1) and thrust bearing race (2), install them into direct clutch hub (3).



I2RH0B510307-

55) After applying A/T fluid to input shaft front thrust bearing (1), install it to direct clutch assembly (2).

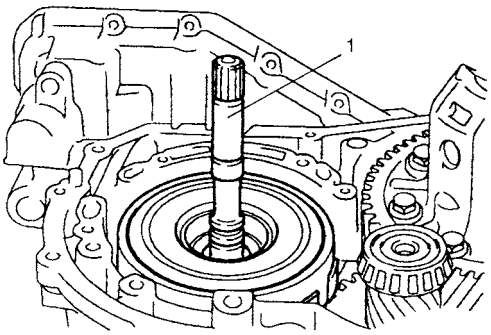


I2RH0B510308-

56) Apply A/T fluid to direct clutch assembly (1). Install direct clutch assembly while rotating clockwise and counterclockwise frequently to fit clutch discs to mating hub.

NOTE:

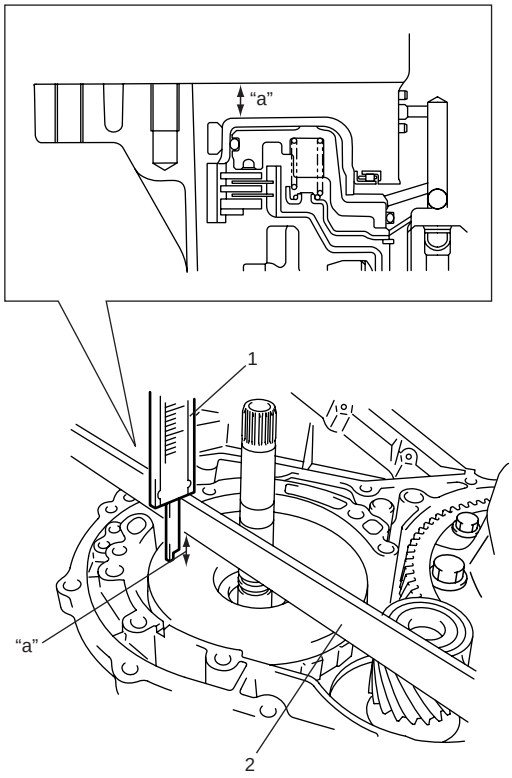
Before installation, align teeth of direct clutch discs to facilitate installation.



I2RH0B510309-

57) Check for correct installation of direct clutch assembly as follows.
Measure distance “a” by using micrometer caliper (1) and straightedge (2). If out of specification, remove direct clutch assembly, direct clutch hub and reinstall them properly.

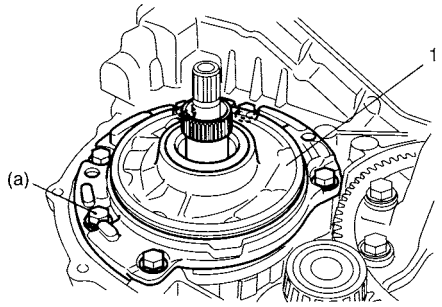
Distance between direct clutch assembly and mating surface of transaxle case
“a”: 10.5 – 11.3 mm (0.413 – 0.445 in.)



I2RH0B510310-

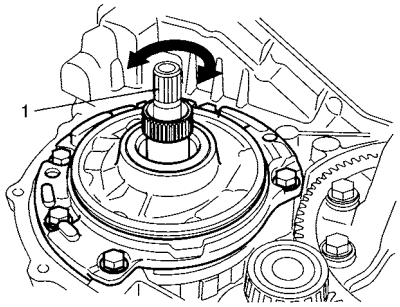
58) Install oil pump assembly (1) to transaxle case.

Tightening torque
Oil pump assembly bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I2RH0B510311-

59) Make sure that input shaft (1) turns smoothly.



I2RH0B510312-

60) Measure input shaft thrust play.
Apply dial gauge onto input shaft end (1) and measure thrust play of input shaft.

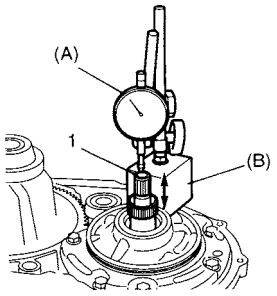
Special tool
(A): 09900–20607
(B): 09900–20701

Input shaft thrust play
0.3 – 0.9 mm (0.012 – 0.035 in.)

When input shaft thrust play is out of specification, select input shaft front thrust bearing with proper thickness from among the following table and replace it.

Available input shaft front thrust bearing thickness

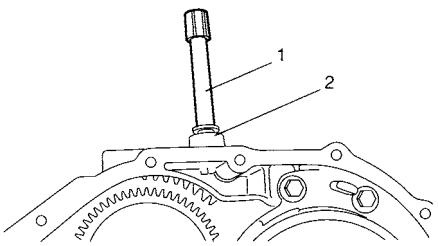
Thickness	Outside diameter	Inside diameter
3.45 mm (0.14 in.)	48.5 mm (1.90 in.)	32.9 mm (1.30 in.)
4.05 mm (0.16 in.)	48.5 mm (1.90 in.)	32.5 mm (1.28 in.)



I2RH0B510313-

61) After applying A/T fluid to new O-ring, fit it to breather union (2). Then install breather union to transaxle case.

62) Install breather hose (1).

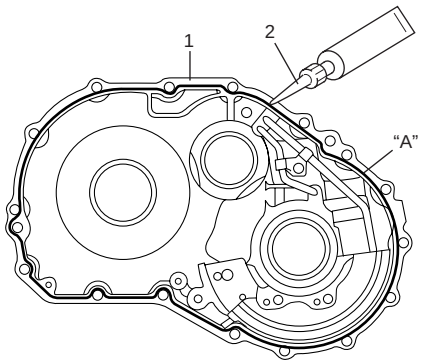


I2RH0B510314-

63) Wipe off and clean mating surface between transaxle case (1) and torque converter housing.

64) Apply sealant to torque converter housing by using a nozzle (2) as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter.

"A": Sealant 99000–31230



I2RH0B510315-

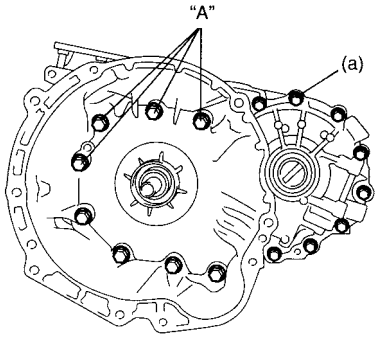
65) Install torque converter housing to transaxle case, tighten bolts to specified torque.

CAUTION:

Apply sealant to threads of four bolts shown in figure before tightening.

"A": Sealant 99000–31230

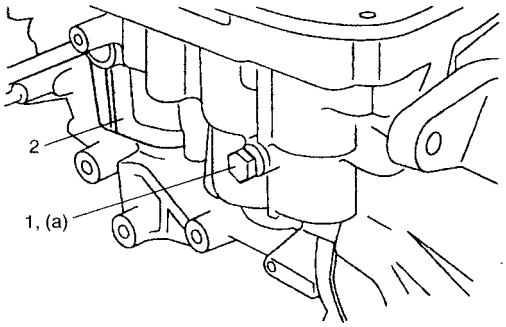
Tightening torque
Torque converter housing bolt (a): 33 N·m (3.3 kg-m, 24.0 lb-ft)



I3RM0B510069-

66) After applying A/T fluid to new O-ring, fit it to transaxle case plug (1). Then install the transaxle case plug to transaxle case (2).

Tightening torque
Transaxle case plug (a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



I2RH0B510317-

67) Install new O-rings to each accumulator piston and apply A/T fluid to them.

Accumulator O-ring dimension

O-ring name	Inside diameter	Section diameter
Large B1 accumulator O-ring (2) Large C1 accumulator O-ring (2) Large C2 accumulator O-ring (2) – Above three O-rings are same.	29.4 mm (1.16 in.)	2.6 mm (0.10 in.)
Small B1 accumulator O-ring (4)	19.7 mm (0.78 in.)	2.6 mm (0.10 in.)
Small C1 accumulator O-ring (6) Small C2 accumulator O-ring (6) – Above two O-rings are same.	21.8 mm (0.86 in.)	2.6 mm (0.10 in.)

NOTE:

Make sure that O-rings are not twisted or caught when installing.

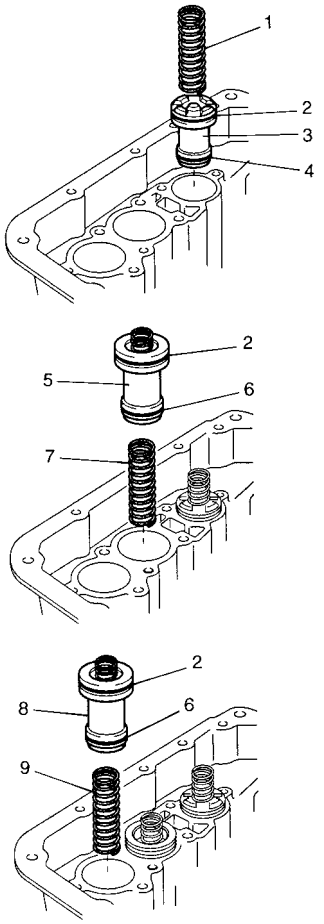
68) Install B1, C1, C2 accumulator pistons and springs.

Accumulator piston identification

Piston name	Identification as embossed letters on piston
B1 accumulator piston (3)	SB-1
C1 accumulator piston (5)	S2C-1
C2 accumulator piston (8)	S2C-2

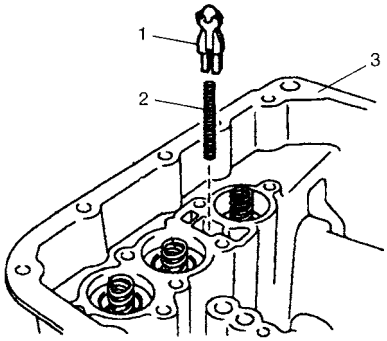
Accumulator spring identification

Spring name	Color of identification paint
B1 accumulator No.2 spring (1)	Pink
C1 accumulator No.2 spring (7)	Light blue
C2 accumulator No.2 spring (9)	Yellow



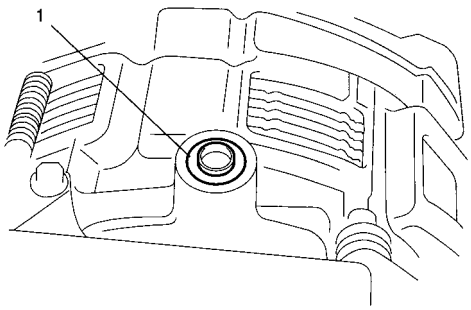
I2RH0B510318-

69) After applying A/T fluid to cooler check valve (1) and spring (2), install them to transaxle case (3).



I2RH0B510319-

70) After applying A/T fluid to new governor apply No.1 gasket (1), install it to transaxle case.



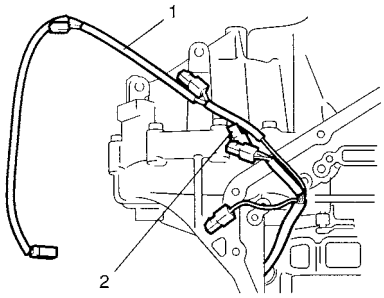
I2RH0B510320-

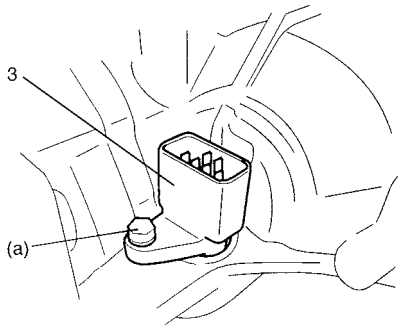
71) After applying A/T fluid to new O-ring, fit it to valve body harness connector (3), then install valve body harness to transaxle case.

CAUTION:

When put valve body harness (1) into transaxle case, take care not to damage transmission fluid temperature sensor (2) at narrow entrance of case.
Careless sensor treatment might cause sensor malfunction.

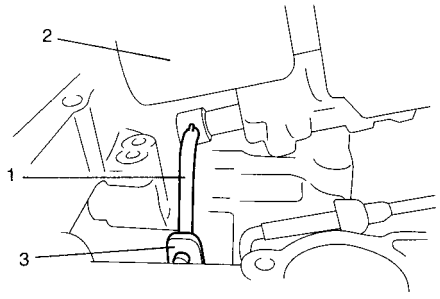
Tightening torque
Valve body harness connector bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)





I2RH0B510321-

72) Install manual valve rod (1) to manual valve lever (3) and then install valve body assembly (2) to transaxle case.



I2RH0B510322-

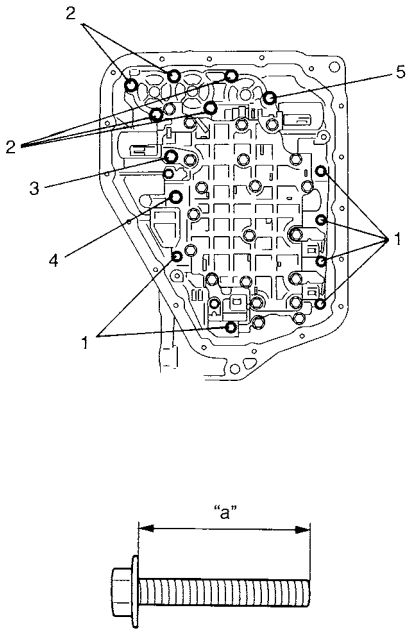
73) Tighten valve body bolts to specified torque.

Tightening torque
Valve body bolt: 11 N·m (1.1 kg-m, 8.0 lb-ft)

Valve body bolt length

Bolt	Length “a”	Pieces
A (1)	20 mm (0.79 in.)	6

Bolt	Length “a”	Pieces
B (2)	28 mm (1.10 in.)	5
C (3)	49 mm (1.93 in.)	1
D (4)	36 mm (1.42 in.)	1
E (5)	40 mm (1.58 in.)	1

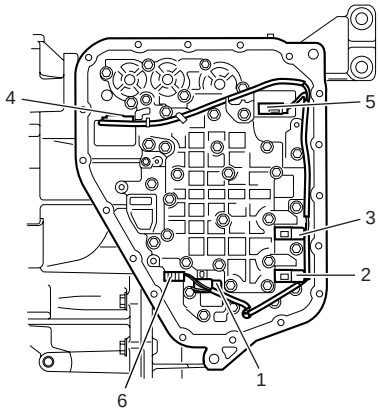


I2RH0B510323-

74) Connect solenoid connectors to solenoid valves identifying their installing positions by wire colors, and install transmission fluid temperature sensor to its clamp.

Solenoid valve coupler specification

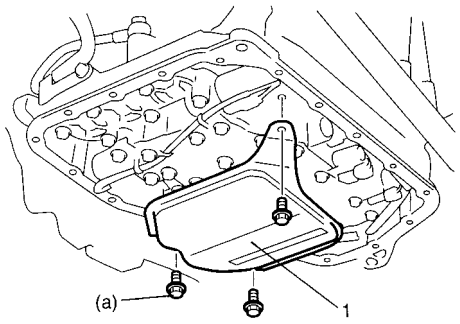
Solenoid valve coupler	Wire color
Shift solenoid valve-A (1)	White
Shift solenoid valve-B (2)	Black
Timing solenoid valve (3)	Yellow
TCC pressure control solenoid valve (4)	Light green / Brown
Pressure control solenoid valve (5)	Gray / Green
Transmission fluid temperature sensor (6)	Orange



I4RS0A510030-

75) Install oil strainer assembly (1).

Tightening torque
Oil strainer bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

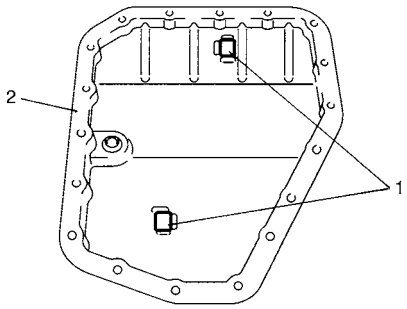


I2RH0B510325-

76) Install oil cleaner magnets (1) in oil pan (2).

NOTE:

If metal particles are attached to the magnets, clean them before installing.

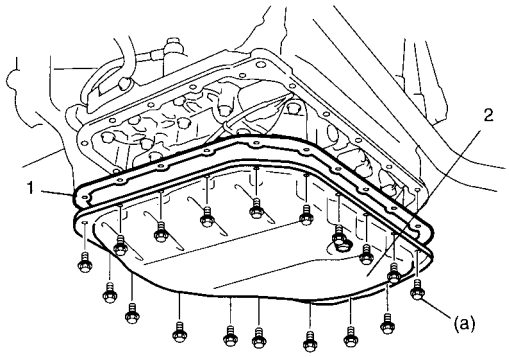


I2RH0B510326-

77) Install new oil pan gasket (1) between transaxle case and oil pan (2).

78) Tighten oil pan bolts to specified torque diagonally and little by little.

Tightening torque
Oil pan bolt (a): 7.0 N·m (0.7 kg-m, 5.0 lb-ft)



I2RH0B510327-

79) After applying A/T fluid to new O-rings, fit it to fluid inlet union (1). Then install fluid outlet union to transaxle case.

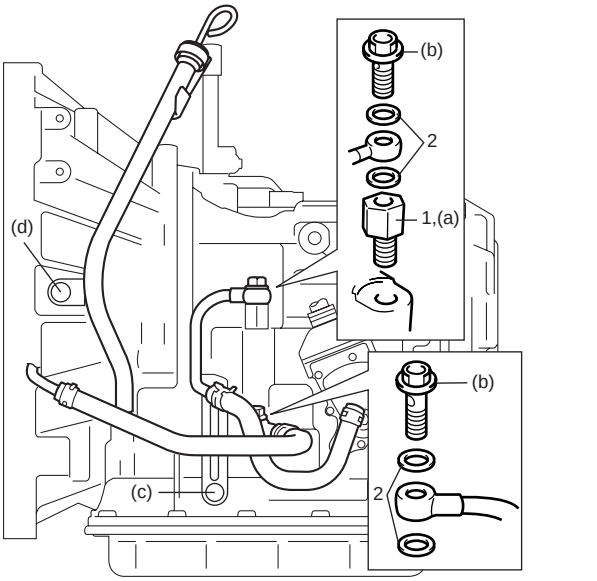
Tightening torque
Fluid outlet union (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

80) Install new gaskets (2) and then install fluid cooler pipes.

Tightening torque
Fluid cooler pipe union bolt (b): 22 N·m (2.2 kg-m, 16.0 lb-ft)
Fluid cooler pipe bracket bolt (c): 10 N·m (1.0 kg-m, 7.5 lb-ft)

81) After applying A/T fluid to new O-ring, fit it to fluid filler tube. Then install fluid filler tube to transaxle case.

Tightening torque
Fluid filler tube bolt (d): 10 N·m (1.0 kg-m, 7.5 lb-ft)



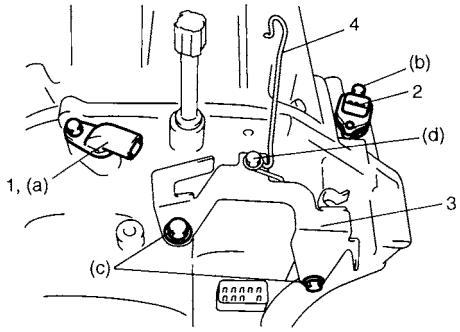
I3RM0B510070-

82) Apply A/T fluid to O-rings of each sensor and install input shaft speed sensor (1) and output shaft speed sensor (VSS) (2).

Tightening torque
Input shaft speed sensor bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)
Output shaft speed sensor (VSS) bolt (b): 13 N·m (1.3 kg-m, 9.5 lb-ft)

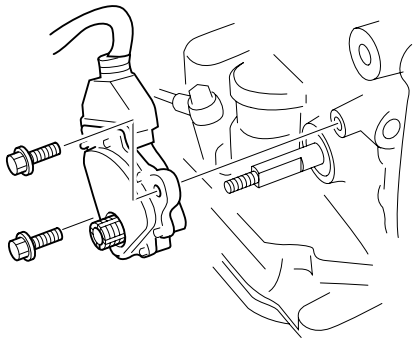
83) Install harness bracket (3) and select cable clamp (4).

Tightening torque
Harness bracket bolt (c): 23 N·m (2.3 kg-m, 17.0 lb-ft)
Select cable clamp bolt (d): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I3RM0B510071-

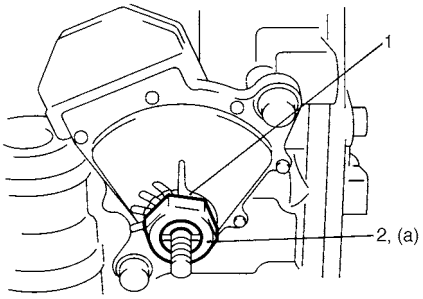
84) Install transmission range sensor to transaxle case, tighten bolts temporarily at this step.



I3RM0B510072-

85) Install lock washer (1) and tighten lock nut (2) to specified torque.

Tightening torque
Transmission range sensor lock nut (a): 7 N·m (0.7 kg-m, 5.0 lb-ft)



I3RM0B510073-

86) Install manual select lever (1) temporarily at this step.

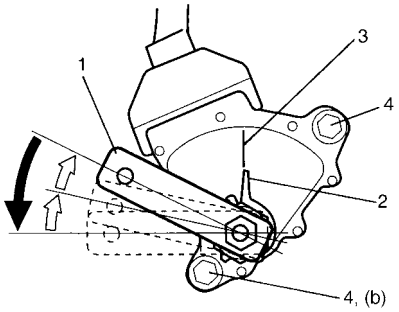
87) After shifting manual select lever counterclockwise fully, select “N” range position by bringing it back 2 notches clockwise.

88) Remove manual select lever (1) at this step.

89) Loosen sensor bolts (4) and align needle direction shaped on lock washer (2) with “N” reference line (3) on transmission range sensor by moving sensor in rotative direction.

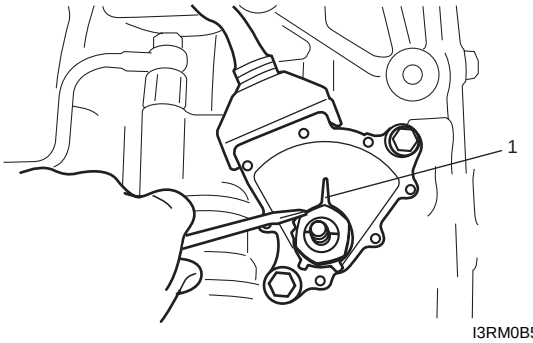
90) Tighten sensor bolts to specified torque.

Tightening torque
Transmission range sensor bolt (b): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



I3RM0B510074-

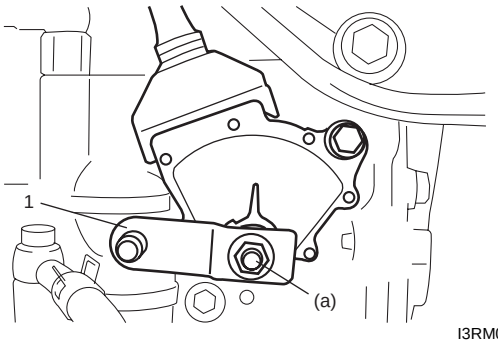
91) Bend dents of lock washer (1) in order to prevent displacement of lock washer.



I3RM0B510075-

92) Install manual select lever (1).

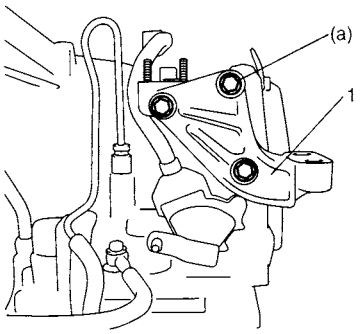
Tightening torque
Manual select lever nut (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I3RM0B510076-

93) Install engine mounting LH bracket (1).

Tightening torque
Engine mounting LH bracket bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)



I3RM0B510077-

94) Install torque converter (3) noting the following points.

CAUTION:

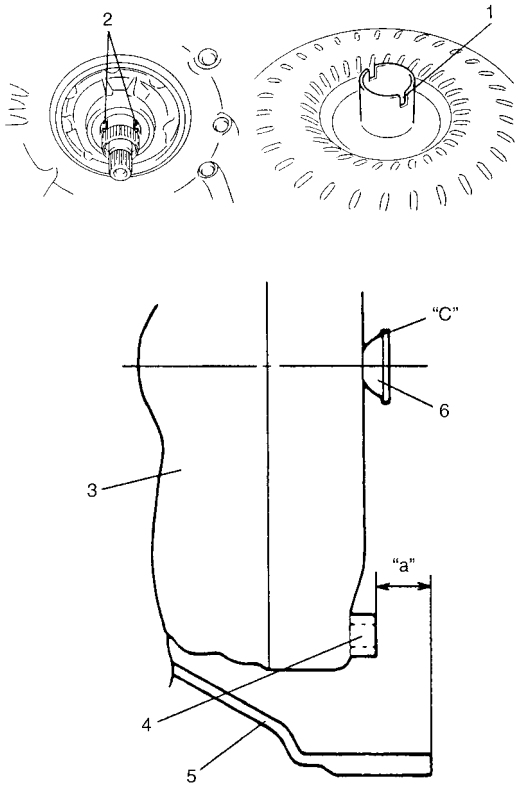
- **Before installing converter, make sure that its pump hub portion is free from nicks, burrs or damage which may cause oil seal to leak.**
- **Be very careful not to drop converter on oil pump gear. Damage in gear, should it occur, may cause a critical trouble.**

- Install torque converter aligning grooves (1) of torque converter and projection (2) of oil pump drive gear.
- Install torque converter, using care not to damage oil seal of oil pump.
- After installing torque converter, check that distance “a” is within specification.

Torque converter installing position
“a”: More than 19.9 mm (0.783 in.)

- Check torque converter for smooth rotation.
- Apply grease around cup (6) at the center of torque converter.

“C”: Grease 99000–25010



I2RH0B510337-

4.	Flange nut
5.	Torque converter housing

Specifications

Tightening Torque Specifications

S4RS0A5107001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
A/T fluid drain plug	17	1.7	12.5	☞ / ☞ / ☞
Transmission range sensor bolt	5.5	0.55	4.0	☞ / ☞
Output shaft speed sensor (VSS) bolt	13	1.3	9.5	☞ / ☞
Input shaft speed sensor bolt	5.5	0.55	4.0	☞ / ☞
Valve body harness connector bolt	5.5	0.55	4.0	☞ / ☞
Shift solenoid bolt	11	1.1	8.0	☞
Oil strainer bolt	10	1.0	7.5	☞ / ☞
Oil pan bolt	7.0	0.7	5.0	☞ / ☞
Transaxle and engine fastening bolt and nut	85	8.5	61.5	☞
Drive plate to torque converter bolt	25	2.5	18.0	☞
Transaxle stiffener bolt	55	5.5	40	☞
Starter motor bolt and nut	50	5.0	36.5	☞
Oil pump subassembly bolt	10	1.0	7.5	☞
Rear cover plug	7.5	0.75	5.5	☞
Solenoid valve bolt	11	1.1	8.0	☞
Final gear bolt	78	7.8	56.5	☞
Torque converter housing plug	7.5	0.75	5.5	☞
Lubrication tube clamp bolt	5.5	0.55	4.0	☞
Fluid reservoir RH plate bolt	5.5	0.55	4.0	☞
Torque converter housing bolt	33	3.3	24.0	☞ / ☞ / ☞
Manual detent spring bolt	10	1.0	7.5	☞
Parking lock pawl bracket bolt	7.5	0.75	5.5	☞
Rear cover bolt	25	2.5	18.0	☞
Fluid reservoir LH plate bolt	10	1.0	7.5	☞
Oil pump assembly bolt	25	2.5	18.0	☞
Transaxle case plug	7.5	0.75	5.5	☞
Valve body bolt	11	1.1	8.0	☞
Fluid outlet union	25	2.5	18.0	☞
Fluid cooler pipe union bolt	22	2.2	16.0	☞
Fluid cooler pipe bracket bolt	10	1.0	7.5	☞
Fluid filler tube bolt	10	1.0	7.5	☞
Harness bracket bolt	23	2.3	17.0	☞
Select cable clamp bolt	10	1.0	7.5	☞
Transmission range sensor lock nut	7	0.7	5.0	☞
Manual select lever nut	13	1.3	9.5	☞
Engine mounting LH bracket bolt	55	5.5	40.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Select Cable Components: ”
“Automatic Transaxle Unit Components: ”
“Automatic Transaxle Assembly Components: ”
“Oil Pump Assembly Components: ”
“Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components: ”
“Valve Body Assembly Components: ”
“Differential Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A5108001

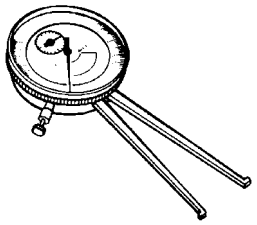
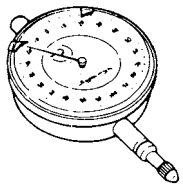
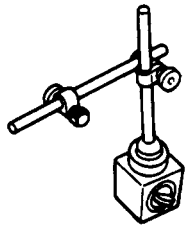
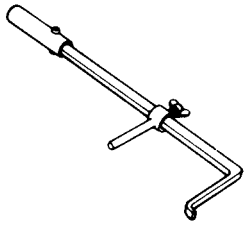
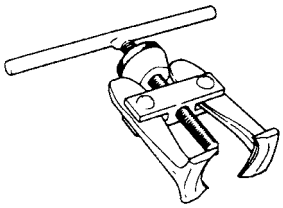
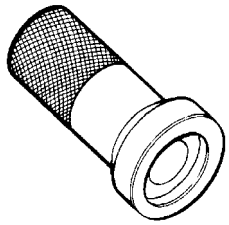
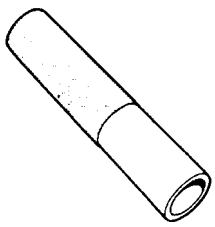
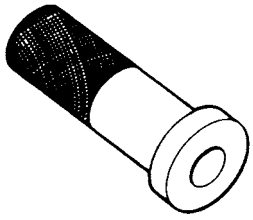
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞
	SUZUKI Super Grease C	P/No.: 99000–25030	☞ / ☞ / ☞ / ☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1216B	P/No.: 99000–31230	☞ / ☞ / ☞

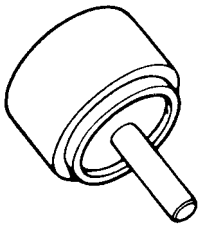
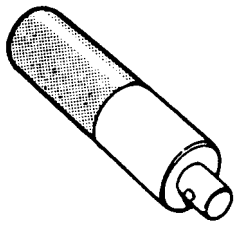
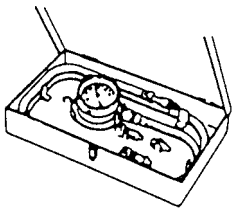
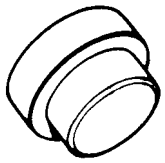
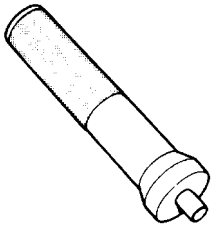
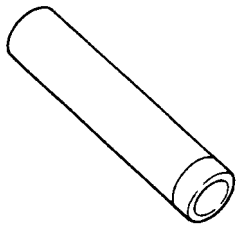
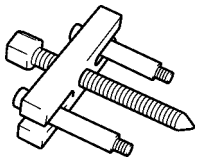
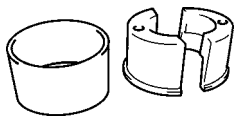
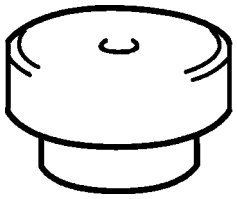
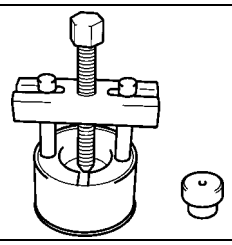
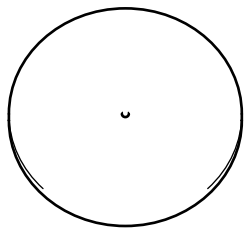
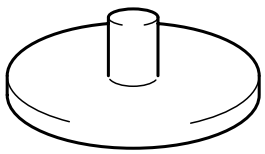
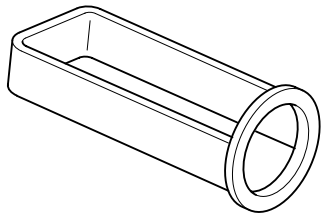
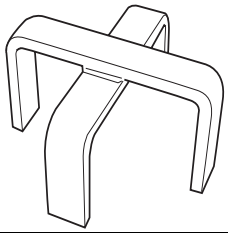
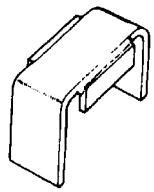
NOTE:

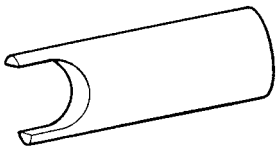
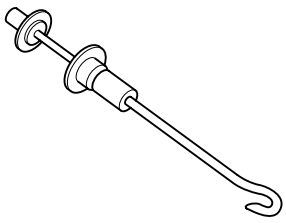
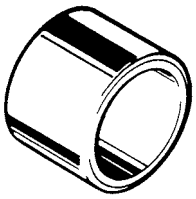
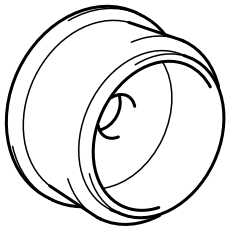
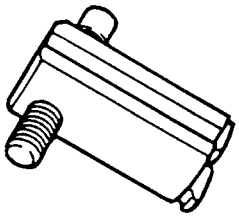
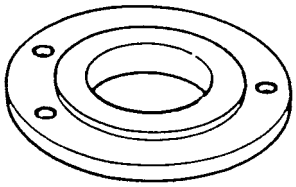
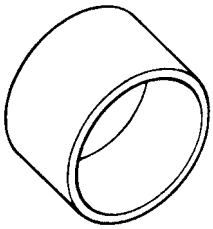
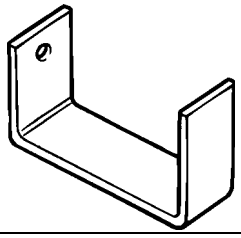
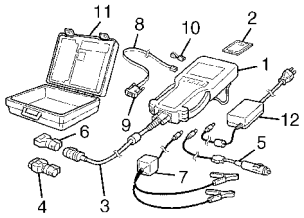
Required service material is also described in the following.
“Select Cable Components: ”
“Automatic Transaxle Unit Components: ”
“Automatic Transaxle Assembly Components: ”
“Oil Pump Assembly Components: ”
“Direct Clutch Assembly Components: ”
“Forward and Reverse Clutch Assembly Components: ”
“2nd Brake Piston Assembly Components: ”
“Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components: ”
“Countershaft Assembly Components: ”
“Valve Body Assembly Components: ”
“Differential Assembly Components: ”

Special Tool

S4RS0A5108002

09900–20605 Dial calipers (1/100 mm, 10-34 mm) ☞ / ☞ / ☞		09900–20607 Dial gauge ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞	
09900–20701 Magnetic stand ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞		09913–50121 Oil seal remover ☞	
09913–61510 Bearing puller ☞		09913–70123 Bearing installing tool ☞ / ☞	
09913–84510 Bearing installer ☞ / ☞ / ☞ / ☞		09913–85210 Bearing installer ☞	

09923–78210 Bearing installer ☞ 	09924–74510 Bearing and oil seal handle ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 
09925–37811–001 Oil pressure gauge ☞ 	09925–88210 Bearing puller attachment ☞ / ☞ 
09925–98210 Input shaft bearing installer ☞ 	09925–98221 Bearing installer ☞ 
09926–37610–001 Bearing puller ☞ / ☞ 	09926–37610–002 Bearing puller attachment ☞ / ☞ 
09926–37610–003 Bearing remover attachment ☞ / ☞ 	09926–37610 Bearing remover ☞ / ☞ 
09926–58010 Bearing remover attachment ☞ 	09926–96030 Clutch spring compressor No.7 ☞ / ☞ 
09926–96050 Brake piston compressor ☞ / ☞ 	09926–97610 Spring compressor ☞ / ☞ 
09926–97620 Spring compressor ☞ / ☞ 	09926–98310 Clutch spring compressor ☞ / ☞ 

09928–06050 Differential preload adapter ☞ / ☞ 	09942–15511 Sliding hammer ☞ / ☞ / ☞ / ☞ 
09944–78210 Bearing installer support ☞ / ☞ 	09944–88220 Oil seal installer ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 
09944–96011 Bearing outer race remover ☞ / ☞ / ☞ / ☞ 	09946–06710 Transfer bearing dummy ☞ / ☞ 
09951–18210 Oil seal remover & installer No. 2 ☞ / ☞ 	09952–06020 Dial gauge plate No.2 ☞ / ☞ / ☞ / ☞ 
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞ 	

Manual Transmission

General Description

Manual Transaxle Construction and Servicing

S4RS0A5201001

The transaxle provides five forward speeds and one reverse speed by means of three synchromeshs and three shafts (input shaft, countershaft and reverse gear shaft). All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.

The low speed synchronizer sleeve & hub is mounted on countershaft and engaged with countershaft 1st gear or 2nd gear, while the high speed synchronizer sleeve & hub is done on input shaft and engaged with input shaft 3rd gear or 4th gear. The 5th speed synchronizer sleeve & hub on input shaft is engaged with input shaft fifth gear mounted on the input shaft.

To prevent the cracking noise from the reverse gear when shifting transaxle gear into the reverse gear, the reverse shift braking device is used.

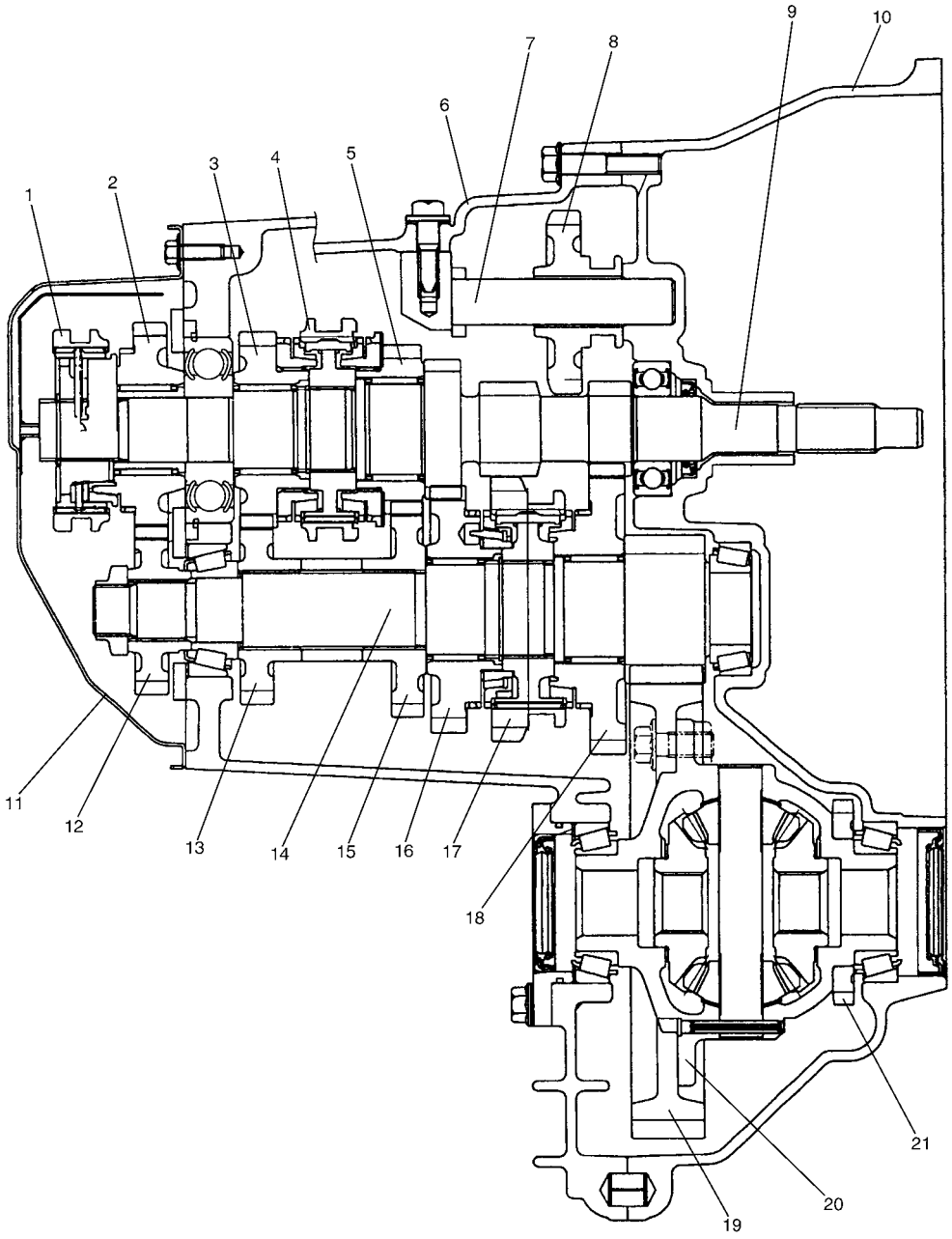
The device utilizes the 5th synchromesh, which is the lever synchro type, to apply the brake on the input shaft rotation.

The double cone synchronizing mechanism is provided to 2nd gear synchromesh device for high performance of shifting to 2nd gear.

The countershaft turns the final gear and differential assembly, thereby turning the front drive shafts which are attached to the front wheels.

For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transaxle case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

Further, care must be taken to adjust preload of countershaft taper roller bearings. New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.



I3RM0B521001-

1. 5th speed sleeve & hub	8. Reverse idler gear	15. Countershaft 3rd gear
2. Input shaft 5th gear	9. Input shaft	16. Countershaft 2nd gear
3. Input shaft 4th gear	10. Right case	17. Low speed synchronizer sleeve & hub
4. High speed synchronizer sleeve & hub	11. Side cover	18. Countershaft 1st gear
5. Input shaft 3rd gear	12. Countershaft 5th gear	19. Final gear
6. Left case	13. Countershaft 4th gear	20. Differential case
7. Reverse gear shaft	14. Countershaft	21. Vehicle speed sensor rotor

Diagnostic Information and Procedures

Manual Transaxle Symptom Diagnosis

S4RS0A5204001

Condition	Possible cause	Correction / Reference Item
Gears slipping out of mesh	Worn shift fork shaft	*Replace.*
	Worn shift fork or synchronizer sleeve	*Replace.*
	Weak or damaged locating springs	*Replace.*
	Worn bearings on input shaft or countershaft	*Replace.*
	Worn chamfered tooth on sleeve and gear	*Replace sleeve and gear.*
Hard shifting	Maladjusted gear select control cable	*Adjust.*
	Inadequate or insufficient lubricant	*Replenish.*
	Improper clutch pedal free travel	*Replace clutch master cylinder or clutch pedal arm.*
	Distorted or broken clutch disc	*Replace.*
	Damaged clutch pressure plate	*Replace clutch cover.*
	Worn synchronizer ring	*Replace.*
	Worn chamfered tooth on sleeve or gear	*Replace sleeve or gear.*
	Worn gear shift / select control cables joint	*Replace.*
	Distorted shift shaft	*Replace.*
	Worn gear shift / select control cables	*Replace.*
Noise	Inadequate or insufficient lubricant	*Replenish.*
	Damaged or worn bearing(s)	*Replace.*
	Damaged or worn gear(s)	*Replace.*
	Damaged or worn synchronizer parts	*Replace.*

Repair Instructions

Manual Transaxle Oil Change

S4RS0A5206001

1) Before changing or inspecting oil, be sure to stop engine and lift vehicle horizontally.
2) With vehicle lifted up, check oil level and leakage. If leakage exists, correct it.

NOTE:

Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage.

3) Remove oil filler plug (2).
4) Remove drain plug (1), and drain old oil.
5) Apply sealant to thread of drain plug (1), and tighten it to specified torque.

"A": Sealant 99000–31260

Tightening torque
Transaxle oil drain plug (a): 21 N·m (2.1 kg-m, 15.5 lb-ft)

6) Pour new specified oil until oil level reaches bottom of oil filler plug hole (3) as shown in figure.

NOTE:

It is highly recommended to use API GL-4 75W-90 gear oil.

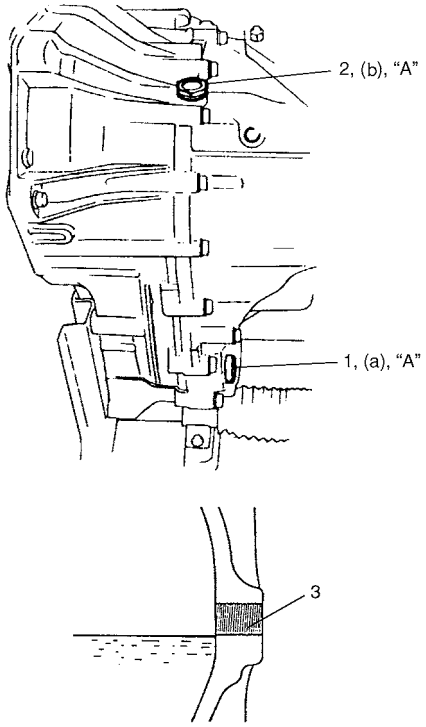
Transaxle oil specification
: API GL-4 (For SAE classification, refer to viscosity chart [A] in figure.)

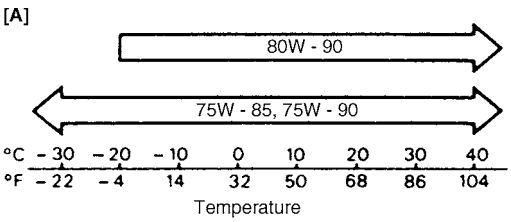
Transaxle oil capacity (Reference)
: 2.2 liters (4.8/3.9 US/Imp. pt)

7) Apply sealant to thread of level / filler plug, and then tighten it to specified torque.

"A": Sealant 99000–31260

Tightening torque
Transaxle oil level / filler plug (b): 21 N·m (2.1 kg-m, 15.5 lb-ft)





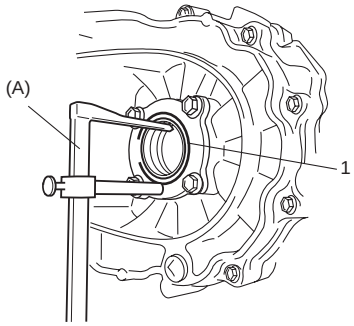
I4RS0A520001-

Differential Side Oil Seal Replacement

S4RS0A5206002

1) Lift up vehicle and drain transaxle oil.
2) Remove front drive shaft and/or center shaft referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
3) Remove oil seal (1) using special tool.

Special tool
(A): 09913–50121



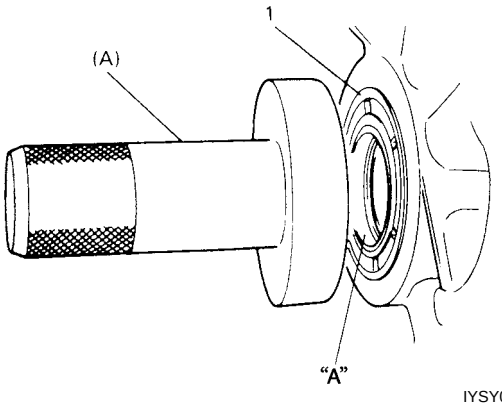
I4RH01520003-

4) Install oil seal (1) facing its spring side inward. Use special tool and hammer for installation.

Special tool
(A): 09913–85210

5) Apply grease to oil seal lip and at the same time check drive shaft where oil seal contacts and make sure of its smoothness.

"A": Grease 99000–25010

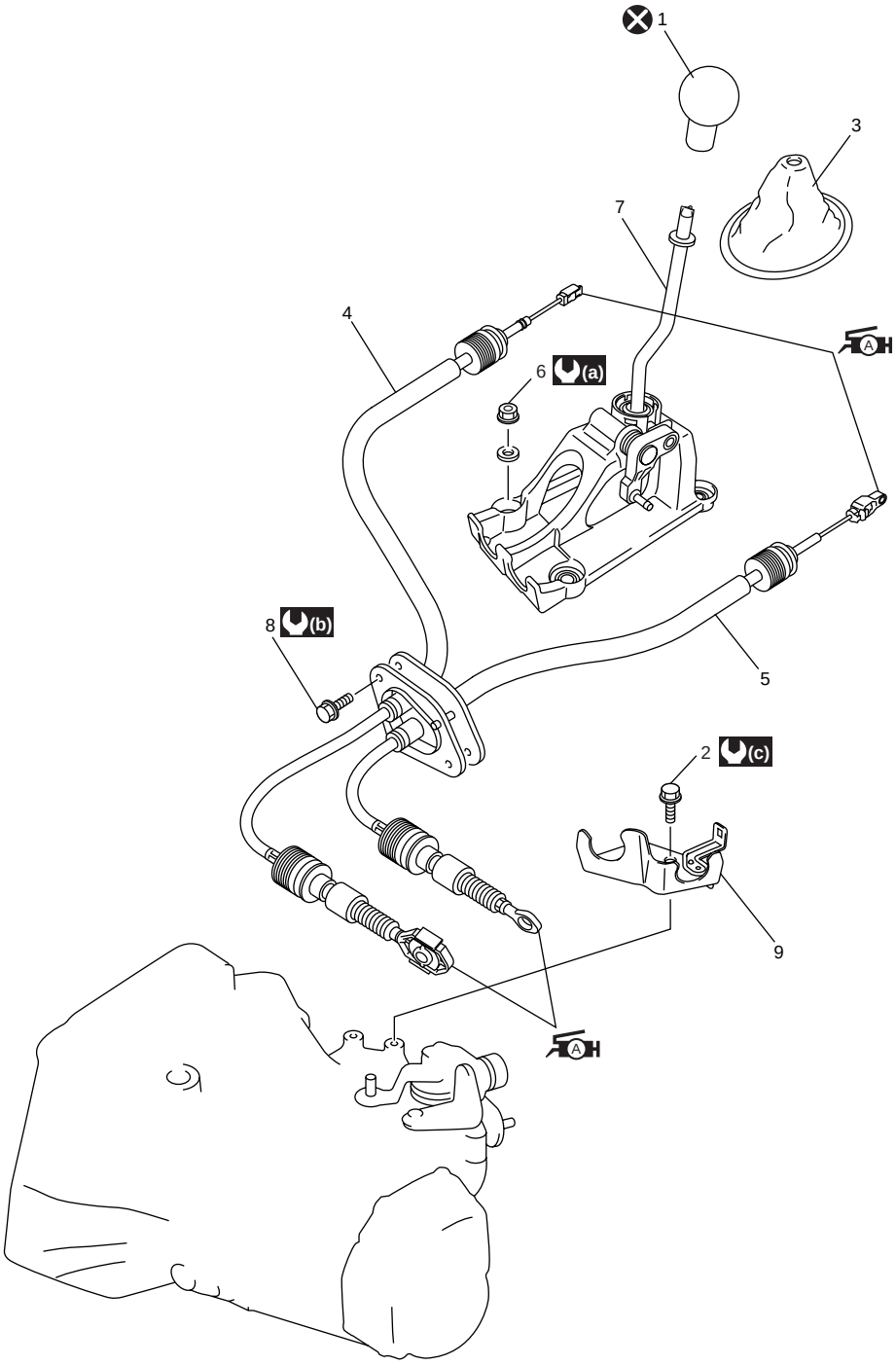


IYSY01520005-

6) Insert front drive shaft and/or center shaft referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
7) Fill transaxle oil as specified referring to "Manual Transaxle Oil Change: ", and make sure that oil has been sealed with oil seal.

Gear Shift Control Lever and Cable Components

S4RS0A5206003



I4RS0A520002-

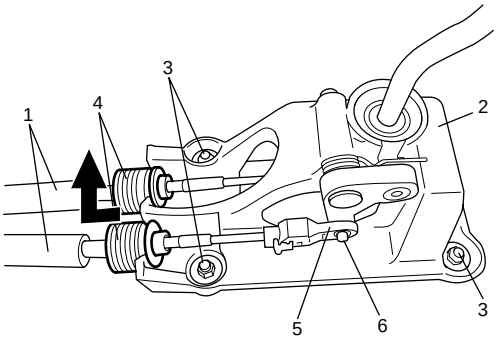
1. Gear shift control lever knob	6. Gear shift control lever assembly mounting nut	(b) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
2. Cable bracket bolt	7. Gear shift control lever assembly	(c) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
3. Gear shift lever boot	8. Cable grommet bolt	: Do not reuse.
4. Gear shift control cable : Apply grease 99000-25010 to cable end.	9. Cable bracket	
5. Gear select control cable : Apply grease 99000-25010 to cable end.	(a) : 13 N·m (1.3 kg-m, 9.5 lb-ft)	

Gear Shift Control Lever and Cable Removal and Installation

S4RS0A5206004

Removal

1) Remove console box.
2) Disconnect cable ends (5) from pivot (6) of gear shift control lever assembly.
3) Disconnect gear shift and select control cables (1) from gear shift control lever assembly (2) while pulling quick joint (4) as shown in figure.
4) Remove gear shift control lever assembly mounting nuts (3) and gear shift lever assembly from floor panel.
5) Disconnect gear shift and select control cables from transaxle.
6) Remove cable grommet bolt, and then remove gear shift and select control cables from floor panel.



I4RS0A520003-

Installation

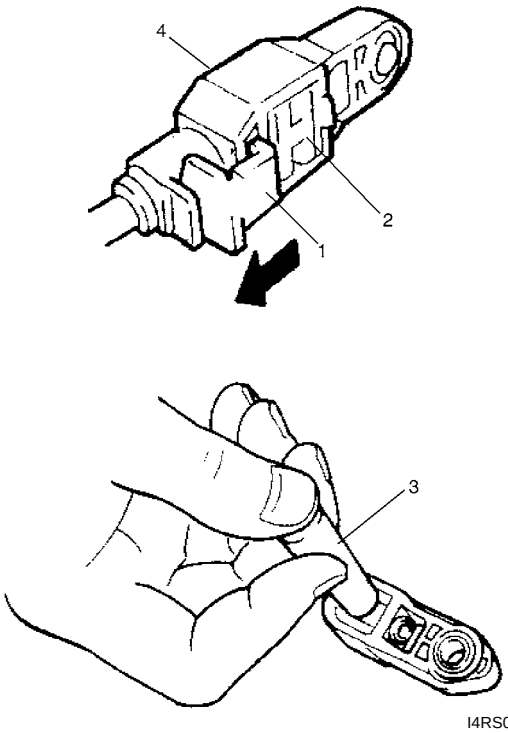
Reverse removal procedure for installation nothing the following.

- Tighten each bolts and nuts to specified torque referring to “Gear Shift Control Lever and Cable Components: ”.
- Adjust gear select control cable referring to “Gear Select Control Cable Adjustment: ”.

Gear Select Control Cable Adjustment

S4RS0A5206026

1) Release lock plate (1) which restricts moving of cable end holder (2).
2) Push cable end holder (2) out from adjuster (4) using appropriate tool (3) to disengage cable.



I4RS0A520004-

3) Apply grease to pin (5) of gear shift control lever, and then install adjuster (1) into pin of gear shift control lever securely.

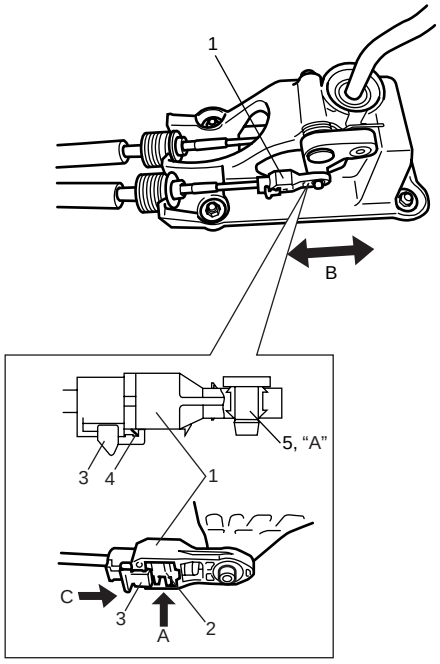
“A”: Grease 99000–25010

4) Push cable end holder (2) in the direction of A.

NOTE:

At this time, do not apply force in the cable operation direction B to adjuster.

5) Slide lock plate (3) in the direction of C, until it gets over the claw (4) of cable end holder.



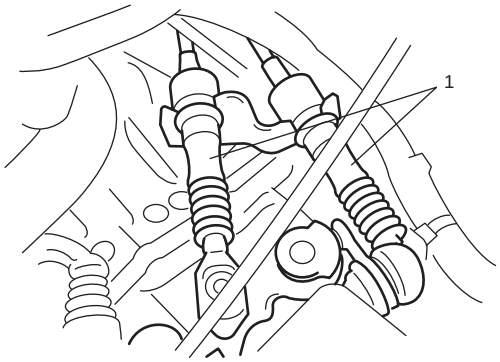
I4RS0A520005-

Vehicle Speed Sensor (VSS) Removal and Installation

S4RS0A5206027

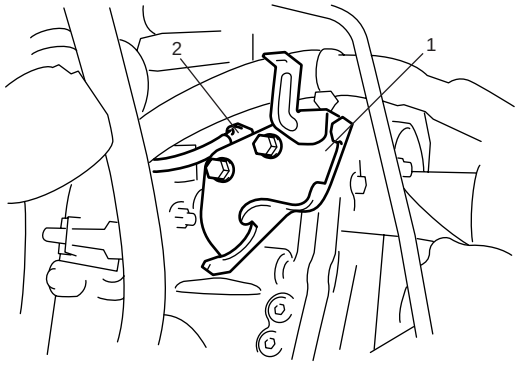
Removal

1) Remove battery and tray with coolant reservoir.
2) Disconnect gear shift and select control cables (1) from transaxle.



I4RS0A520006-

3) Remove cable bracket (1) from transaxle.
4) Disconnect VSS coupler (2).
5) Remove VSS.

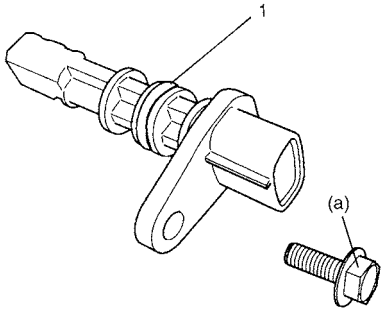


I4RS0A520007-

Installation

1) Apply oil to new O-ring (1) and then install VSS to transaxle.

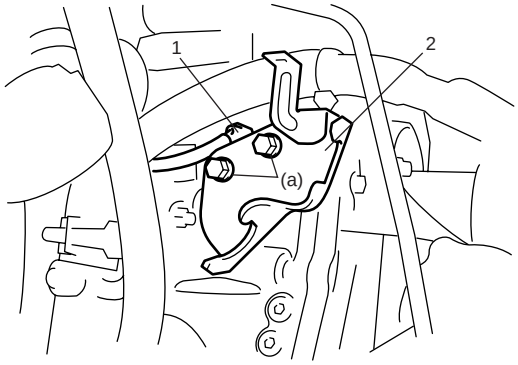
Tightening torque
VSS bolt (a): 5 N·m (0.5 kg-m, 4.0 lb-ft)



I4RS0A520008-

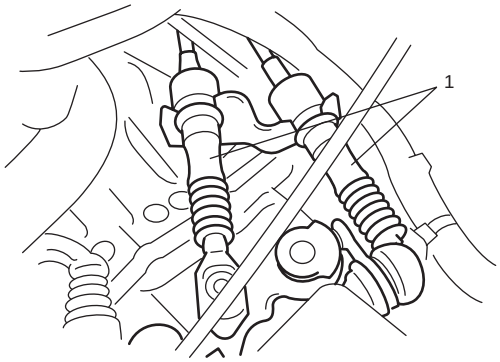
2) Connect VSS coupler (1).
3) Install cable bracket (2) to transaxle.

Tightening torque
Cable bracket bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)



I4RS0A520009-

4) Connect gear shift and select control cables (1) to transaxle.



I4RS0A520006-

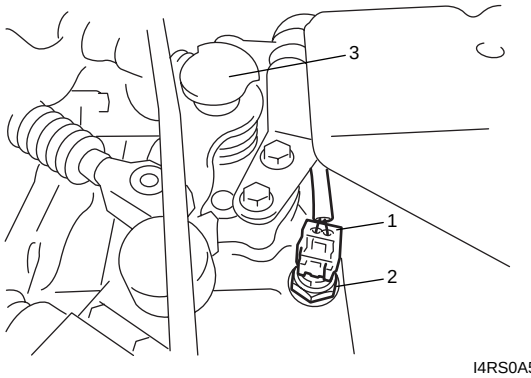
5) Install battery and tray, and then install coolant reservoir to battery tray.

Back Up Lamp Switch Removal and Installation

S4RS0A5206007

Removal

1) Remove battery and tray with coolant reservoir.
2) Disconnect back up lamp switch coupler (1).
3) Remove back up lamp switch (2).



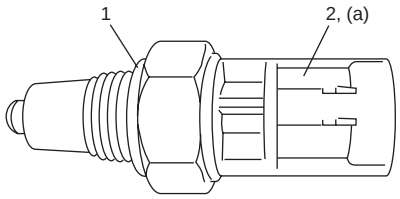
I4RS0A520010-

3. Gear shift and select shaft assembly

Installation

1) Apply oil to new O-ring (1) and tighten back up lamp switch (2) to specified torque.

Tightening torque
Back up lamp switch (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I3RH0A520006-

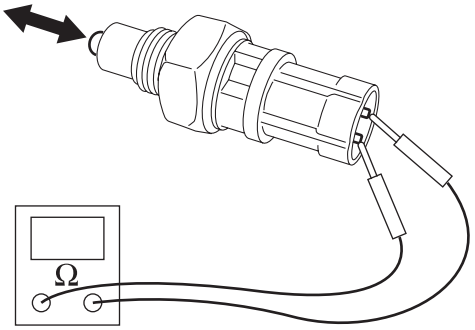
2) Connect back up lamp switch coupler.
3) Install battery and tray, and then install coolant reservoir to battery tray.

Back Up Lamp Switch Inspection

S4RS0A5206008

Check back up lamp switch for function using ohmmeter.

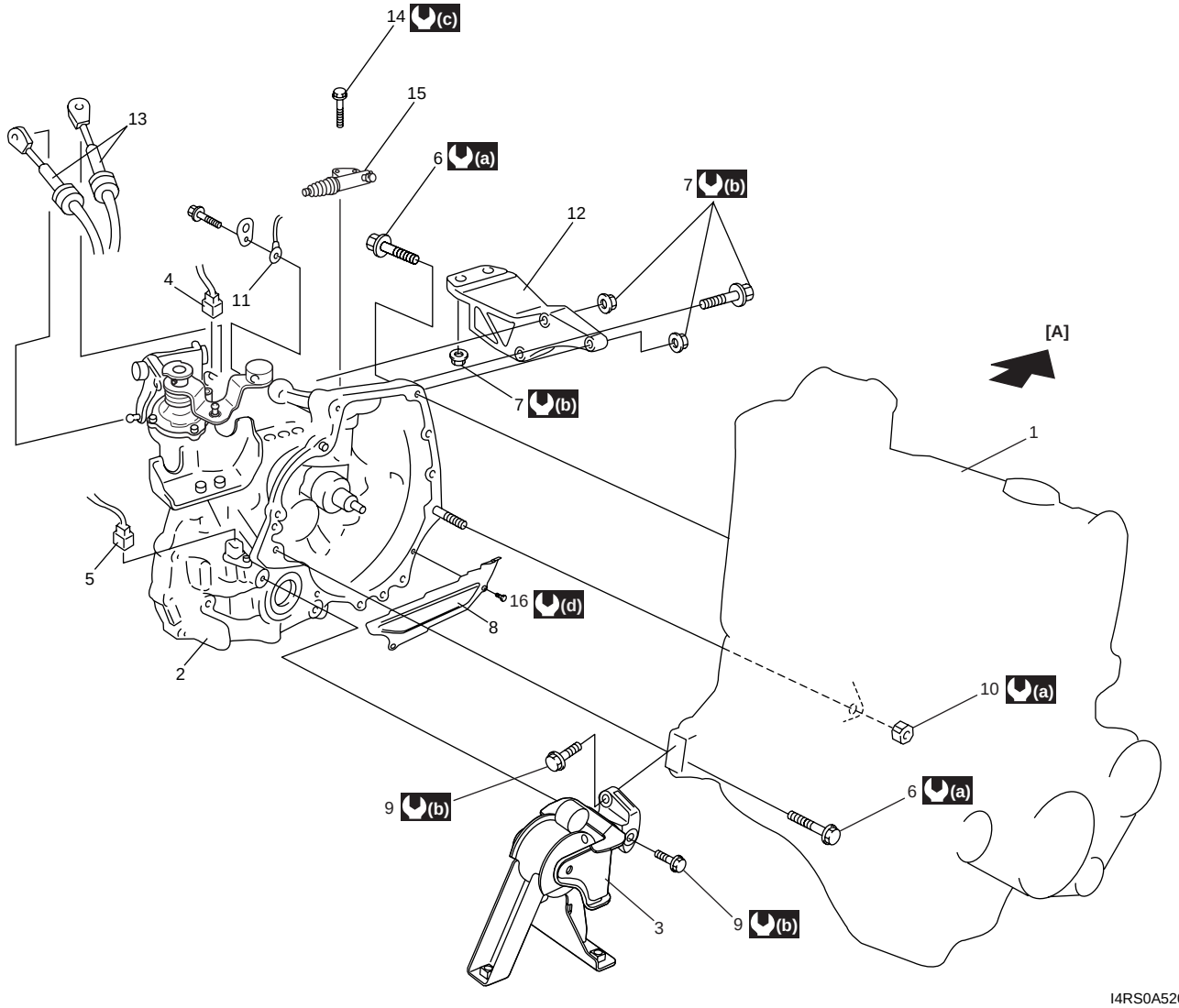
Back up lamp switch specification
Switch ON (Push): Continuity
Switch OFF (Release): No continuity



I4RS0A520011-

Manual Transaxle Unit Components

S4RS0A5206009



I4RS0A520012-

[A]: Forward	7. Engine left mounting bracket bolt and nuts	14. Clutch operating cylinder bolt
1. Engine	8. Clutch housing lower plate	15. Clutch operating cylinder
2. Transaxle	9. Engine rear mounting bracket bolts	16. Clutch housing lower plate bolts

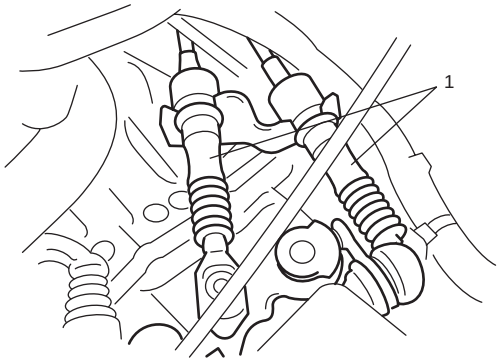
3. Engine rear mounting and bracket	10. Transaxle to engine nut	(a) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
4. Back up lamp switch connector	11. Ground cable	(b) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
5. VSS connector	12. Engine left mounting bracket	(c) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
6. Transaxle to engine bolt	13. Gear shift & select control cables	(d) : 11 N·m (1.1 kg-m, 8.0 lb-ft)

Manual Transaxle Unit Dismounting and Remounting

S4RS0A5206033

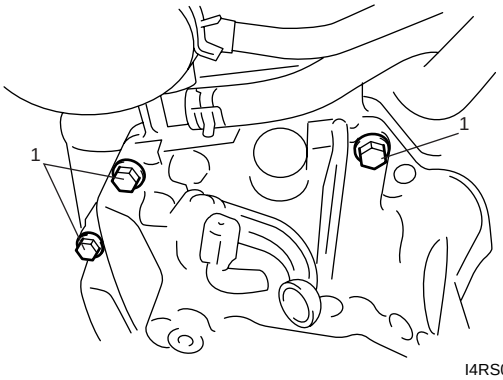
Dismounting

1) Drain coolant.
2) Remove coolant reservoir with reservoir hose.
3) Remove battery and tray.
4) Remove air cleaner case and resonator.
5) Disconnect gear shift and gear select control cables (1) from transaxle.



I4RS0A520006-

6) Disconnect back up lamp switch coupler and VSS coupler and undo wiring harness clamps.
7) Remove ground cable from transaxle.
8) Remove clutch operating cylinder with fluid hose from transaxle.
9) Remove water inlet No.2 pipe from transaxle.
10) Remove starting motor referring to “Starting Motor Dismounting and Remounting: in Section 1I”.
11) Remove transaxle to engine bolts (1) of upper side.

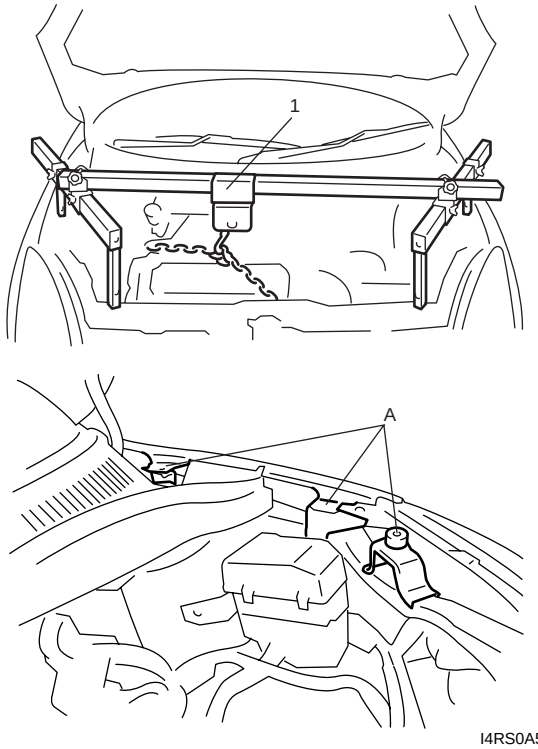


I4RS0A520018-

12) Support engine using supporting device (1).

CAUTION:

Do not apply supporting device to projection part A. If do so, it may be deformed.

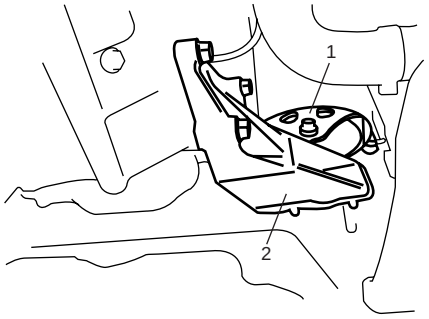


I4RS0A520019-

13) Remove front drive shafts and center shaft referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”.
14) Remove exhaust No.2 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: in Section 1K”.
15) Remove clutch housing lower plate (1).

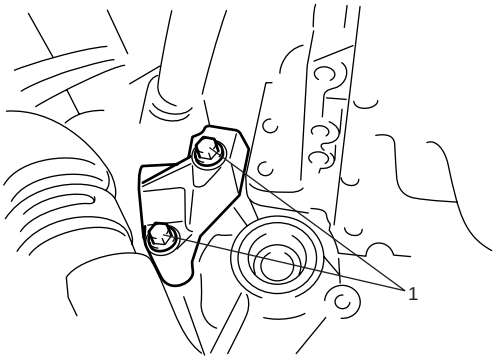
I4RS0A520020-

16) Remove engine under covers.
17) Support transaxle with transmission jack.
18) Remove transaxle to engine bolts and nut of lower side.
19) Remove engine left mounting (1) with bracket (2).



I4RS0A520021-

20) Remove engine rear mounting bracket bolts (1).



I4RS0A520022-

21) Remove other attached parts from transaxle, if any.
22) Pull transaxle so as to disconnect input shaft from clutch disc, and then lower it.

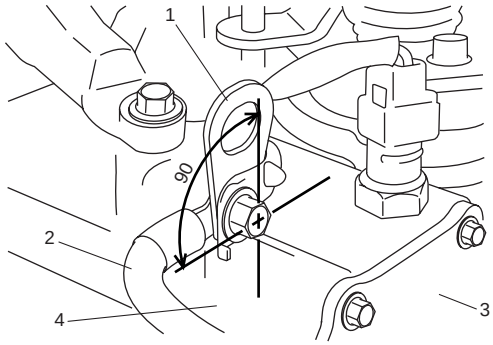
Remounting

CAUTION:

- **Care should be taken not to scratch oil seal lip with drive shaft while raising transaxle.**
- **Do not hit drive shaft joint with hammer when installing it into differential gear.**

Reverse dismounting procedure for remounting noting the following.

- Tighten each bolts and nuts to specified torque referring to “Manual Transaxle Unit Components: ”.
- Set each clamp for wiring securely.
- Fill transaxle oil referring to “Manual Transaxle Oil Change: ”.
- Install hook (1) and ground cable (2) at specified position as shown in figure.



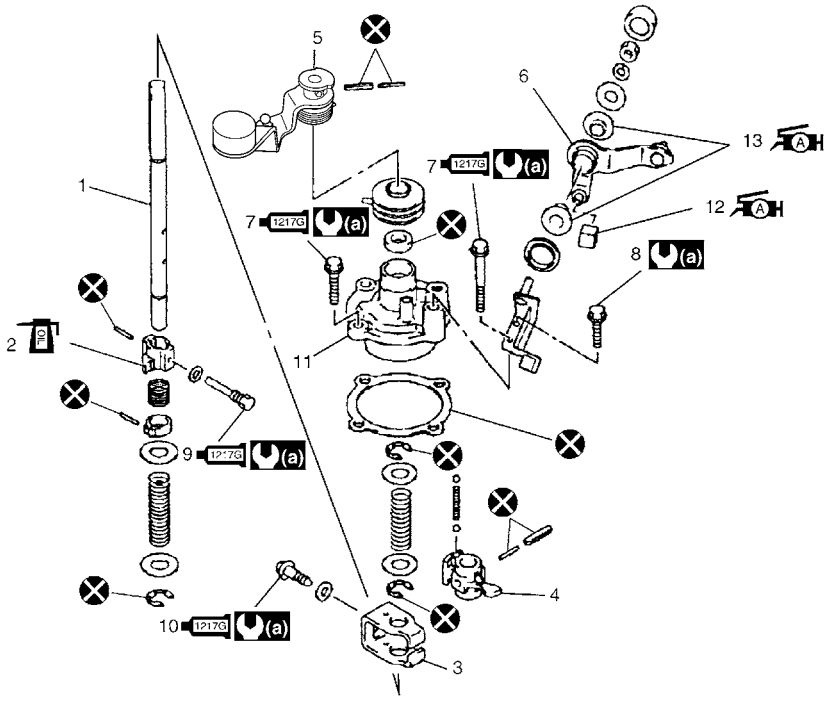
I4RS0A520023-

3.	Transaxle side cover
4.	Transaxle left case

- Connect battery and check function of engine, clutch and transaxle.

Gear Shift and Select Shaft Assembly Components

S4RS0A5206029



I4RS0A520014-

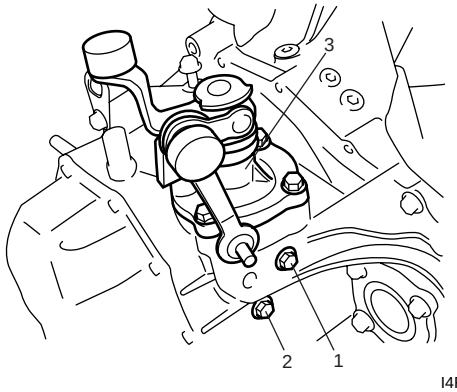
1. Gear shift & select shaft	1217G 7. Gear shift guide case bolt : Apply sealant 99000-31260 to bolt thread.	13. Select lever boss : Apply grease 99000-25010 to internal and external diameter.
2. 5th & reverse gear shift cam	8. Select lever bracket bolt	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
3. Gear shift interlock plate	1217G 9. 5th to reverse interlock guide bolt : Apply sealant 99000-31260 to bolt thread.	: Do not reuse.
4. Gear shift & select lever	1217G 10. Gear shift interlock bolt : Apply sealant 99000-31260 to bolt thread.	: Apply transaxle oil.
5. Shift cable lever	11. Guide case	
6. Select cable lever	12. Select lever shaft bush : Apply grease 99000-25010 to whole area of bush.	

Gear Shift and Select Shaft Assembly Removal and Installation

S4RS0A5206016

Removal

1) Remove gear shift interlock bolt (1) and 5th to reverse interlock guide bolt (2) from transaxle case.
2) Remove gear shift & select shaft assembly (3).



I4RS0A520024-

Installation

1) Apply grease to select lever shaft bush and select lever boss, and install gear shift and select shaft assembly with new gasket into transaxle.

"A": Grease 99000–25010

2) Apply sealant to gear shift guide case bolts (1). Tighten gear shift guide case bolts to specified torque.

"B": Sealant 99000–31260

Tightening torque
Gear shift guide case bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

3) Tighten select lever bracket bolt with select lever bracket to specified torque.

Tightening torque
Select lever bracket bolt: 23 N·m (2.3 kg-m, 17.0 lb-ft)

4) Install washer and gear shift interlock bolt (2) to which sealant have been applied and then tighten it to specified torque.

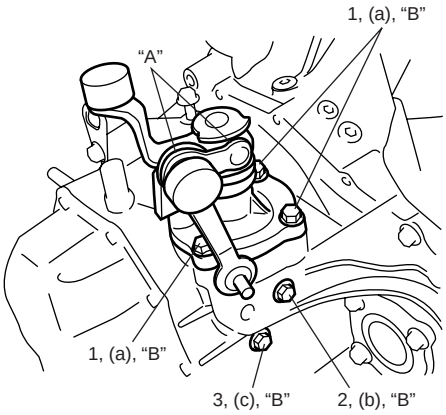
"B": Sealant 99000–31260

Tightening torque
Gear shift interlock bolt (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

5) Install washer and 5th to reverse interlock guide bolt (3) to which sealant have been applied and then tighten it to specified torque.

"B": Sealant 99000–31260

Tightening torque
5th to reverse interlock guide bolt (c): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A520025-

Gear Shift and Select Shaft Disassembly and Assembly

S4RS0A5206017

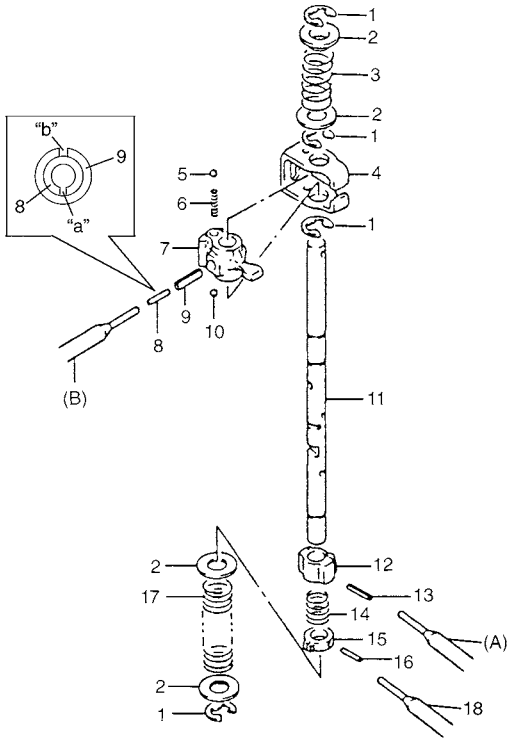
1) Push pins out using 2.8 – 3.0 mm (0.11 – 0.12 in.) commercially available spring pin remover and specified spring pin removers as shown below.

Special tool
(A): 09922–85811 (4.5 mm)
(B): 09925–78210 (6.0 mm)

2) Inspect component parts for wear, distortion or damage. If any detect is found, replace detective part with new one.

NOTE:

- **Set new gear shift & select lever inner pin (8) and outer pin (9) facing each gap ("a", "b") in the opposite direction as shown in figure.**
- **When driving in pins, prevent shaft from being bent by supporting it with wood block.**
- **Assemble 5th & reverse gear shift cam with its pit and pin aligned.**
- **Make sure to select an appropriate spring by identifying the painted colors to keep gear shifting performance as designed.**
  - **Low speed select spring – Blue**
  - **Reverse select spring – Pink**

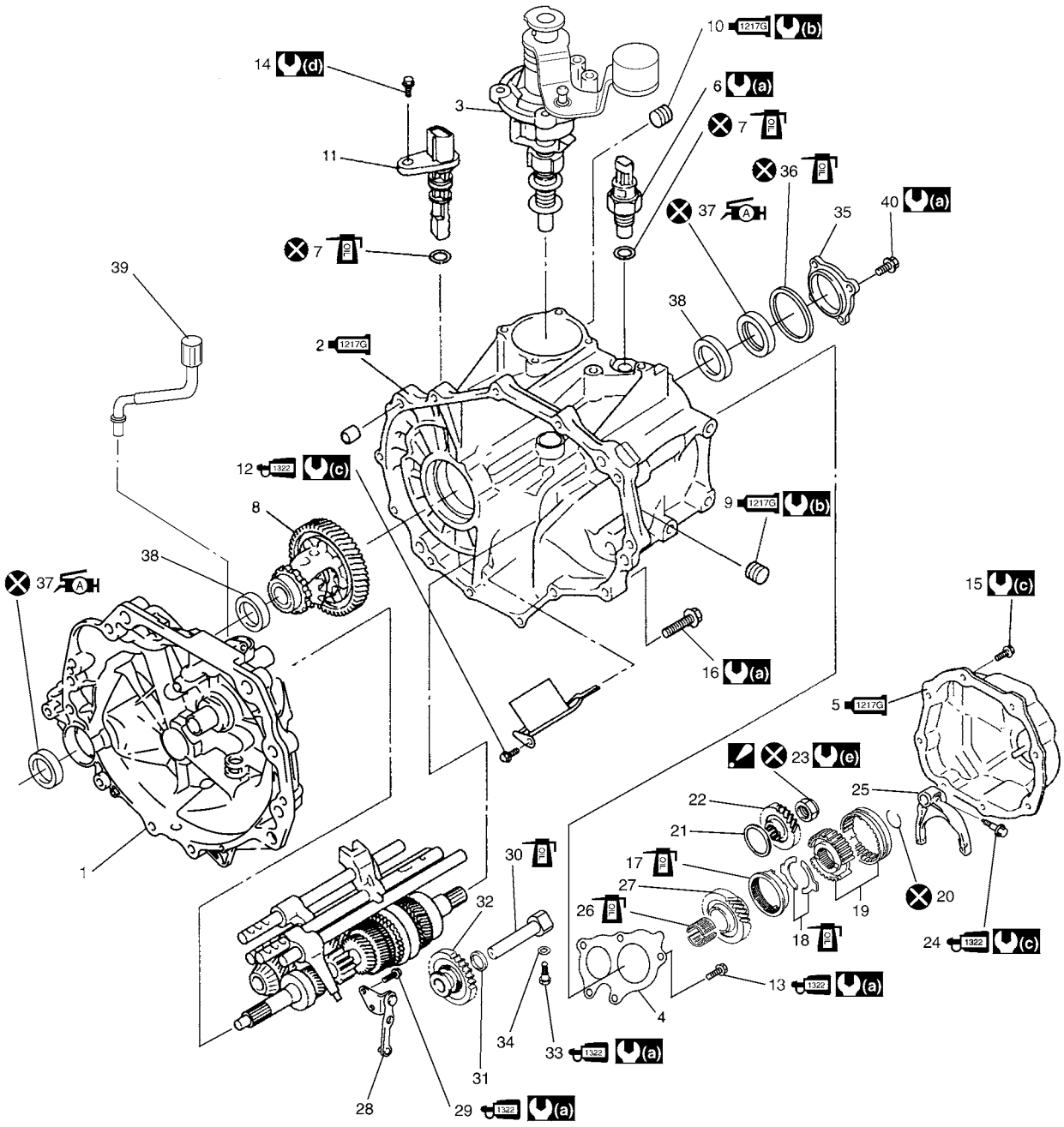


I4RS0A520026-

1. E-ring	10. Ball
2. Washer	11. Gear shift & select shaft
3. Reverse select spring	12. 5th & reverse gear shift cam
4. Gear shift interlock plate	13. 5th & reverse gear shift cam guide pin
5. Ball	14. Cam guide return spring
6. Gear shift interlock spring	15. 5th & reverse gear shift cam guide
7. Gear shift & select lever	16. Gear shift cam guide pin
8. Inner pin	17. Low speed select spring
9. Outer pin	18. Spring pin remover

Manual Transaxle Assembly Components

S4RS0A5206028



I4RS0A520013-

1. Transaxle right case	25. 5th gear shift fork
1217G 2. Transaxle left case : Apply sealant 99000-31260 to mating surface of left case and right case.	26. Needle bearing (Separated steel cage type.)
3. Gear shift and select shaft assembly	27. Input shaft 5th gear
4. Transaxle left case plate	28. Reverse gear shift lever
1217G 5. Transaxle side cover : Apply sealant 99000-31260 to mating surface of side cover and left case.	1322 29. Reverse gear shift lever bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
6. Back up lamp switch	30. Reverse gear shaft
7. O-ring	31. Washer
8. Differential assembly	32. Reverse idler gear
1217G 9. Oil level/filler plug : Apply sealant 99000-31260 to all around thread part of plug.	1322 33. Reverse shaft bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
1217G 10. Oil drain plug : Apply sealant 99000-31260 to all around thread part of plug.	34. Washer
11. VSS	35. Side bearing retainer
1322 12. Oil gutter bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	36. O-ring
1322 13. Left case plate bolts : Apply thread lock 99000-32110 to all around thread part of bolt.	A 37. Oil seal : Apply grease 99000-25010 to oil seal lip.
14. VSS bolt	38. Outer race
15. Side cover bolts	39. Breather hose
16. Transaxle case bolts	40. Side bearing retainer bolt
17. 5th speed synchronizer ring	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
18. 5th speed synchronizer lever	(b) : 21 N·m (2.1 kg-m, 15.5 lb-ft)
19. 5th speed synchronizer sleeve & hub	(c) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
20. Circlip	(d) : 5 N·m (0.5 kg-m, 4.0 lb-ft)
21. Bearing set shim	(e) : 100 N·m (10.0 kg-m, 72.5 lb-ft)
22. Countershaft 5th gear	: Do not reuse.
23. Countershaft nut : After tightening nut to specified torque, caulk nut securely.	: Apply transaxle oil.
1322 24. Shift fork bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	

Fifth Gear Disassembly and Assembly

S4RS0A5206018

Disassembly

1) Remove 9 bolts and take off transaxle side cover (1).

CAUTION:

Care should be taken not to distort side cover when it is removed from left case.

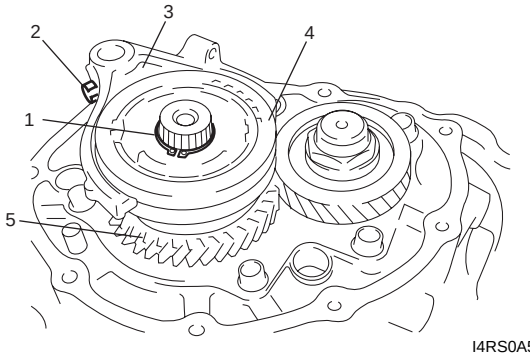
I4RS0A520027-

2) Using special tool, remove circlip (1).

Special tool
: 09900–06107

3) Remove 5th shift fork bolt (2).

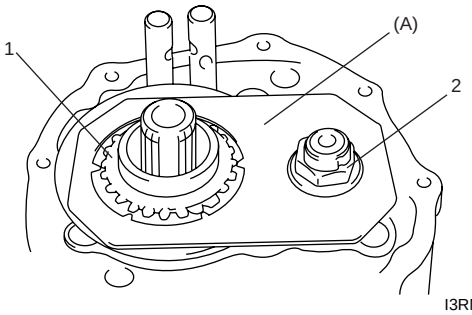
4) Remove gear shift fork (3), synchronizer sleeve & hub assembly (4), synchronizer levers, synchronizer ring and input shaft 5th gear (5) all together. Use gear puller for removal if spline fitting of hub is tight.



I4RS0A520028-

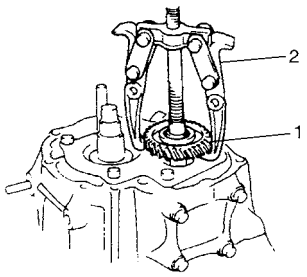
5) Unfasten caulking of countershaft nut (2), install input shaft 5th gear (1) and special tool to stop rotation of shafts, and then remove countershaft nut (2).

Special tool
(A): 09927–76060



I3RM0B521014-

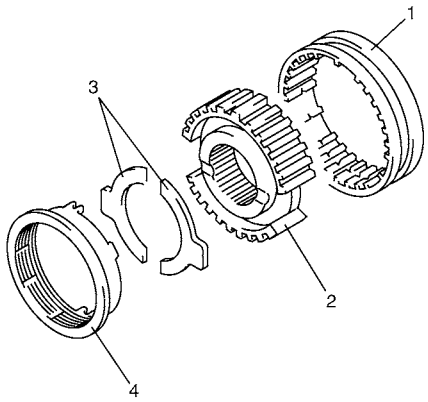
6) Remove input shaft 5th gear, needle bearing and then countershaft 5th gear (1). Gear puller (2) would be necessary if spline fitting of countershaft 5th gear is tight.



I4RS0A520041-

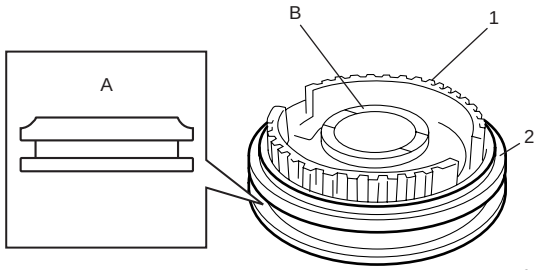
Assembly

1) Assemble 5th speed synchronizer sleeve (1), hub (2), 5th speed synchronizer levers (3) and synchronizer ring (4) as follows.



I4RH01520054-

a) Install hub (1) to 5th speed synchronizer sleeves (2) in specified direction as shown in the figure.



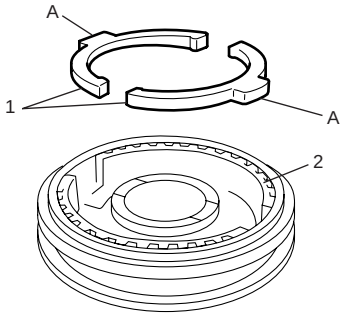
I4RH01520048-

A: Chamfered side	B: Long boss

b) Fit 5th speed synchronizer levers (1) to hub (2) as shown in the figure.

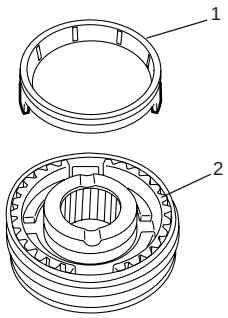
NOTE:

- **Align protrusion A of 5th speed synchronizer levers (1) with groove of hub (2).**



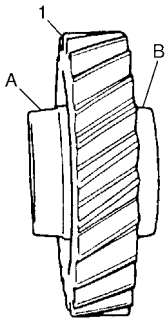
I4RH01520049-

c) Install synchronizer ring (1) to hub (2) as shown in the figure.



I4RH01520055-

2) Install 5th gear (1) to countershaft facing machined boss A inward.



I2RH01520088-

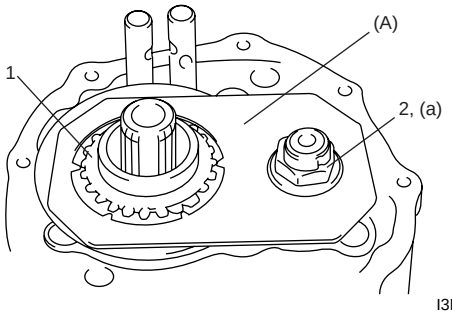
A: Machined boss (Inside)	
B: No machining (Outside)	

3) Install needle bearing of separated steel cage type to input shaft, apply oil then install input shaft 5th gear (1) and special tool to stop shaft rotation.

Special tool
(A): 09927–76060

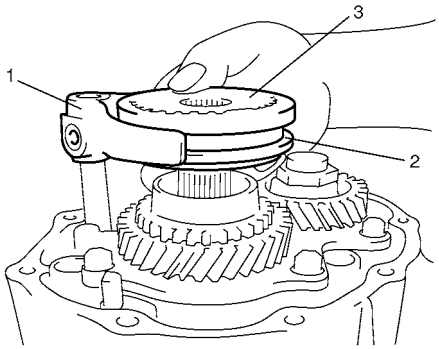
4) Tighten new countershaft nut (2) to specified torque, and caulk countershaft nut securely.

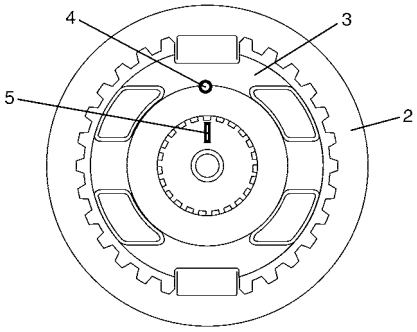
Tightening torque
Countershaft nut (a): 100 N·m (10.0 kg-m, 72.5 lb-ft)



I3RM0B521016-

5) Fit 5th gear shift fork (1) to synchronizer sleeve (2) and hub (3) assembly and install them into input shaft and gear shift shaft aligning punch mark (4) with matching mark (5) on input shaft.





I4RS0A520029-

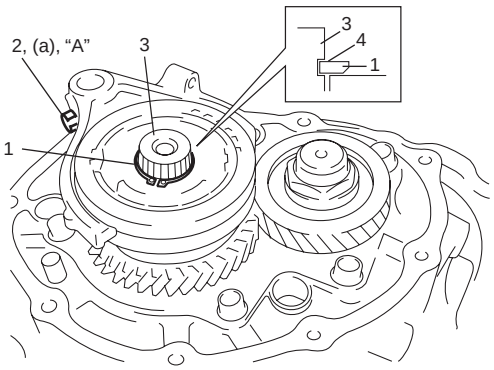
6) Tighten shift fork bolt (2) to which thread lock cement has been applied.

"A": Thread lock cement 99000–32110

Tightening torque
Shift fork bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

7) Using special tool, install new circlip (1) to input shaft (3) in specified direction as shown in the figure.

Special tool
: 09900–06107



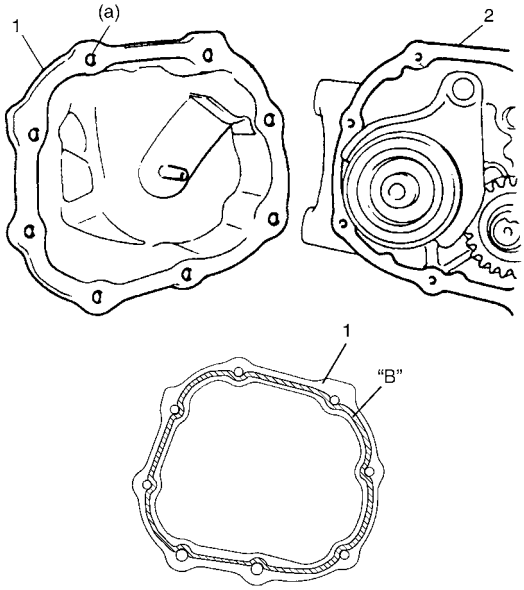
I4RS0A520030-

4. Polished surface

8) Clean mating surface of both left case (2) and side cover (1), apply sealant to side cover (1) as shown in figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, mate it with left case and then tighten bolts to specified torque.

"B": Sealant 99000–31260

Tightening torque
Side cover bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A520031-

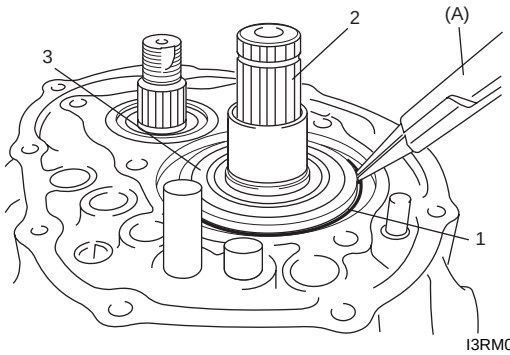
Manual Transaxle Assembly Disassembly and Reassembly

S4RS0A5206034

Disassembly

1) Remove gear shift and select shaft assembly referring to “Gear Shift and Select Shaft Assembly Removal and Installation: ”.
2) Remove fifth gear referring to “Fifth Gear Disassembly and Assembly: ”.
3) Remove left case plate.
4) Remove snap ring (1) using special tool.

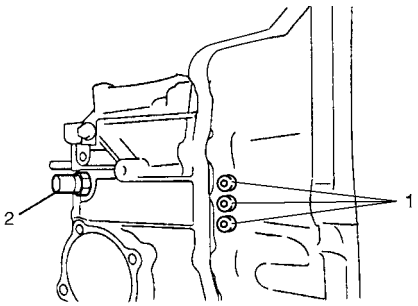
Special tool
(A): 09900–06107



I3RM0A520037-

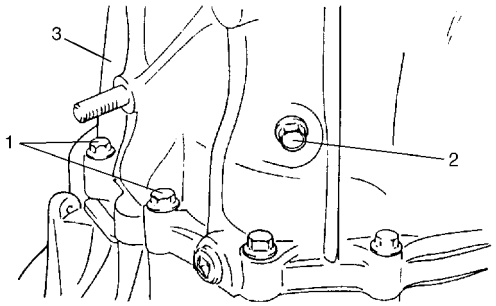
2.	Input shaft
3.	Input shaft left bearing

5) Remove gear shift locating bolts (1) with washers, then take out locating springs and steel balls.
6) Remove back up lamp switch (2).



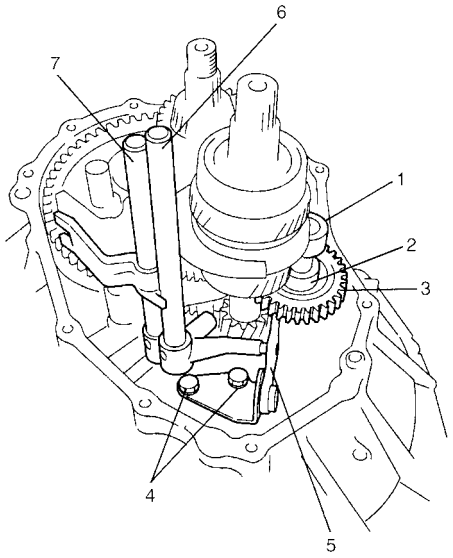
I2RH01520032-

7) Remove reverse shaft bolt (2) with washer.
8) Remove case bolts (1) from outside and another bolts from clutch housing side.
9) Tapping left case flanges with plastic hammer, remove left case (3).



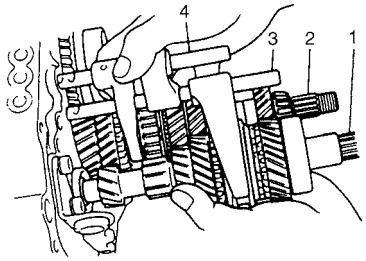
I4RS0A520032-

10) Pull out reverse gear shaft (1) with washer (2), then take off reverse idler gear (3).
11) Remove reverse gear shift lever bolts (4) and reverse gear shift lever (5).
12) Pull out 5th & reverse gear shift guide shaft (6) together with 5th & reverse gear shift shaft (7).



I4RS0A520033-

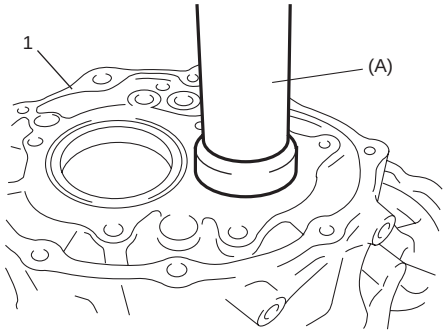
13) Tapping input shaft end with plastic hammer, push it out as assembly from case a little, then take out input shaft assembly (1), countershaft assembly (2), high speed gear shift shaft (3) and low speed gear shift shaft (4) all at once.



I2RH01520035-

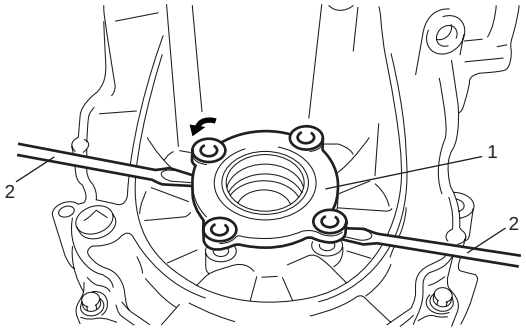
14) Remove countershaft left bearing outer race from left case (1) using special tool.

Special tool
(A): 09913–70123



I4RH01520021-

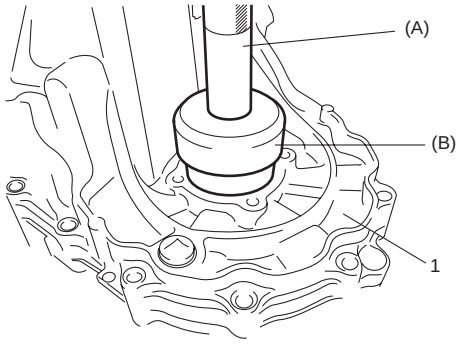
15) Remove side bearing retainer bolts.
16) Turn side bearing retainer (1) counterclockwise until it stops, and remove side bearing retainer using 2 flat end rods (2) or the like.
17) Remove O-ring from side bearing retainer.



I4RS0A520034-

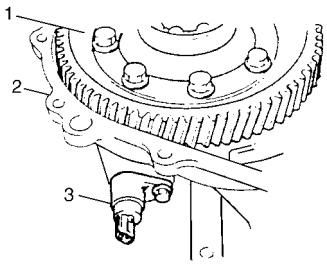
18) Remove differential bearing shim.
19) Remove differential side bearing outer race from left case (1) using special tools.

Special tool
(A): 09924–74510
(B): 09926–27610



I4RS0A520035-

20) Remove differential gear assembly (1) from right case (2).

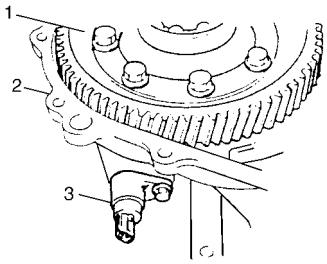


I2RH01520036-

3. VSS

Installation

1) Install differential assembly (1) into right case (2).



I2RH01520036-

3. VSS

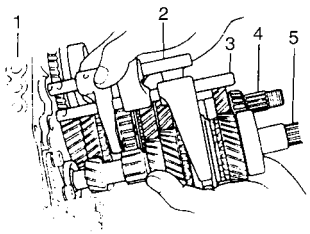
2) Join input shaft assembly (5), countershaft assembly (4), low speed gear shift shaft (2) and high speed gear shift shaft (3) assemblies all together, then install them into right case (1).

CAUTION:

Take care not to damage oil seal lip by input shaft, or oil leakage may take place.

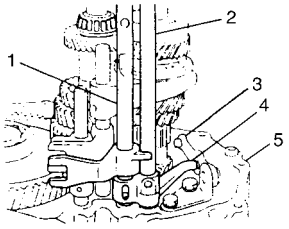
NOTE:

- **Input shaft right bearing on shaft can be installed into right case tapping shaft with plastic hammer.**
- **Check to make sure that countershaft is engaged with final gear while installing.**



I2RH01520080-

3) Install 5th & reverse gear shift shaft (1) with 5th & reverse gear shift guide shaft (2) into right case (5). Reverse gear shift arm (4) has to be joined with reverse gear shift lever (3) at the same time.



I2RH01520081-

4) Make reverse idler gear (1) with reverse gear shift lever (2), insert reverse gear shaft (3) into case (4) through idler gear and then align “A” in shaft with “B” in case.

5) Fasten reverse gear shift lever bolts after applying thread lock cement.

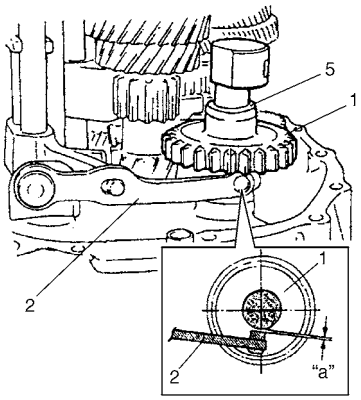
: Thread lock cement 99000–32110

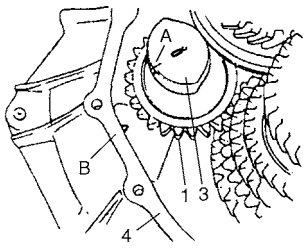
Tightening torque
Reverse gear shift lever bolt: 23 N·m (2.3 kg-m, 17.0 lb-ft)

NOTE:

- **Make sure that washer (5) has been installed in shaft at above the gear.**
- **Check to confirm that reverse gear shift lever end has clearance “a” to idler gear groove.**

  Distance between lever and idler gear shaft
  “a”: 0.5 – 1.0 mm (0.02 – 0.04 in.)





I4RS0A520036-

6) Clean mating surfaces of both right and left cases, apply sealant to right case (2) as shown in the figure by such amount that its section is 1.5 mm (0.059 in.) in diameter then mate it with left case (1).

“B”: Sealant 99000–31260

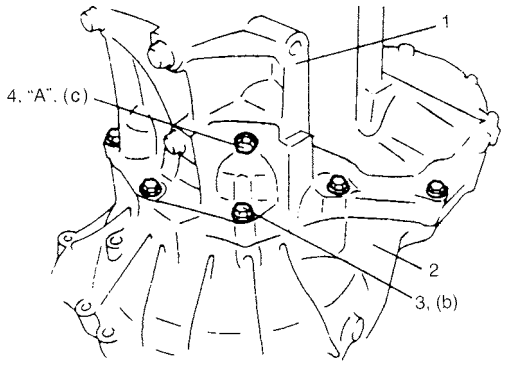
7) Install reverse shaft bolt (4) to which thread lock cement has been applied, with aluminum washer and tighten it to specified torque.

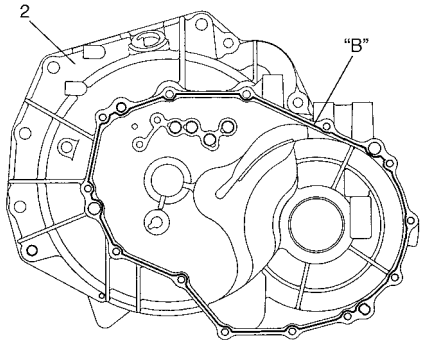
“A”: Thread lock cement 99000–32110

Tightening torque
Reverse shaft bolt (c): 23 N·m (2.3 kg-m, 17.0 lb-ft)

8) Tighten case bolts (3) from outside tighten another case bolts from clutch housing side to specified torque.

Tightening torque
Transaxle case bolt (b): 23 N·m (2.3 kg-m, 17.0 lb-ft)





I3RM0A520043-

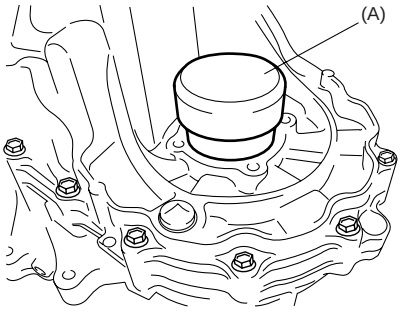
9) Install side bearing retainer as follows.

a) Install differential side bearing outer race to left case and then tap and accustom outer race using special tool and plastic hammer.

CAUTION:

Do not drive in a race with hammer.
Driving it may cause to damage bearing.

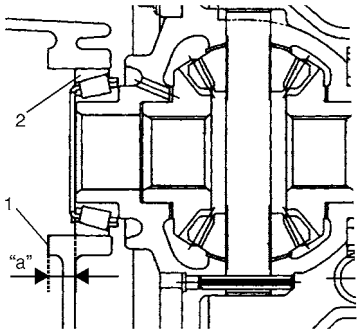
Special tool
(A): 09926–27610



I4RH01520053-

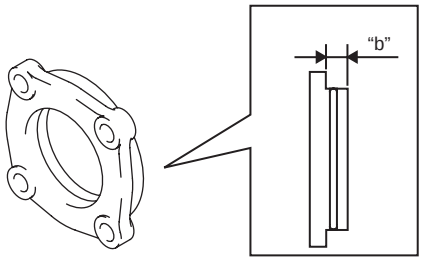
b) Select a shim of differential side bearing as follows.

i) Measure depth “a” from left case (1) face to side bearing outer race (2) using depth gauge.



I4RS0A520037-

ii) Measure height “b” of side bearing retainer with depth gauge.



I4RS0A520038-

iii) Calculate clearance a – b, and select differential shim according to the following table.

Bearing shim specification

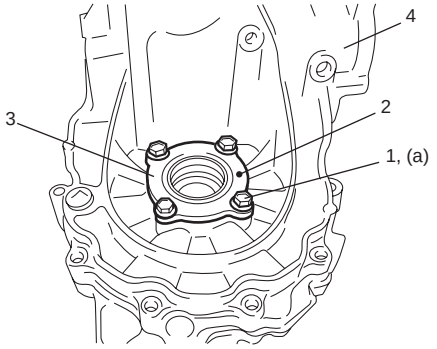
Clearance “a” – “b”	Thickness of bearing shim to be installed
0.636 – 0.665 mm (0.0250 – 0.0261 in.)	0.75 mm (0.030 in.)
0.666 – 0.695 mm (0.0262 – 0.0273 in.)	0.78 mm (0.031 in.)
0.696 – 0.725 mm (0.0274 – 0.0285 in.)	0.81 mm (0.032 in.)
0.726 – 0.755 mm (0.0286 – 0.0297 in.)	0.84 mm (0.033 in.)
0.756 – 0.785 mm (0.0298 – 0.0309 in.)	0.87 mm (0.034 in.)
0.786 – 0.815 mm (0.0310 – 0.0320 in.)	0.90 mm (0.035 in.)
0.816 – 0.845 mm (0.0321 – 0.0332 in.)	0.93 mm (0.037 in.)
0.846 – 0.875 mm (0.0333 – 0.0344 in.)	0.96 mm (0.038 in.)
0.876 – 0.905 mm (0.0345 – 0.0356 in.)	0.99 mm (0.039 in.)
0.906 – 0.935 mm (0.0357 – 0.0368 in.)	1.02 mm (0.040 in.)
0.936 – 0.965 mm (0.0369 – 0.0379 in.)	1.05 mm (0.041 in.)
0.966 – 0.995 mm (0.0380 – 0.0391 in.)	1.08 mm (0.043 in.)
0.996 – 1.025 mm (0.0392 – 0.0403 in.)	1.11 mm (0.044 in.)
1.026 – 1.055 mm (0.0404 – 0.0415 in.)	1.14 mm (0.045 in.)
1.056 – 1.085 mm (0.0416 – 0.0427 in.)	1.17 mm (0.046 in.)
1.086 – 1.115 mm (0.0428 – 0.0438 in.)	1.20 mm (0.047 in.)
1.116 – 1.145 mm (0.0439 – 0.0450 in.)	1.23 mm (0.048 in.)
1.146 – 1.175 mm (0.0451 – 0.0462 in.)	1.26 mm (0.050 in.)
1.176 – 1.205 mm (0.0463 – 0.0474 in.)	1.29 mm (0.051 in.)
1.206 – 1.235 mm (0.0475 – 0.0486 in.)	1.32 mm (0.052 in.)
1.236 – 1.265 mm (0.0487 – 0.0498 in.)	1.35 mm (0.053 in.)
1.266 – 1.295 mm (0.0499 – 0.0509 in.)	1.38 mm (0.054 in.)
1.296 – 1.325 mm (0.0510 – 0.0521 in.)	1.41 mm (0.056 in.)

c) Install differential side bearing shim to left case (4).
d) Apply oil to new O-ring of side bearing retainer (3), and install side bearing retainer with new O-ring to left case.
e) Tighten side bearing retainer bolts (1) to specified torque.

NOTE:

Install side bearing retainer with its punch mark (2) facing upward.

Tightening torque
Side bearing retainer bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A520039-

10) Check locating springs (2, 4 and 5) for deterioration and replace with new one as necessary.

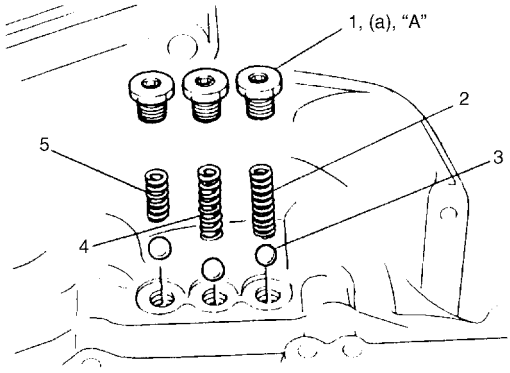
Locating spring

Locating spring free length	Standard	Service limit
Low speed (2)	53.1 mm (2.091 in.)	50.5 mm (1.988 in.)
High speed (4)	45.9 mm (1.807 in.)	44.0 mm (1.732 in.)
5th & reverse (5)	29.9 mm (1.777 in.)	28.5 mm (1.122 in.)

11) Install steel balls (3) and locating springs (2, 4 and 5) for respective gear shift shaft and tighten bolts (1) to which sealant has been applied.

"A": Sealant 99000–31260

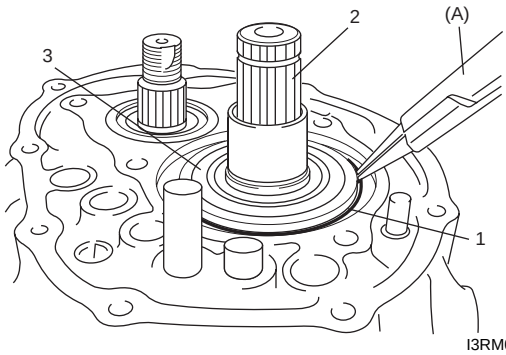
Tightening torque
Gear shift locating bolt (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I2RH01520084-

12) Install new snap ring (1) using special tool.

Special tool
(A): 09900–06107

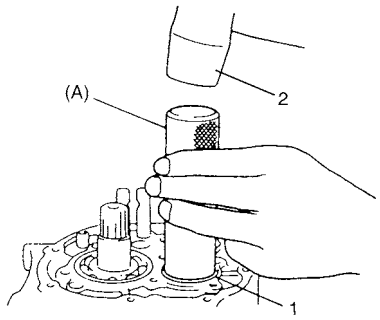


I3RM0A520037-

2. Input shaft
3. Input shaft left bearing

13) To seat countershaft left bearing outer race (1) to bearing cone, and tap countershaft left bearing outer race (1) using special tool and plastic hammer (2).

Special tool
(A): 09913–70123



I3RM0A520030-

14) With putting a shim (2) on bearing outer race (3), place straightedge (1) over it and compress it by hand through straightedge, and then measure clearance "a" between case surface (4) and straightedge using feeler gauge (5).

Clearance between case surface and straightedge (Shim protrusion)
"a": 0.13 – 0.17 mm (0.0051 – 0.0067 in.)

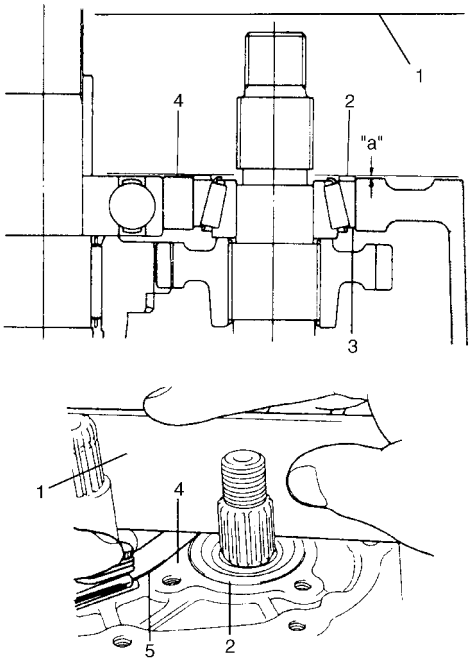
15) By repeating Step 14), select a suitable shim which adjusts clearance “a” to specification and put it on bearing outer race.

NOTE:

Insert 0.15 mm (0.0059 in.) feeler to know whether or not a shim fulfills specification quickly.

Available shim thickness

0.55 mm (0.021 in.)	**0.90 mm (0.035 in.)**
0.60 mm (0.023 in.)	**0.95 mm (0.037 in.)**
0.65 mm (0.025 in.)	**1.00 mm (0.039 in.)**
0.70 mm (0.027 in.)	**1.05 mm (0.041 in.)**
0.75 mm (0.029 in.)	**1.10 mm (0.043 in.)**
0.80 mm (0.031 in.)	**1.15 mm (0.059 in.)**
0.85 mm (0.033 in.)	



I3RM0A520031-

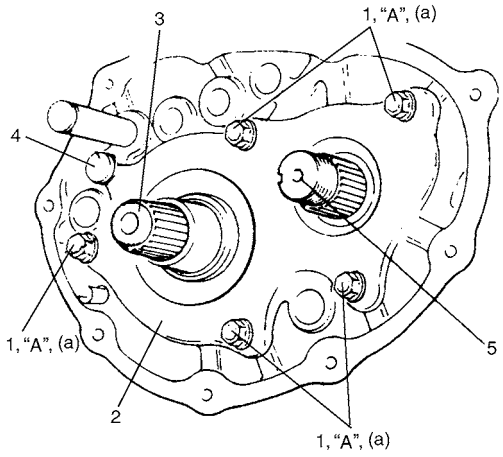
16) Place left case plate (2) inserting its end in groove of shift guide shaft (4) and tighten bolts (1) to which thread lock cement has been applied.

NOTE:

After tightening bolts, make sure that countershaft (5) can be rotated by hand feeling certain load.

“A”: Thread lock cement 99000–32110

Tightening torque
Left case plate bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A520042-

3. Input shaft

17) Install fifth gear referring to “Fifth Gear Disassembly and Assembly: ”.
18) Install gear shift and select shaft assembly referring to “Gear Shift and Select Shaft Assembly Removal and Installation: ”.
19) Install back up lamp switch referring to “Back Up Lamp Switch Removal and Installation: ”.
20) Check input shaft for rotation in each gear position.
21) Also confirm continuity of back up lamp switch in reverse position using ohmmeter.

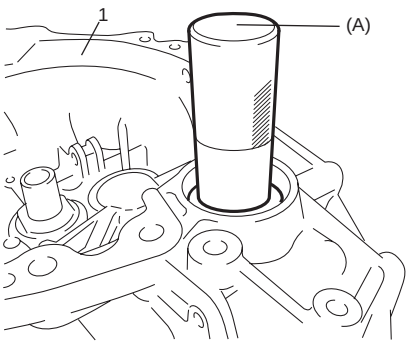
Transaxle Right Case Disassembly and Assembly

S4RS0A5206020

Disassembly

1) Remove gear shift shaft, input shaft assembly and countershaft assembly referring to “Manual Transaxle Assembly Disassembly and Reassembly: ”.
2) Remove differential side bearing outer race from right case (1) using special tool.

Special tool
(A): 09925–15410



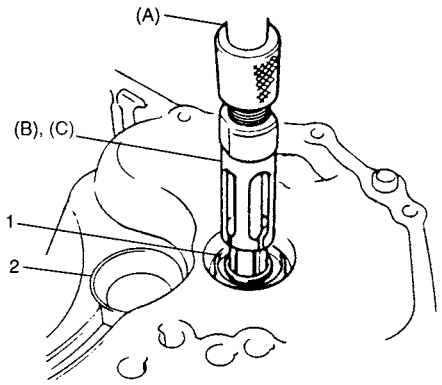
I3RM0B521021-

3) Remove input shaft oil seal (1) using special tools, if necessary.

Special tool
(A): 09930–30104
(B): 09923–74510

4) Pull out countershaft right bearing outer race (2) using special tools, if necessary.

Special tool
(A): 09930–30104
(C): 09941–64511



I4RS0A520040-

5) Replace differential side oil seal from right case referring to “Differential Side Oil Seal Replacement: ” if necessary.

Assembly

NOTE:

Before installation, wash each part and apply specified transaxle oil to sliding faces of bearing and gear.

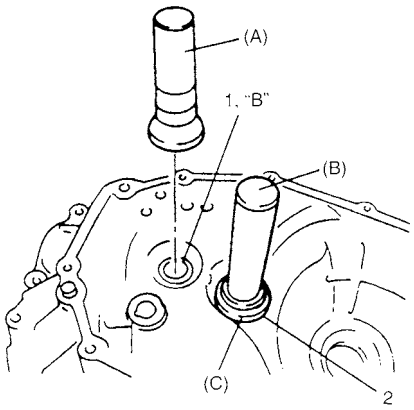
1) Install differential side oil seal into right case referring to “Differential Side Oil Seal Replacement: ” if removed.
2) If input shaft oil seal (1) has been removed, install it with its spring side facing upward. Use special tool and hammer for installation and apply grease to oil seal lip.

“B”: Grease 99000–25010

Special tool
(A): 09913–84510

3) If countershaft right bearing outer race (2) has been removed, install it using special tools and hammer.

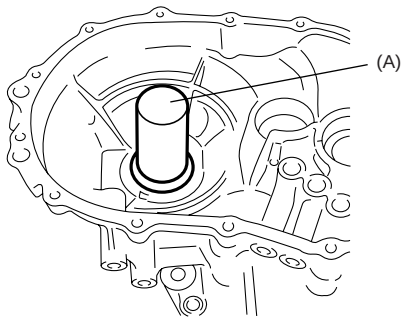
Special tool
(B): 09925–98210
(C): 09924–84510–004



I3RM0A520047-

4) Install differential side bearing outer race to right case using special tool and hammer.

Special tool
(A): 09913–85210



I4RH01520027-

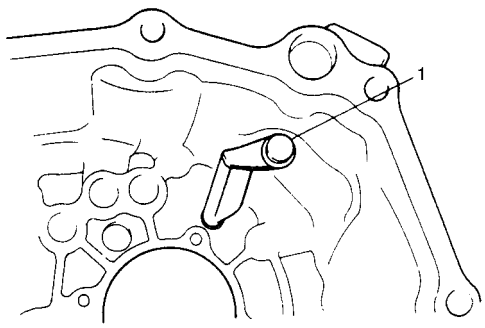
5) Install gear shift shaft, input shaft assembly and countershaft assembly referring to “Manual Transaxle Assembly Disassembly and Reassembly: ”.

Transaxle Left Case Disassembly and Assembly

S4RS0A5206035

Disassembly

1) Replace differential side oil seal from left case referring to “Differential Side Oil Seal Replacement: ”, if necessary.
2) Remove input oil gutter (1) from left case, if necessary.



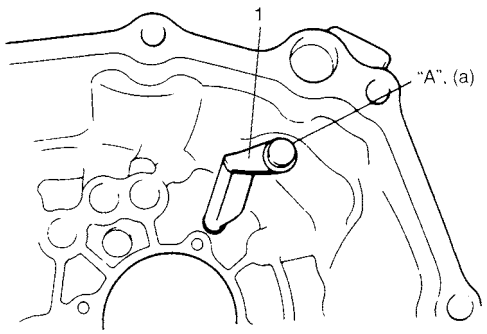
I4RH01520028-

Assembly

1) If input oil gutter (1) has been removed, install it with bolt to which thread lock cement has been applied.

"A": Thread lock cement 99000–32110

Tightening torque
Oil gutter bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

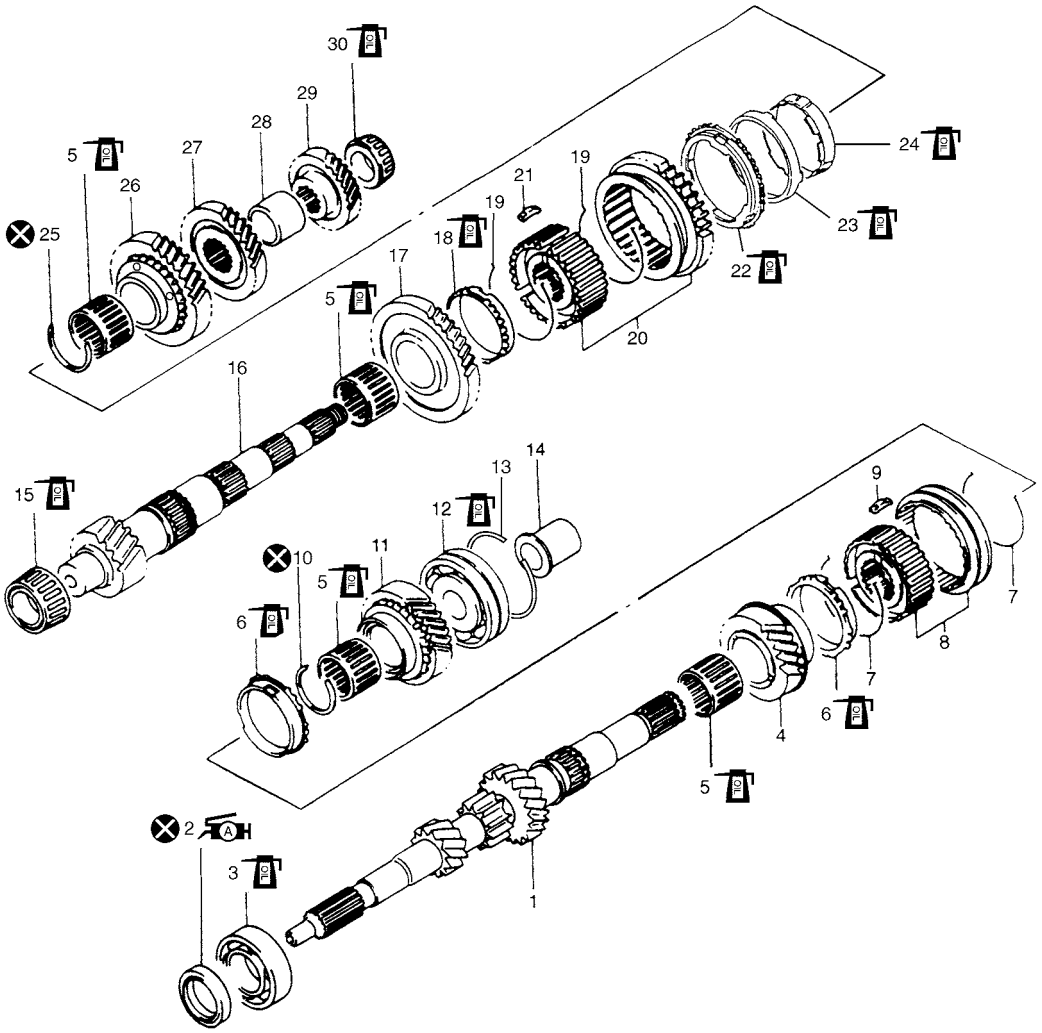


I3RM0A520048-

2) If differential side oil seal is removed, install it to left case referring to "Differential Side Oil Seal Replacement: ".

Input Shaft and Countershaft Components

S4RS0A5206030



I3RM0B521010-

1. Input shaft	12. Input shaft left bearing	23. 2nd gear synchronizer center cone
2. Oil seal : Apply grease 99000-25010 to oil seal lip.	13. Circlip	24. 2nd gear synchronizer inner ring
3. Input shaft right bearing	14. 5th gear spacer	25. Circlip
4. Input shaft 3rd gear	15. Countershaft right bearing	26. Countershaft 2nd gear
5. Needle bearing (resin cage type)	16. Countershaft	27. Countershaft 3rd gear
6. High speed synchronizer ring	17. Countershaft 1st gear	28. 3rd & 4th gear spacer
7. High speed synchronizer spring	18. 1st gear synchronizer ring	29. Countershaft 4th gear

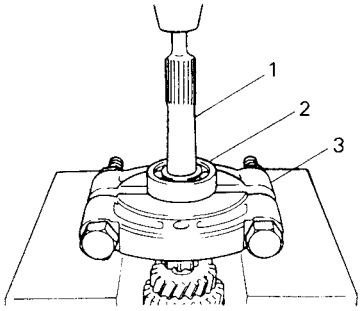
8. High speed synchronizer sleeve & hub	19. Low speed synchronizer spring	30. Countershaft left bearing
9. High speed synchronizer key	20. Low speed synchronizer sleeve & hub	: Do not reuse.
10. Circlip	21. Low speed synchronizer key	: Apply transaxle oil.
11. Input shaft 4th gear	22. 2nd gear synchronizer outer ring	

Input Shaft Assembly Disassembly and Reassembly

S4RS0A5206021

Disassembly

1) Remove input shaft right bearing (2) from input shaft (1) using bearing puller (3) and hydraulic press.

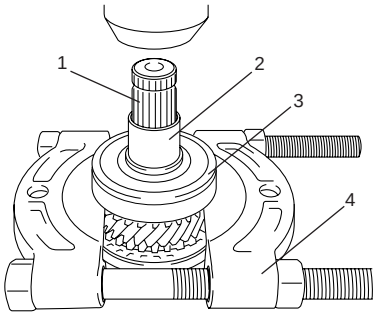


IYSY01521048-

2) Drive out 5th gear spacer (2) and left bearing (3) from input shaft (1) using bearing puller (4) and hydraulic press.

CAUTION:

To avoid gear tooth from being damaged, support it at flat side of bearing puller.

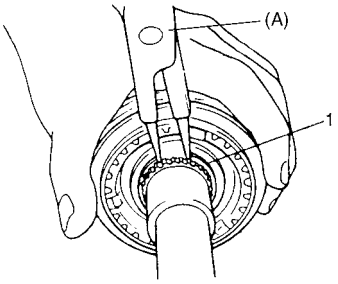


I4RH01520030-

3) Take out 4th gear, 4th gear needle bearing of resin cage type and high speed synchronizer ring.

4) Using special tool, remove circlip (1).

Special tool
(A): 09900–06107

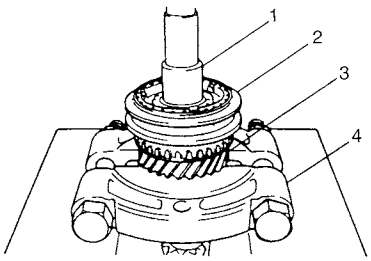


I2RH01520046-

5) Drive out high speed synchronizer sleeve & hub assembly (2) together with 3rd gear (3) from input shaft (1) using bearing puller (4) and hydraulic press.

CAUTION:

Make sure to use flat side of bearing puller to avoid causing damage to 3rd gear tooth.



I2RH01520097-

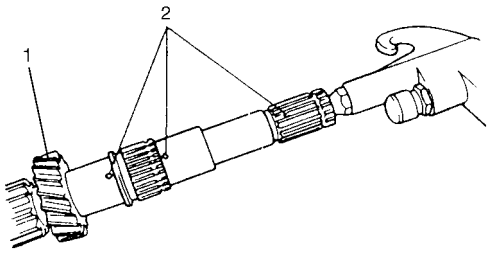
6) Take out 3rd gear needle bearing of resin cage type from shaft.

7) Disassemble high speed synchronizer sleeve & hub assembly.

Assembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.

2) To ensure lubrication of input shaft (1), air blow oil holes (2) and make sure that they are free from any obstruction.



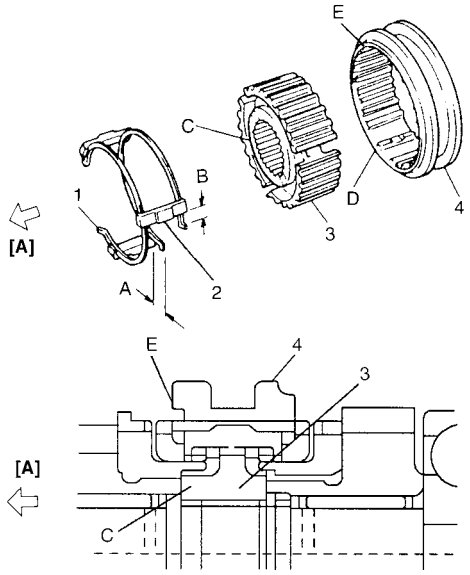
I2RH01520049-

3) Fit high speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs (1) as shown in the figure.

NOTE:

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Size of high speed synchronizer sleeve, hub, keys and springs is between those of low speed and 5th speed ones.**

Synchronizer key installation position
A = B

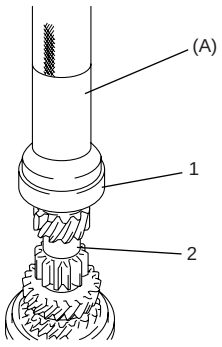


I3RM0B521022-

[A]: 3rd gear side	D: Key way
C: Long flange	E: Projecting end

4) Drive in right bearing (1) to input shaft (2) using special tool and hammer.

Special tool
(A): 09951–16080



I4RH01520031-

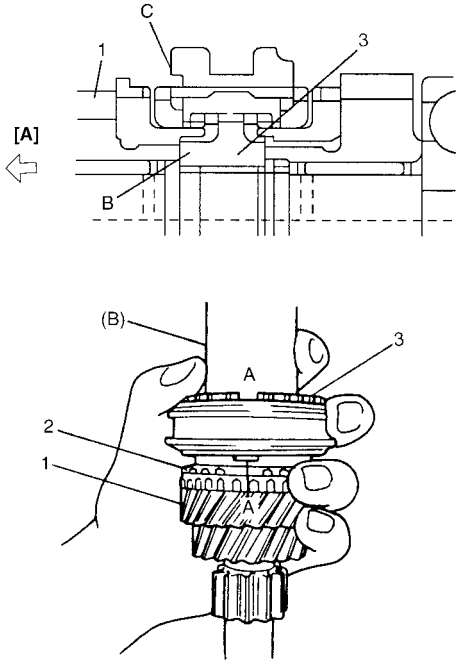
5) Install 3rd gear needle bearing of resin cage type, apply oil to it, then install 3rd gear (1) and synchronizer ring (2).

6) Drive in high speed synchronizer sleeve & hub assembly (3) using special tool and hammer, facing long flange side of hub to 3rd gear.

NOTE:

- **While press-fitting sleeve & hub, make sure that synchronizer ring key slots are aligned with keys in sleeve & hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.**
- **Synchronizer rings for 3rd and 4th are identical.**

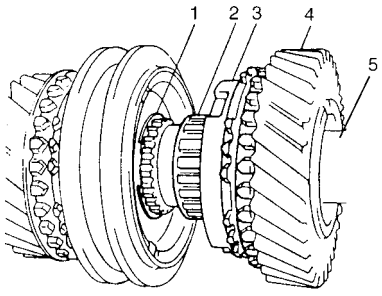
Special tool
(B): 09913–84510



I3RM0B521023-

[A]: 3rd gear side	B: Long flange
A: Key way	C: Projecting end

7) Install circlip (1) and confirm that circlip is installed in groove securely. Install needle bearing (2) of resin cage type, apply oil to it and then install synchronizer ring (3) and 4th gear (4).



I2RH01520052-

5. Input shaft

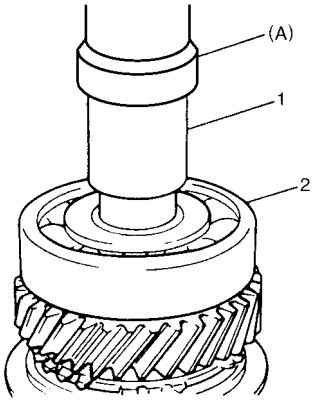
8) Press-fit left bearing (2) using special tool and hammer.

Special tool
(A): 09913–70123

9) Using the same special tool at Step 8), drive in 5th gear spacer (1).

CAUTION:

To prevent 5th gear spacer from being distorted because of excessive compression, do not press-fit it with left bearing at once.



I4RH01520032-

Countershaft Assembly Disassembly and Reassembly

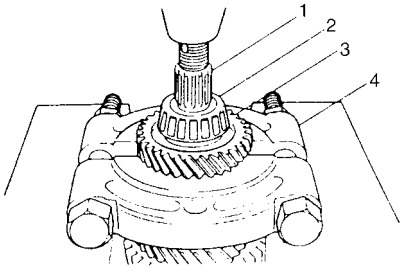
S4RS0A5206022

Disassembly

1) Drive out left bearing cone (2) with 4th gear (3) from countershaft (1) using bearing puller (4) and hydraulic press.

CAUTION:

- **Use bearing puller and hydraulic press that will bear at least 5 ton (11,000 lb) safely.**
- **To avoid tooth damage, support 4th gear at flat side of bearing puller.**

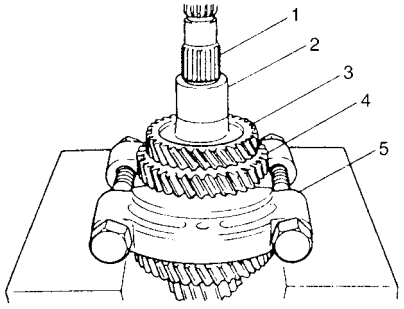


I2RH01520054-

2) Apply bearing puller (5) to 2nd gear (4) and drive out 3rd & 4th gear spacer (2) and 3rd gear (3) together with 2nd gear from countershaft (1) using hydraulic press. Take out needle bearing of resin cage type from countershaft.

CAUTION:

- **If compression exceeds 5 ton (11,000 lb), release compression once, reset bearing puller support and then continue press work again.**
- **To avoid gear tooth from being damaged, support it at flat side of bearing puller.**

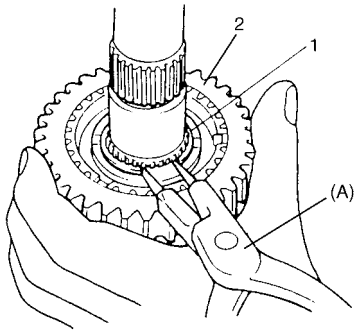


I2RH01520055-

3) Take out 2nd gear synchronizer outer ring, center cone and inner ring.

4) Using special tool, remove circlip (1).

Special tool
(A): 09900–06107



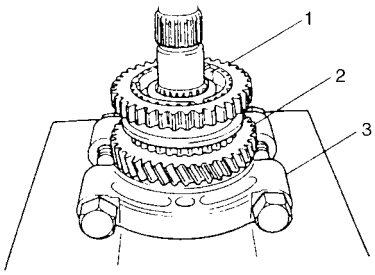
I2RH01520056-

2. Low speed synchronizer sleeve

5) Apply bearing puller (3) to 1st gear (2) and drive out low speed synchronizer sleeve & hub assembly (1) with 1st gear using hydraulic press.

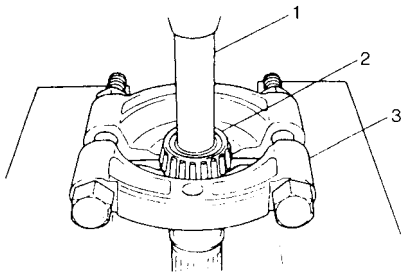
CAUTION:

To avoid gear tooth from being damaged, support it at flat side of bearing puller.



I2RH01520057-

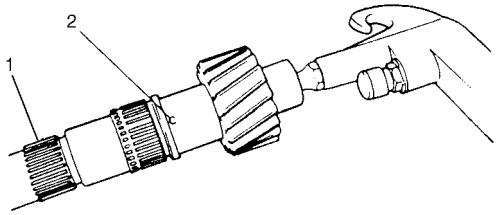
6) Disassemble low speed synchronizer sleeve & hub assembly.
7) Take out 1st gear needle bearing of resin cage type from shaft.
8) Remove right bearing cone (2) using bearing puller (3), metal stick (1) and hydraulic press.



I2RH01520058-

Assembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2) To ensure lubrication of countershaft (1), air blow oil holes (2) and make sure that they are free from any obstruction.



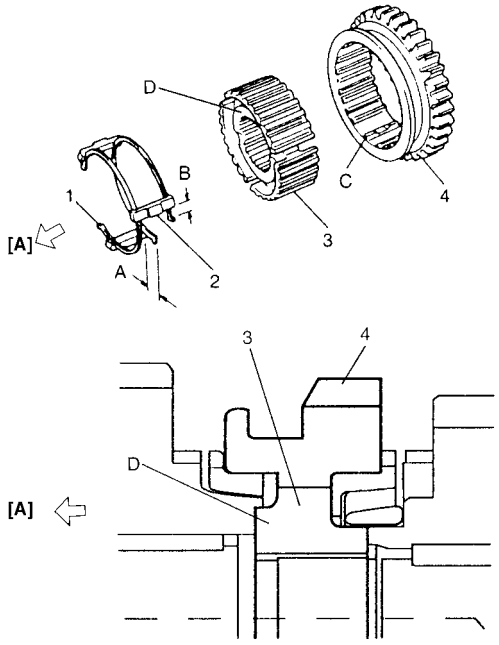
I2RH01520060-

3) Fit low speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs (1) as shown in the figure.

NOTE:

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Size of low speed synchronizer keys and springs are the largest compared with those of high speed and 5th speed ones.**

Synchronizer key installation position
A = B

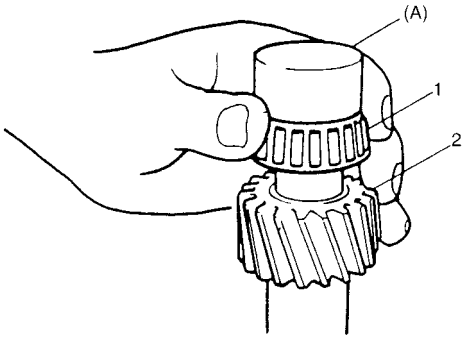


I3RM0A520051-

[A]: 1st gear side	D: Short flange
C: Key way	

4) Install right bearing cone (1) to countershaft (2) using special tool and hammer.

Special tool
(A): 09923–78210



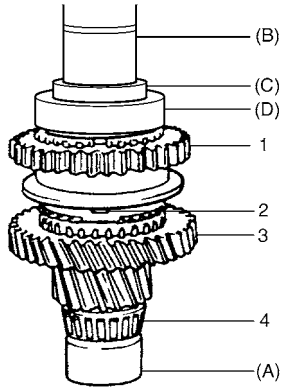
I2RH01520062-

5) Install needle bearing of resin cage type, apply oil to it, then install 1st gear and 1st gear synchronizer ring.
6) Drive in low speed synchronizer sleeve & hub assembly (1) using special tools and hammer.

NOTE:

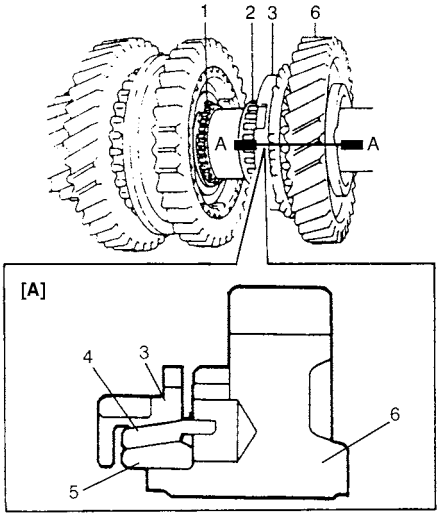
- **Support shaft with special tool as shown in the figure so that retainer of bearing cone (4) will be free from compression.**
- **Make sure that synchronizer ring (2) key slots are aligned with keys while press-fitting sleeve & hub assembly.**
- **Check free rotation of 1st gear (3) after press-fitting sleeve & hub assembly.**

Special tool
(A): 09923–78210
(B): 09940–51710
(C): 09924–07730
(D): 09924–07710



I4RH01520057-

7) Install circlip (1) and confirm that circlip is installed in groove securely.
Install needle bearing (2) of separated steel cage type, apply oil to bearing.
With synchronizer outer ring (3), center cone (4) and inner ring (5) put together and installed to 2nd gear (6) as shown in the figure.



I2RH01520064-

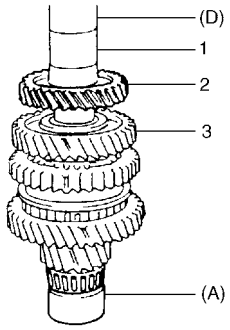
[A]: Section A – A

8) Press-fit 3rd gear (2) and spacer (1) using special tools and hydraulic press.

CAUTION:

Press-fit spacer (1) and 3rd gear (2) first, and then 4th gear later separately so that countershaft will not be compressed excessively.

Special tool
(A): 09923–78210
(D): 09913–84510



I2RH01520065-

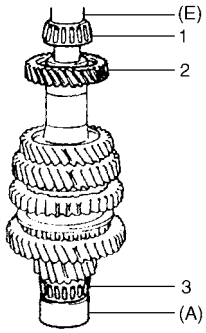
3. 2nd gear

9) Press-fit 4th gear (2) using the same procedure as Step 8).
10) Install left bearing cone (1) using special tools and hammer.

NOTE:

For protection of right bearing cone (3), always support shaft with special tool as shown in the figure.

Special tool
(A): 09923–78210
(E): 09913–80113



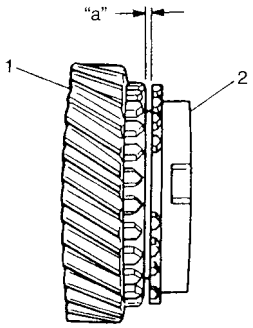
I2RH01520066-

Synchronizer Parts Inspection

S4RS0A5206036

Check clearance “a” between synchronizer ring (2) and gear (1), each chamfered tooth of gear, synchronizer ring and sleeve, then determine parts replacement.

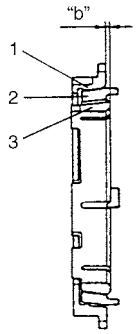
Clearance “a” between synchronizer ring and gear
Standard: 1.0 – 1.4 mm (0.039 – 0.055 in.)
Service limit: 0.5 mm (0.019 in.)



I2RH01520048-

Put the 2nd gear synchronizer outer ring (1), inner ring (3) and the cone (2) together and then measure the step difference between the outer ring and the inner ring. And also check each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

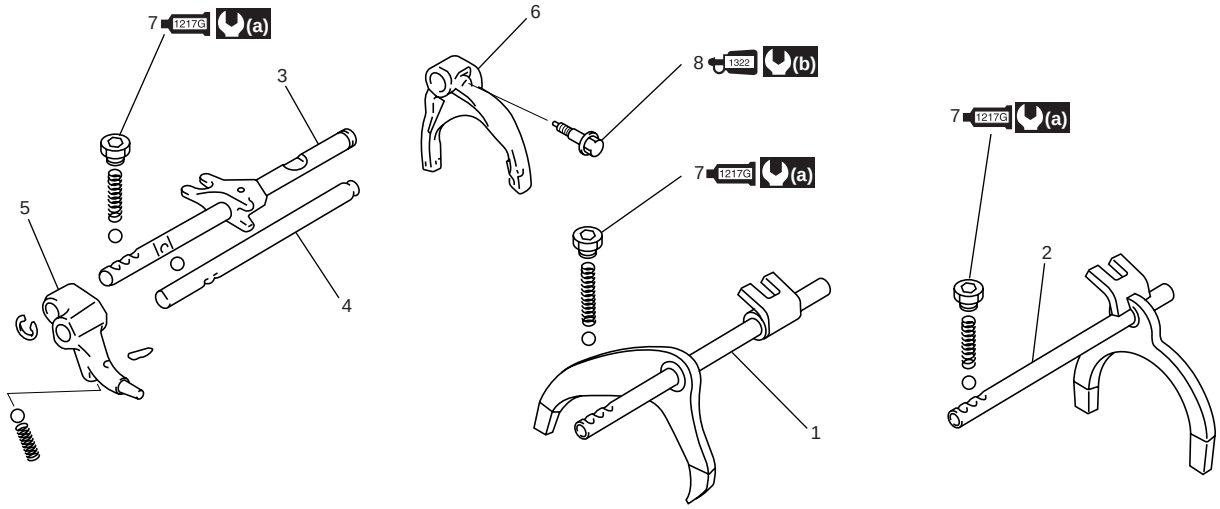
Difference “b” between synchronizer outer ring and inner ring
Standard: 1.0 – 1.4 mm (0.039 – 0.055 in.)
Service limit: 0.5 mm (0.019 in.)



I2RH01520059-

Gear Shift Shaft Components

S4RS0A5206031



I4RS0A520015-

1. Low speed gear shift shaft	5. Reverse gear shift arm	(a) : 13 N·m (1.3 kg-m, 9.5 lb-ft)
2. High speed gear shift shaft	6. 5th gear shift fork	(b) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
3. 5th & reverse gear shift shaft	1217G 7. Gear shift locating bolt : Apply sealant 99000-31260 to bolt thread.	
4. 5th & reverse gear shift guide shaft	1322 8. Shift fork bolt : Apply thread lock 99000-32110 to bolt thread.	

5th and Reverse Gear Shift Shafts Disassembly and Assembly

S4RS0A5206024

Disassembly

Disassemble component parts using special tool and hammer.

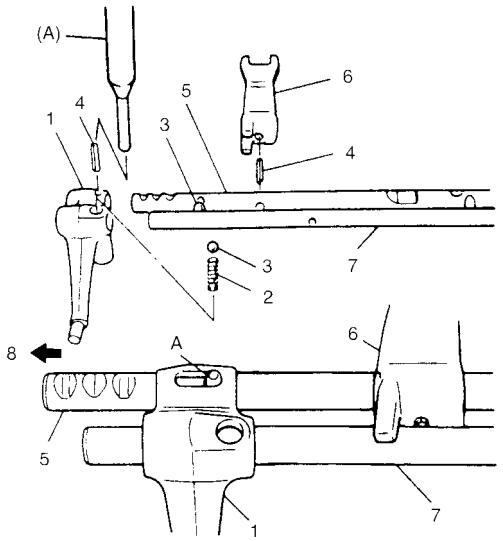
Special tool
(A): 09922–85811

Assembly

Replace or correct parts as required and assemble shafts making sure that component parts are in proper order as shown.

NOTE:

- **Distinguish reverse gear shift arm spring (Blue) (2) from low speed locating spring (Yellow).**
- **Install 2 steel balls (3) in reverse gear shift arm (1) without fail.**
- **Drive in spring pin for reverse gear shift arm facing slit A toward 5th gear side.**



I3RM0A520053-

A:	Face pin slit toward 5th gear side
4.	Spring pin
5.	5th & reverse gear shift shaft
6.	5th & reverse gear shift yoke
7.	5th & reverse gear shift guide shaft
8.	5th gear side

Gear Shift Shaft and Fork Inspection

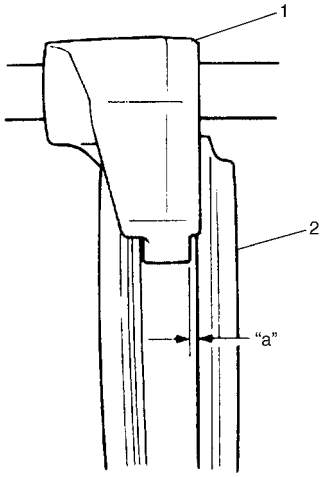
S4RS0A5206037

Using feeler gauge, check clearance between fork (1) and sleeve (2) and replace those parts if it exceeds limit.

NOTE:

For correct judgement of parts replacement, carefully inspect contact portion of fork and sleeve.

Clearance “a” between fork and sleeve
Service limit “a”: 1.0 mm (0.039 in.)

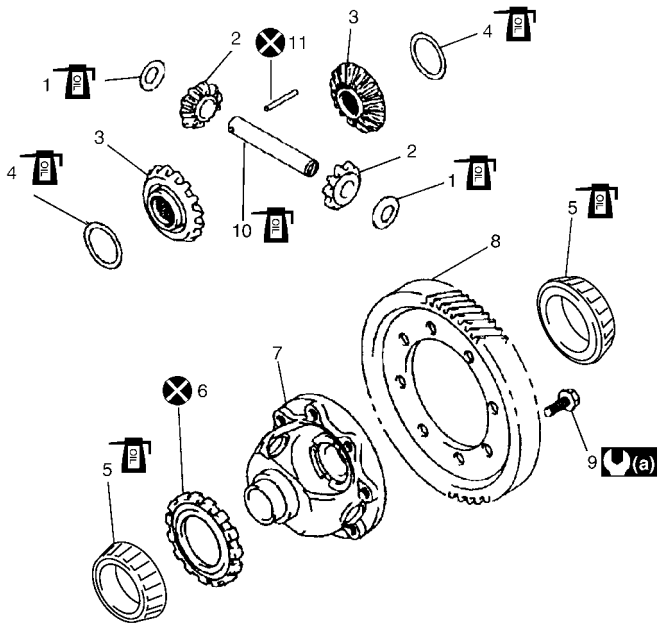


I2RH01520068-

Insert each gear shift shaft into case and check that it moves smoothly. If it doesn’t, correct using oilstone, reamer or the like.

Differential Components

S4RS0A5206032



I4RS0A520016-

1. Differential pinion washer	8. Final gear
2. Differential side pinion gear	9. Final gear bolt
3. Differential side gear	10. Differential pinion shaft
4. Side gear washer	11. Differential pinion shaft pin
5. Differential side bearing	(a) : 90 N·m (9.0 kg-m, 65.0 lb-ft)
6. Speed sensor ring	: Do not reuse.
7. Differential case	: Apply transaxle oil.

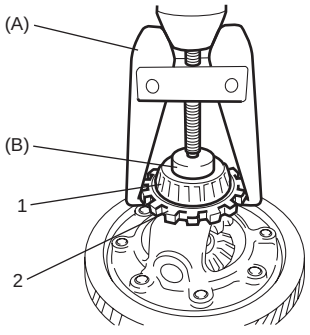
Differential Disassembly and Assembly

S4RS0A5206025

Disassembly

1) Using special tools, remove right bearing (1) and sensor rotor (2).

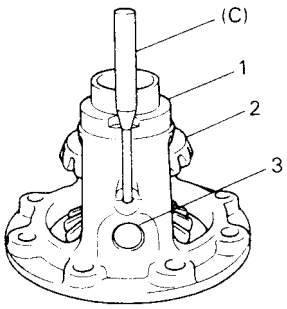
Special tool
(A): 09913–60910
(B): 09925–88210



I4RH01520039-

2) Remove left bearing in the same manner at Step 1).
3) Support differential case with soft jawed vise and remove final gear bolts then take out final gear.
4) Using special tool and hammer, drive out differential pinion shaft pin and then disassemble component parts.

Special tool
(C): 09922–85811



IYSY01521077-

1. Differential case	
2. Differential gear	
3. Differential pinion shaft	

Assembly

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly. Make sure that all parts are clean.

1) Assemble differential gear and measure thrust play of differential gear as follows.

Special tool
(A): 09900–20607
(B): 09900–20701

Differential gear thrust play
0.03 – 0.31 mm (0.001 – 0.012 in.)

Left side

1. Hold differential assembly with soft jawed vise and apply measuring tip of dial gauge to top surface of gear (2).
2. Using 2 screwdrivers (1), move gear up and down and read movement of dial gauge pointer.

Right side

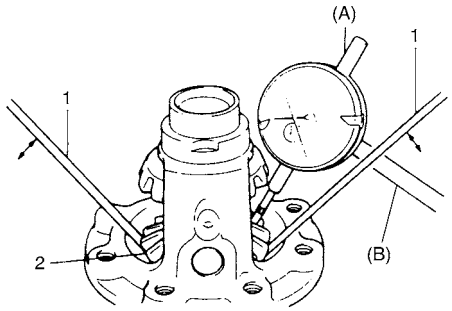
1. Using similar procedure to the left side, set dial gauge tip to gear (2) shoulder.
2. Move gear up and down by hand and read dial gauge.

2) If thrust play is out of specification, select suitable thrust washer from among the following available size, install it and check again that specified gear play is obtained.

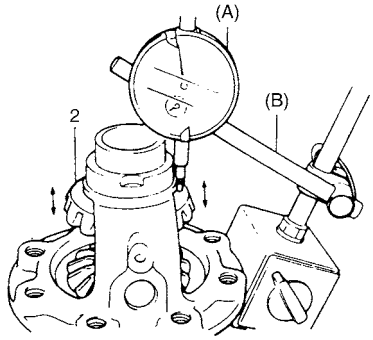
Available thrust washer thickness

0.90 mm (0.035 in.)	**1.05 mm (0.041 in.)**
0.95 mm (0.037 in.)	**1.10 mm (0.043 in.)**
1.00 mm (0.039 in.)	**1.15 mm (0.045 in.)**

[A]



[B]



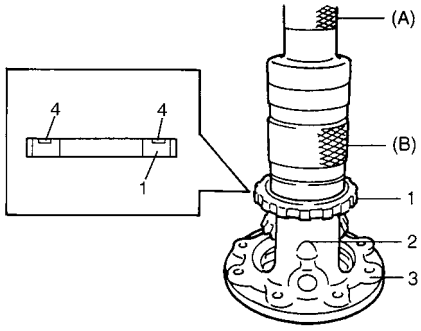
I3RH0A520083-

[A]: Left side	[B]: Right side

3) Drive in new differential pinion shaft pin (2) till the depth from differential case (3) surface is about 1 mm (0.04 in.).

4) Press-fit new sensor rotor (1) with groove (4) upward as shown using special tools and copper hammer.

Special tool
(A): 09913–76010
(B): 09940–54910



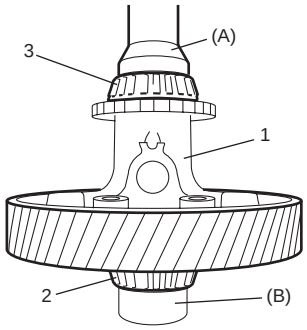
I3RM0B521024-

5) Press-fit left bearing (2) using special tools and copper hammer.

Special tool
(A): 09913–76010

6) Support differential assembly (1) as illustrated so as to left bearing is floating, and then press-fit right bearing (3) using special tools.

Special tool
(A): 09913–76010
(B): 09951–16060



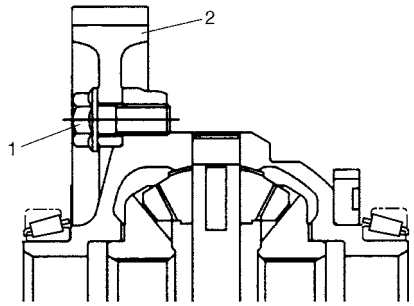
I3RM0B521025-

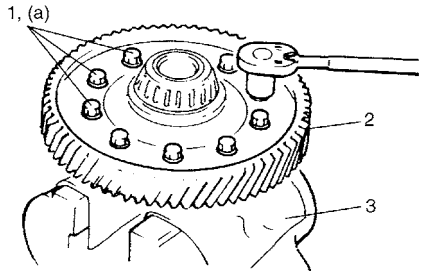
7) Hold differential assembly with soft jawed vise (3), install final gear (2) as shown in the figure and then tighten bolts (1) to specified torque.

CAUTION:

Use of any other bolts than specified ones is prohibited.

Tightening torque
Final gear bolt (a): 90 N·m (9.0 kg-m, 65.0 lb-ft)





I4RS0A520043-

Specifications

Tightening Torque Specifications

S4RS0A5207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Transaxle oil drain plug	21	2.1	15.5	☞
Transaxle oil level / filler plug	21	2.1	15.5	☞
VSS bolt	5	0.5	4.0	☞
Cable bracket bolt	55	5.5	40.0	☞
Back up lamp switch	23	2.3	17.0	☞
Gear shift guide case bolt	23	2.3	17.0	☞
Select lever bracket bolt	23	2.3	17.0	☞
Gear shift interlock bolt	50	5.0	36.5	☞
5th to reverse interlock guide bolt	23	2.3	17.0	☞
Countershaft nut	100	10.0	72.5	☞
Shift fork bolt	10	1.0	7.5	☞
Side cover bolt	10	1.0	7.5	☞
Reverse gear shift lever bolt	23	2.3	17.0	☞
Reverse shaft bolt	23	2.3	17.0	☞
Transaxle case bolt	23	2.3	17.0	☞
Side bearing retainer bolt	23	2.3	17.0	☞
Gear shift locating bolt	13	1.3	9.5	☞
Left case plate bolt	23	2.3	17.0	☞
Oil gutter bolt	10	1.0	7.5	☞
Final gear bolt	90	9.0	65.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Gear Shift Control Lever and Cable Components: ”
“Manual Transaxle Unit Components: ”
“Gear Shift and Select Shaft Assembly Components: ”
“Manual Transaxle Assembly Components: ”
“Gear Shift Shaft Components: ”
“Differential Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A5208001

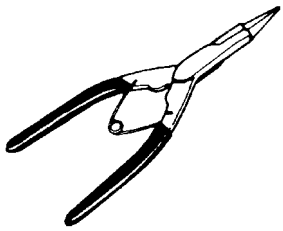
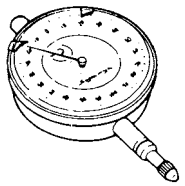
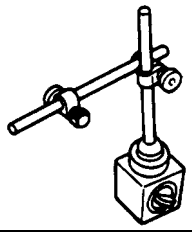
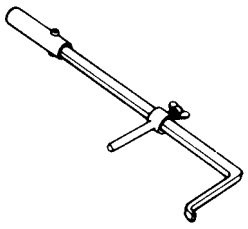
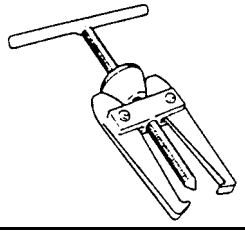
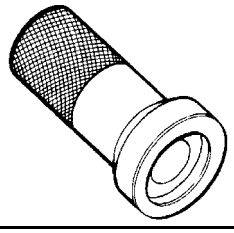
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞ / ☞ / ☞ / ☞ / ☞

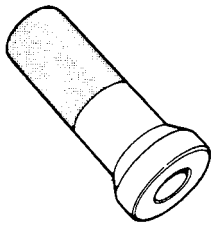
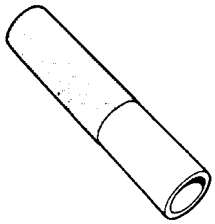
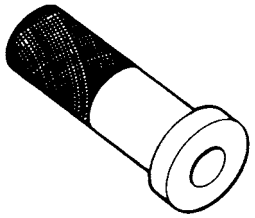
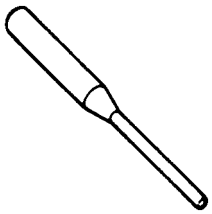
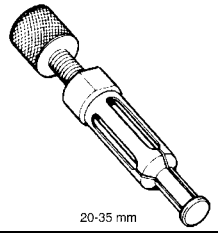
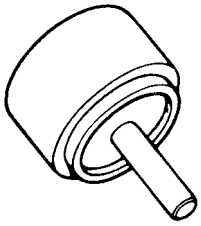
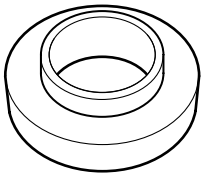
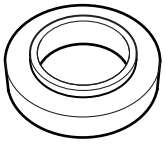
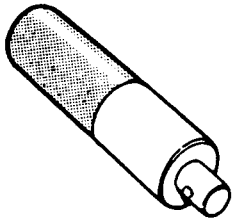
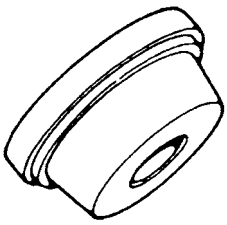
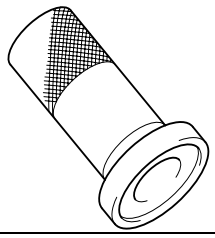
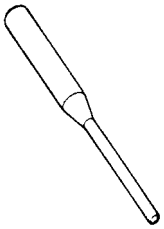
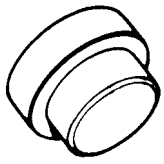
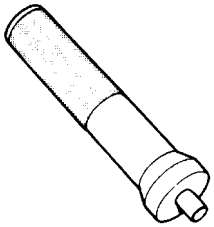
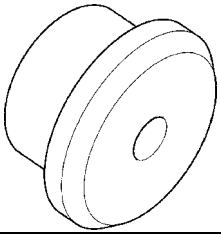
NOTE:

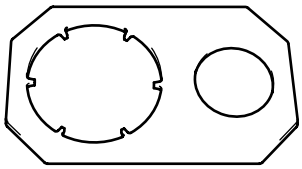
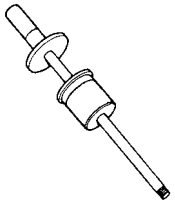
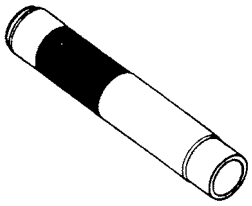
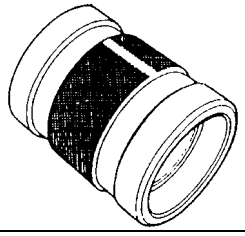
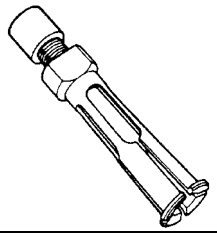
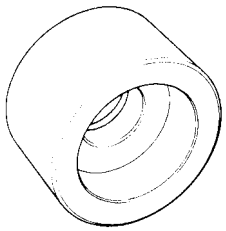
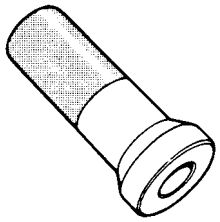
Required service material is also described in the following.
“Gear Shift Control Lever and Cable Components: ”
“Gear Shift and Select Shaft Assembly Components: ”
“Manual Transaxle Assembly Components: ”
“Input Shaft and Countershaft Components: ”
“Gear Shift Shaft Components: ”
“Differential Components: ”

Special Tool

S4RS0A5208002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ / ☞ / ☞ / ☞ / ☞		09900–20607 Dial gauge ☞	
09900–20701 Magnetic stand ☞		09913–50121 Oil seal remover ☞	
09913–60910 Bearing and gear puller (40-60mm) ☞		09913–70123 Bearing installing tool ☞ / ☞ / ☞	

09913–76010 Bearing installer ☞ / ☞ / ☞ 	09913–80113 Bearing installer ☞
09913–84510 Bearing installer ☞ / ☞ / ☞ 	09913–85210 Bearing installer ☞ / ☞ 
09922–85811 Spring pin remover (4.5 mm) ☞ / ☞ / ☞ 	09923–74510 Bearing puller (20-35 mm) ☞ 
09923–78210 Bearing installer ☞ / ☞ / ☞ / ☞ 	09924–07710 Synchronizer hub installer ☞ 
09924–07730 Bearing installer ☞ 	09924–74510 Bearing and oil seal handle ☞ 
09924–84510–004 Bearing installer attachment ☞ 	09925–15410 Oil seal installer ☞ 
09925–78210 Spring pin remover (6 mm) ☞ 	09925–88210 Bearing puller attachment ☞ 
09925–98210 Input shaft bearing installer ☞ 	09926–27610 Oil seal installer ☞ / ☞ 

09927–76060 Gear holder ☞ / ☞ 	09930–30104 Sliding shaft ☞ / ☞ 
09940–51710 Bearing installer ☞ 	09940–54910 Front fork oil seal install driver ☞ 
09941–64511 Bearing and oil seal remover (30 mm Min.) ☞ 	09951–16060 Control arm bush remover ☞ 
09951–16080 Bearing installer ☞ 	

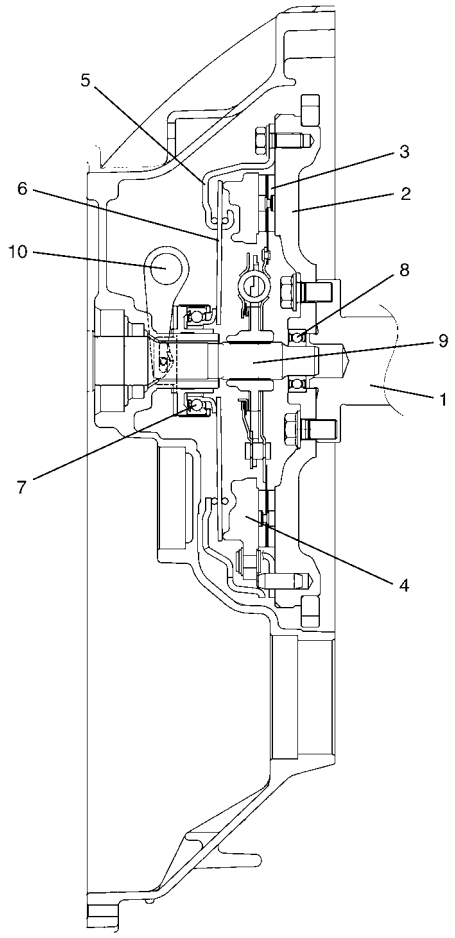
Clutch

General Description

Clutch Construction

S4RS0A5301001

The clutch is a diaphragm spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapered fingers pointing inward.
The disc, carrying four torsional coil springs, is positioned on the transaxle input shaft with an involute spline fit.
The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge part of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch release bearing is held back. This is the engaged condition of the clutch.
Depressing the clutch pedal causes the release bearing to advance and pushes on the tips of the tapered fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transaxle input shaft.



I4RS0A530001-

1. Crankshaft	5. Clutch cover	9. Input shaft
2. Flywheel	6. Diaphragm spring	10. Release shaft
3. Clutch disc	7. Release bearing	
4. Pressure plate	8. Input shaft bearing	

Diagnostic Information and Procedures

Clutch System Symptom Diagnosis

S4RS0A5304001

Condition	Possible cause	Correction / Reference Item
Slipping	Improper clutch pedal free travel	*Replace master cylinder or clutch pedal arm.*
	Worn or oily clutch disc facing	*Replace disc.*
	Warped disc, pressure plate or flywheel surface	*Replace disc, clutch cover or flywheel.*
	Weakened diaphragm spring	*Replace clutch cover.*
	Master cylinder piston or seal cup not returning	*Replace master cylinder.*
Dragging clutch	Improper clutch pedal free travel	*Replace master cylinder or clutch pedal arm.*
	Weakened diaphragm spring, or worn spring tip	*Replace clutch cover.*
	Rusted input shaft splines	*Lubricate.*
	Damaged or worn splines of transaxle input shaft	*Replace input shaft.*
	Excessively wobbly clutch disc	*Replace disc.*
	Clutch facings broken or dirty with oil	*Replace disc.*
	Fluid leakage	*Repair or replace.*
Clutch vibration	Glazed (glass-like) clutch facings	*Repair or replace disc.*
	Clutch facings dirty with oil	*Replace disc.*
	Release bearing slides unsmoothly on input shaft bearing retainer	*Lubricate or replace input shaft bearing retainer.*
	Wobbly clutch disc, or poor facing contact	*Replace disc.*
	Weakened torsion springs in clutch disc	*Replace disc.*
	Clutch disc rivets loose	*Replace disc.*
	Distorted pressure plate or flywheel surface	*Replace clutch cover or flywheel.*
	Weakened engine mounting	*Replace engine mounting.*
	Loosened engine mounting bolt or nut	*Retighten engine mounting bolt or nut.*
Noisy clutch	Worn or broken release bearing	*Replace release bearing.*
	Input shaft front bearing worn down	*Replace input shaft bearing.*
	Excessive rattle of clutch disc hub	*Replace disc.*
	Cracked clutch disc	*Replace disc.*
	Pressure plate and diaphragm spring rattling	*Replace clutch cover.*
Grabbing clutch	Clutch disc facings soaked with oil	*Replace disc.*
	Clutch disc facings excessively worn	*Replace disc.*
	Rivet heads showing out of facing	*Replace disc.*
	Weakened torsion springs	*Replace disc.*

Repair Instructions

Clutch Pedal Inspection

S4RS0A5306019

Clutch Pedal Free Travel “A”

1) Depress clutch pedal (1), stop the moment clutch resistance is felt, and measure how much pedal has moved (clutch pedal free travel) as represented by “A” in the figure. Then check its conformance to specification shown below.

   Clutch pedal free travel
   “A”: 2 – 8 mm (0.08 - 0.31 in.)

2) If “A” is not within specification, check pedal arm (2) and master cylinder (3) and replace defective part.

Cylinder Push Rod Play “B”

1) Press clutch pedal (1) gradually with finger, stop when slight increase of resistance is felt and measure how much pedal has moved (push rod play) as represented by “B” as shown. Then check its conformance to below specification.

   Push rod play
   “B”: Max. 3 mm (0.12 in.)

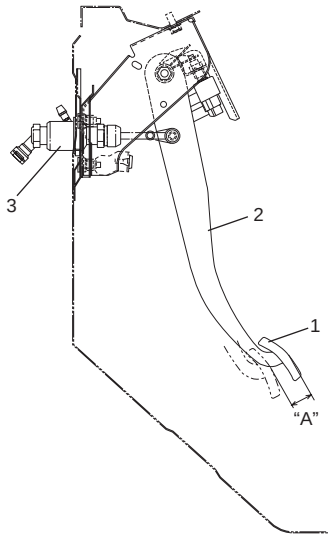
2) If “B” is not within specification, replace master cylinder (3) or pedal arm (2).

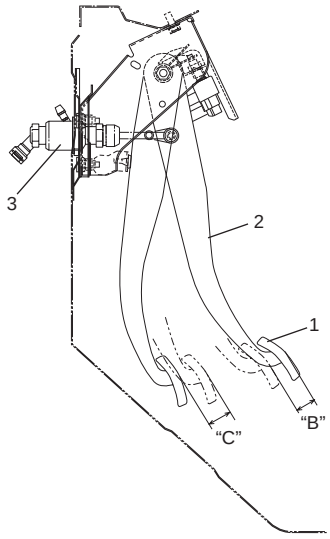
Clutch Release Margin “C”

1) Pull up parking brake fully and block wheels.
2) Start engine and keep engine at idle with neutral gear position.
3) Without clutch pedal (1) depressed, be slow to shift the shift lever to reverse position until transaxle emits gear contact noise.
4) Be slow to depress clutch pedal (1), and at gear contact noise died position (release point) stop depressing.
5) Measure distance between release point and full stroke point on clutch pedal (1) which is shown by “C” in the figure.

   Clutch release margin
   “C”: 25 - 55 mm (0.98 - 2.17 in.)

6) If “C” is not within specification, it is possible that air is trapped in this system. If suspected so, bleed air referring to “Air Bleeding of Clutch System: ”.Upon completion of above inspection and adjustment, start engine and check clutch for proper operation.





I4RS0A530002-

Clutch Fluid Level Inspection

S4RS0A5306020

Refer to “Master Cylinder and Brake Fluid Level Inspection: in Section 4A”.

Air Bleeding of Clutch System

S4RS0A5306021

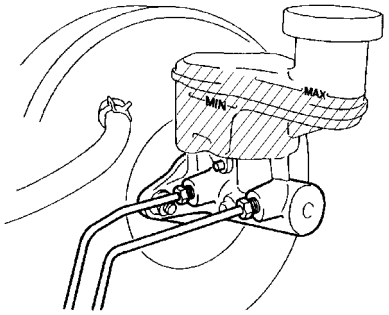
CAUTION:

Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

Bleeding operation is necessary to remove air whenever it entered hydraulic clutch system.

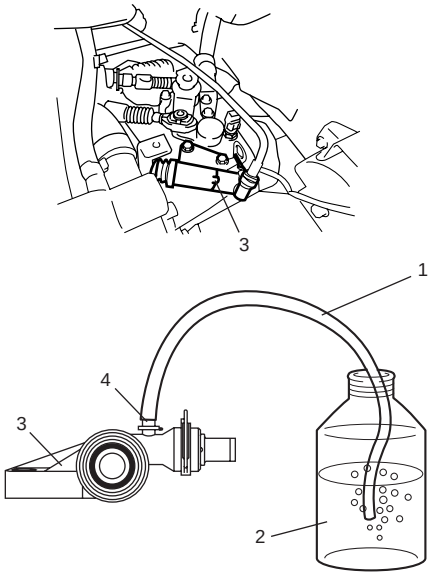
1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.

   : Brake fluid (DOT 3)



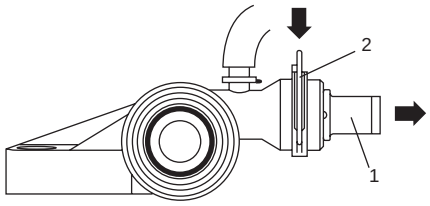
I4RS0A530023-

2) Remove bleeder plug cap from clutch operating cylinder (3). Attach a vinyl tube (1) to bleeder plug (4), and insert the other end into container (2).



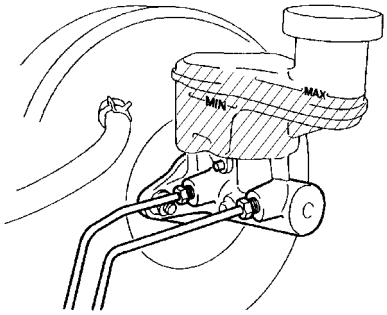
I4RS0A530003-

3) Depress clutch pedal several times, and then while holding it depressed, push snap ring (2) and pull pipe connector (1) one notch.



I4RS0A530004-

4) When fluid pressure in cylinder is almost depleted, push pipe connector.
5) Repeat this operation until there are no more air bubbles in hydraulic line.
6) When bubbles stop, depress and hold clutch pedal, push pipe connector, and pull snap ring.
7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.

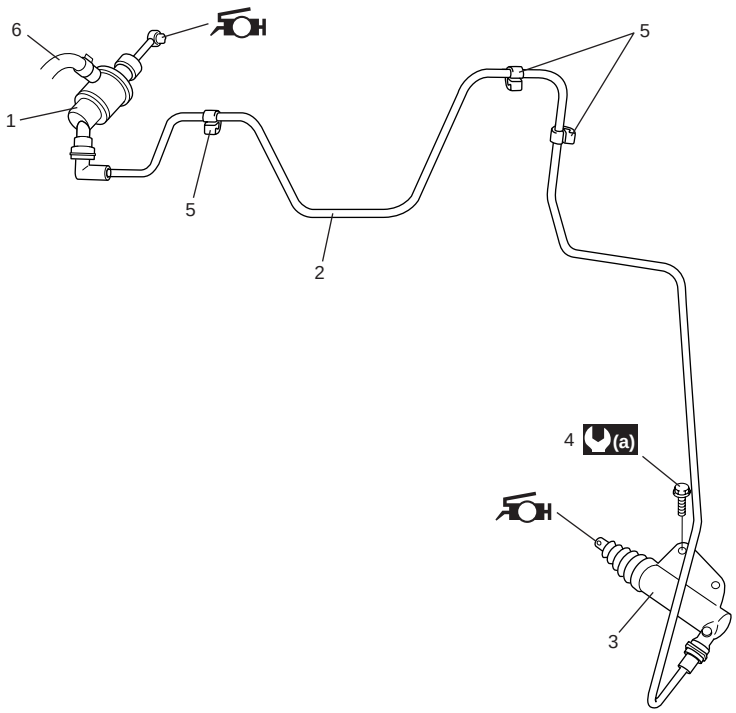


I4RS0A530023-

10) Check clutch pedal for sponginess. If found spongy, repeat entire procedure of bleeding.

Clutch Fluid Pipe and Hose Components

S4RS0A5306022



I4RS0A530005-

1. Master cylinder : Apply grease 99000-25100 to push rod end.	5. Clamp
2. Pipe	6. Clutch reservoir hose
3. Operating cylinder : Apply grease 99000-25100 to rod tip.	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
4. Operating cylinder bolt	

Clutch Fluid Pipe Removal and Installation

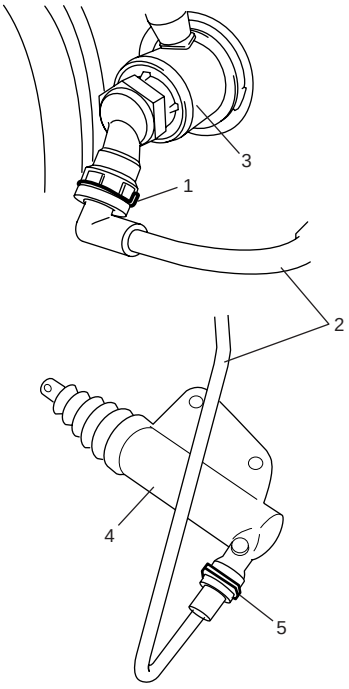
S4RS0A5306023

Removal

CAUTION:

Do not allow fluid to get on painted surface. It may cause painted surface damage.

1) Remove dust and dirt from each joint of pipe to be disconnected and clean around brake master cylinder reservoir cap.
2) Take out fluid with syringe or such from brake master cylinder reservoir.
3) Pull clamp (1) of master cylinder and push clamp (5) of operating cylinder, and then disconnect clutch fluid pipe (2).



I4RS0A530006-

3. Clutch master cylinder	
4. Clutch operating cylinder	

Installation

Reverse removal procedure for installation noting the following.

CAUTION:

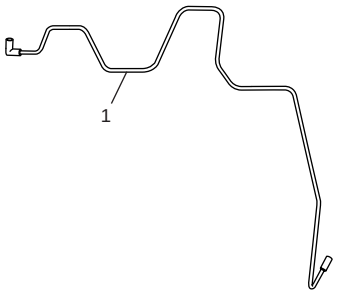
- **Do not allow fluid to get on painted surface.**
- **Do not allow pipe to contact hard against vehicle body or other parts.**

- Install each clamp securely.
- After installation, check clutch pedal free travel and bleed air from system referring to “Clutch Pedal Inspection: ” and “Air Bleeding of Clutch System: ”.
- Check fluid leakage.
- Add fluid to MAX level of reservoir.

Clutch Fluid Pipe Inspection

S4RS0A5306026

Check pipe (1) for dent, kink, crack, dirt and dust. Replace if check result is not satisfactory.



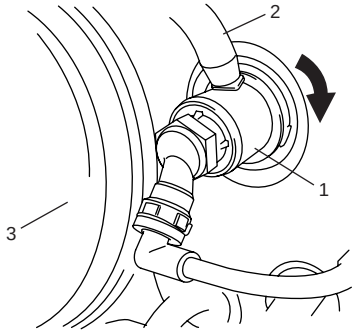
I4RS0A530007-

Clutch Master Cylinder Removal and Installation

S4RS0A5306024

Removal

1) Clean around brake master cylinder reservoir cap and take out fluid with syringe or such from brake master cylinder reservoir.
2) Disconnect clutch fluid pipe from clutch master cylinder (1) referring to “Clutch Fluid Pipe Removal and Installation: ”.
3) Disconnect clutch reservoir hose (2).
4) Remove push rod from clutch pedal.
5) Turn clutch master cylinder (1) clockwise as shown in figure, and then remove it.



I4RS0A530008-

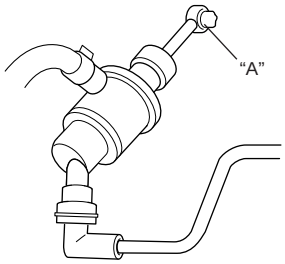
3. Brake booster

Installation

Reverse removal procedure for installation noting the following.

- Apply grease to push rod tip.

“A”: Grease 99000–25100



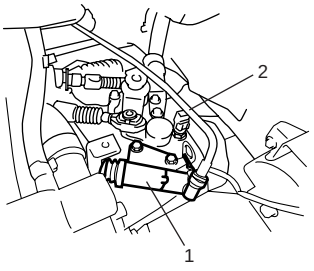
I4RS0A530009-

Clutch Operating Cylinder Removal and Installation

S4RS0A5306025

Removal

1) Clean around brake master cylinder reservoir cap and take out fluid with syringe or such from brake master cylinder reservoir.
2) Disconnect clutch fluid pipe (2) from operating cylinder referring to “Clutch Fluid Pipe Removal and Installation: ”.
3) Remove clutch operating cylinder (1).

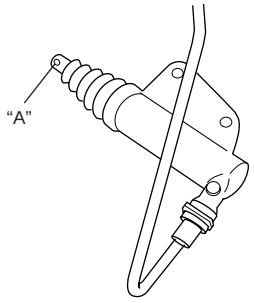


I4RS0A530010-

Installation
Reverse removal procedure for installation noting the following.

- Apply grease to push rod tip.

  "A": Grease 99000–25100



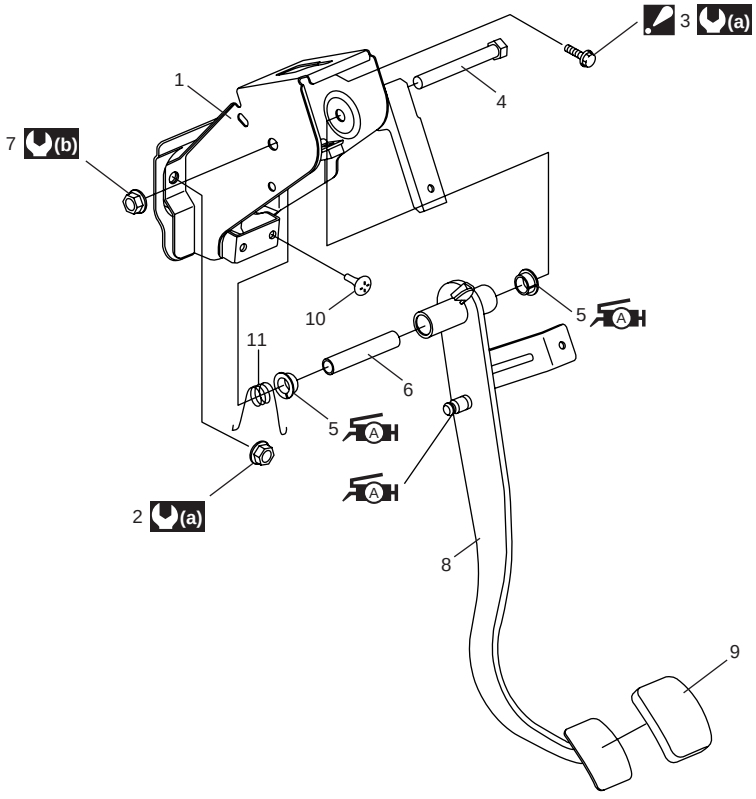
I4RS0A530011-

- Tighten clutch operating cylinder bolt to specified torque.

  Tightening torque
  Clutch operating cylinder bolt: 23 N·m (2.3 kg-m, 17.0 lb-ft)

Clutch Pedal and Clutch Pedal Bracket Components

S4RS0A5306007

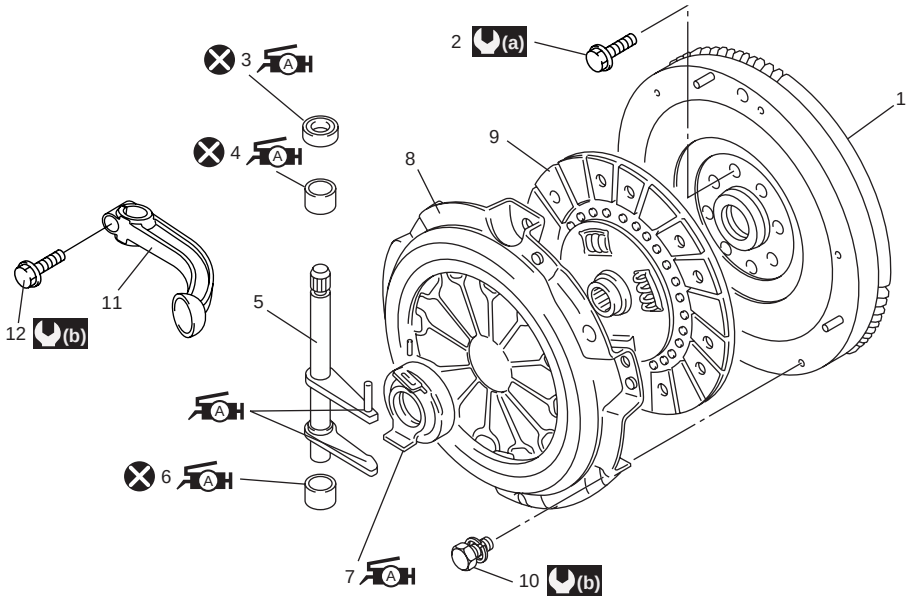


I4RS0A530012-

1. Clutch pedal bracket	A 8. Clutch pedal : Apply grease 99000-25010 to outside surf of pin.
2. Pedal bracket nut	9. Pedal pad
3. Pedal bracket bolt : Pedal bracket bolt must be tighten after pedal bracket nut.	10. Cushion
4. Pedal shaft bolt	11. Return spring
A 5. Pedal bush : Apply grease 9900-25010 to outside of bush.	(a) : 13 N·m (1.3 kg-m, 9.5 lb-ft)
6. Pedal shaft spacer	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
7. Pedal shaft nut	

Clutch Cover, Clutch Disc and Flywheel Components

S4RS0A5306014



I4RS0A530013-

1. Flywheel	9. Clutch disc
2. Flywheel bolt	10. Clutch cover bolt
3. Clutch release shaft seal : Apply grease 99000-25010 to seal lip. (0.3 g (0.01 oz))	11. Release arm
4. Clutch release shaft No.2 bush : Apply grease 99000-25010 to bush inside. (0.3 g (0.01 oz))	12. Release arm bolt
5. Clutch release shaft : Apply grease 99000-25010 to the end of release shaft arm. (0.3 g (0.01 oz))	(a) : 70 N·m (7.0 kg-m, 51.0 lb-ft)
6. Clutch release shaft No.1 bush : Apply grease 99000-25010 to bush inside. (0.3 g (0.01 oz))	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
7. Release bearing : Apply grease 99000-25010 to joint of bearing and release shaft and also bearing inside. (0.3 g (0.01 oz))	Do not reuse.
8. Clutch cover	

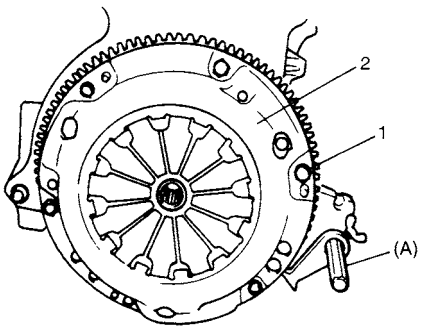
Clutch Cover, Clutch Disc and Flywheel Removal and Installation

S4RS0A5306015

Removal

1) Dismount manual transaxle assembly referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B".
2) Hold flywheel with special tool and remove clutch cover bolts (1), clutch cover (2) and clutch disc.

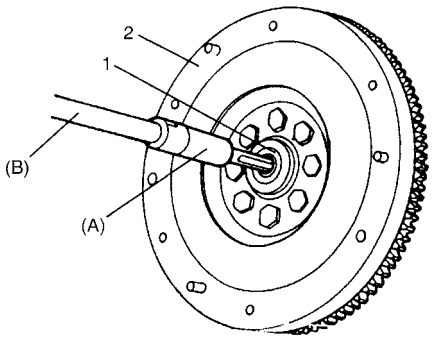
Special tool
(A): 09924–17810



I4RS0A530014-

3) Pull out input shaft bearing (1) from flywheel (2), use the following special tool if necessary.

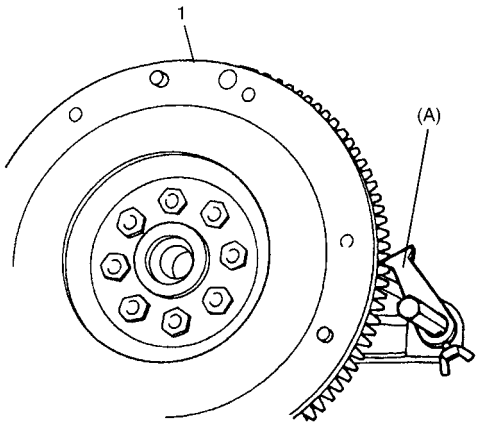
Special tool
(A): 09921–26020
(B): 09930-30104



I2RH01530023-

4) Remove flywheel (1) from crank shaft using special tool.

Special tool
(A): 09924–17810



I4RS0A530015-

Installation

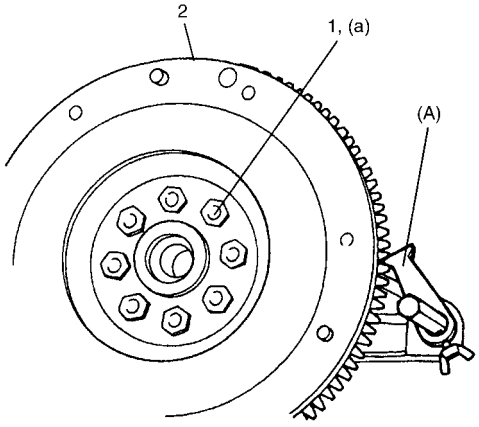
NOTE:

Before assembling, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

1) Install flywheel (2) to crankshaft and tighten bolts (1) to specification.

Special tool
(A): 09924–17810

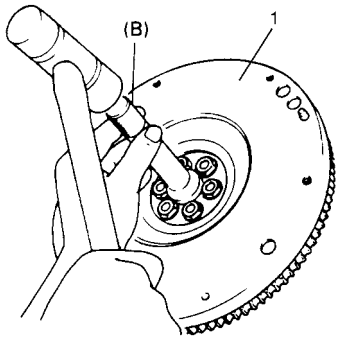
Tightening torque
Flywheel bolt (a): 70 N·m (7.0 kg-m, 51.0 lb-ft)



I2RH01530024-

2) Using special tool, install input shaft bearing to flywheel (1).

Special tool
(B): 09925–98210



I4RS0A530016-

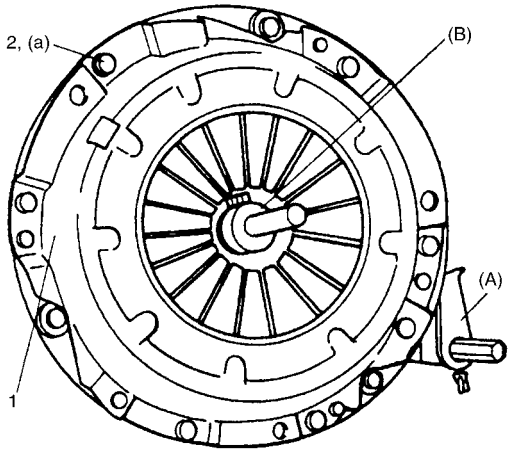
3) Aligning clutch disc to flywheel center using special tool, install clutch cover (1) and bolts (2). Then tighten bolts (2) to specification.

NOTE:

- **While tightening clutch cover bolts, compress clutch disc with special tool (clutch center guide) by hand so that disc is centered.**
- **Tighten cover bolts little by little evenly in diagonal order.**

Special tool
(A): 09924–17810
(B): 09923-36320

Tightening torque
Clutch cover bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



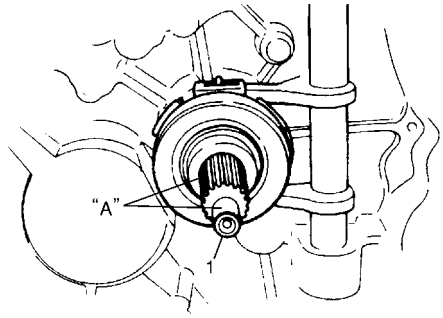
I4RS0A530017-

4) Slightly apply grease to input shaft (1), then join manual transaxle assembly with engine referring to “Manual Transaxle Unit Dismounting and Remounting: in Section 5B”.

“A”: Grease 99000–25210

NOTE:

When inserting transaxle input shaft to clutch disc, turn crankshaft little by little to match the splines.



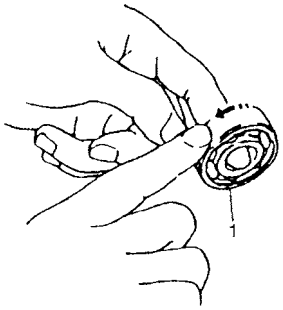
I4RS0A530018-

Clutch Cover, Clutch Disc and Flywheel Inspection

S4RS0A5306016

Input Shaft Bearing

Check bearing (1) for smooth rotation and replace it if abnormality is found.

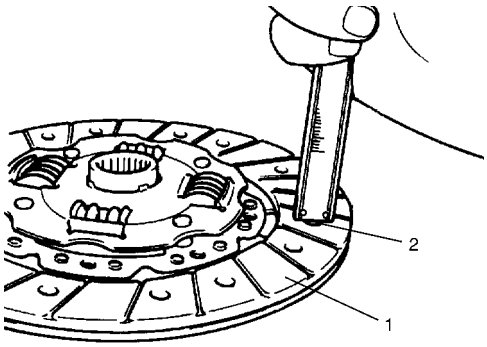


I3RM0A530014-

Clutch Disc

Measure depth of rivet head depression, i.e. distance between rivet head and facing surface.
If depression is found to have reached service limit at any of rivet holes (2), replace clutch disc assembly (1).

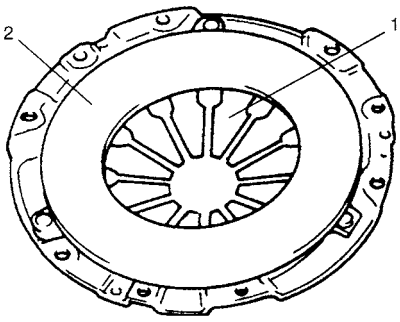
Rivet head depth
Standard: 1.65 – 2.25 mm (0.06 – 0.09 in.)
Limit: 0.5 mm (0.02 in.)



I4RS0A530019-

Clutch Cover

1) Check diaphragm spring (1) for abnormal wear or damage.
2) Inspect pressure plate (2) for wear or heat spots.
3) If abnormality is found, replace clutch cover. Do not disassemble it into diaphragm spring and pressure plate.



I3RM0A530015-

Flywheel

Check surface contacting clutch disc for abnormal wear or heat spots. Replace or repair as required.

Clutch Release System Removal and Installation

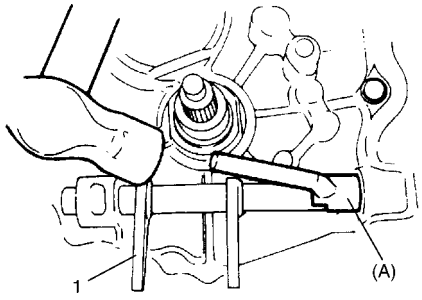
S4RS0A5306017

Removal

1) Remove release arm by loosening its bolt.
2) Take out release bearing by turning release shaft (1).
3) Drive out No.2 bush using special tool and hammer. Release shaft seal will also be pushed out.

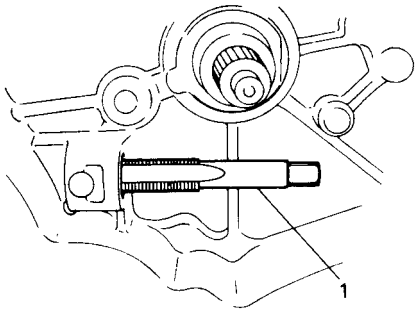
   Special tool
   (A): 09922-46010

4) Remove release shaft (1).



I4RS0A530020-

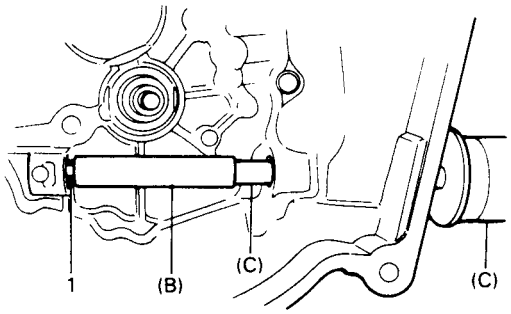
5) Install tap (M16 X 1.5) (1) to clutch release shaft No.1 bush.



IYSY01531016-

6) Pull No.1 bush out using tap (1) and special tools.

Special tool
(B): 09923–46020
(C): 09930-30104



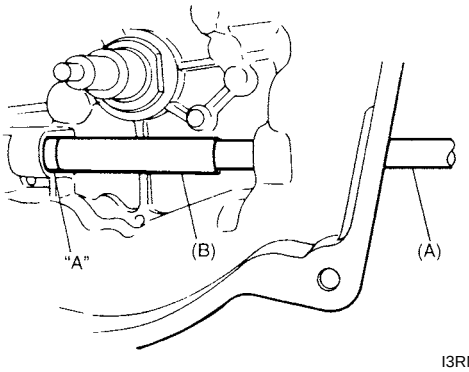
IYSY01531017-

Installation

1) Drive in a new No.1 bush using special tools and hammer, and then apply grease to bush inside.

Special tool
(A): 09943-88211
(B): 09923-46030

"A": Grease 99000–25010



I3RM0A530016-

2) Install release shaft.

3) Apply grease to No.2 bush (1) inside and press-fit it using the same special tool as in removal.

"A": Grease 99000–25010

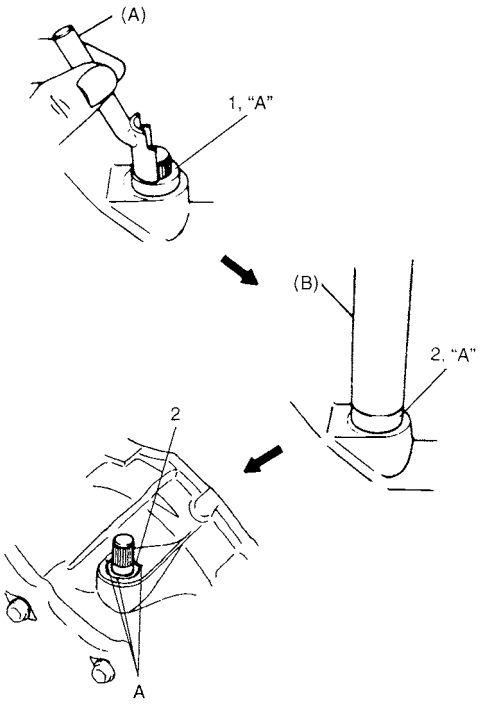
Special tool
(A): 09922-46010

4) Coat grease to release shaft seal (2) lip and then install it till it is flush with case surface. Use special tool for this installation and face seal lip downward (inside).

"A": Grease 99000–25010

Special tool
(B): 09925-98221

5) Caulk seal at A using caulking tool and hammer.



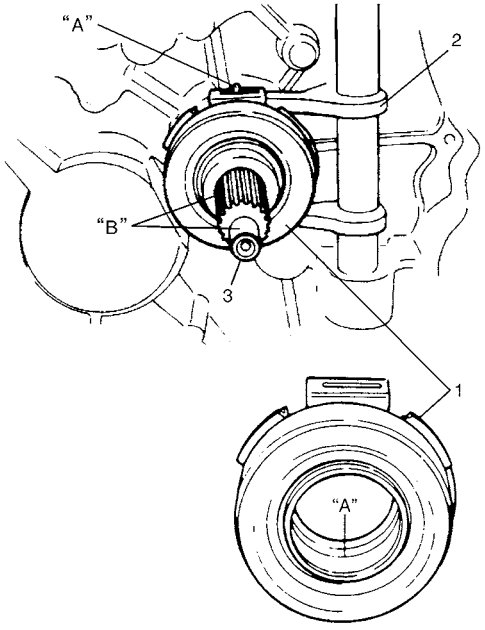
I3RM0A530017-

6) Apply grease to release bearing inside and release shaft (2), then set release bearing (1).

"A": Grease 99000–25010

7) Apply small amount of grease to input shaft (3) spline (0.3 g (0.01 oz)) and front end (0.15 g (0.005 oz)) as well.

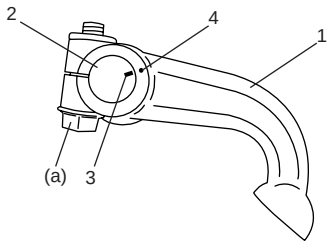
"B": Grease 99000–25210



I4RS0A530021-

8) Set release arm (1) to release shaft (2) aligning punch mark (4) of release arm and punch mark (3) of release shaft, then tighten bolt to specified torque.

Tightening torque
Release lever bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A530022-

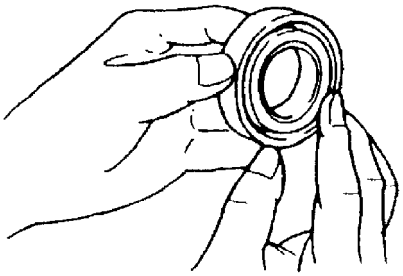
Clutch Release System Inspection

S4RS0A5306018

Clutch Release Bearing
Check clutch release bearing for smooth rotation. If abnormality is found, replace it.

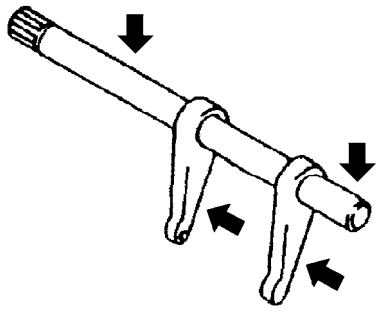
CAUTION:

Do not wash release bearing. Washing may cause grease leakage and consequential bearing damage.



I3RM0A530020-

Clutch Release Shaft
Check clutch release shaft and its pin for deflection or damage.
If abnormality is found, replace it.



I3RM0A530021-

Specifications

Tightening Torque Specifications

S4RS0A5307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Clutch operating cylinder bolt	23	2.3	17.0	☞
Flywheel bolt	70	7.0	51.0	☞
Clutch cover bolt	23	2.3	17.0	☞
Release lever belt	23	2.3	17.0	☞

NOTE:

The specified tightening torque is also described in the following.
"Clutch Fluid Pipe and Hose Components: "
"Clutch Pedal and Clutch Pedal Bracket Components: "
"Clutch Cover, Clutch Disc and Flywheel Components: "

Reference:
For the tightening torque of fastener not specified in this section, refer to "Fasteners Information: in Section 0A".

Special Tools and Equipment

Recommended Service Material

S4RS0A5308001

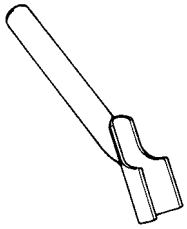
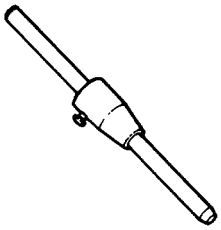
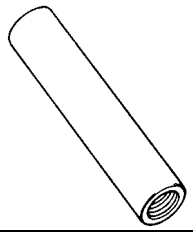
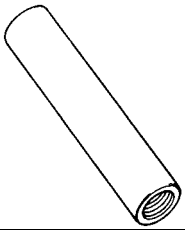
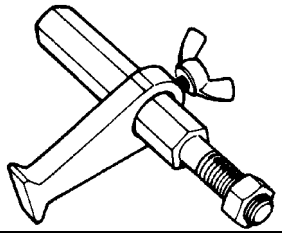
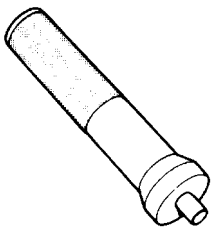
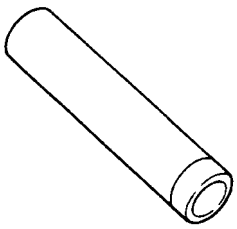
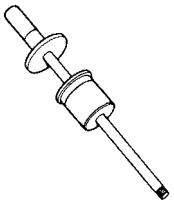
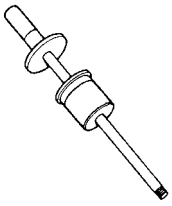
Material	SUZUKI recommended product or Specification		Note
Brake fluid	DOT 3	—	(DOT 3) ☞
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞ / ☞
	SUZUKI Silicone Grease	P/No.: 99000–25100	☞ / ☞
	SUZUKI Super Grease I	P/No.: 99000–25210	☞ / ☞

NOTE:

Required service material is also described in the following.
"Clutch Fluid Pipe and Hose Components: "
"Clutch Pedal and Clutch Pedal Bracket Components: "
"Clutch Cover, Clutch Disc and Flywheel Components: "

Special Tool

S4RS0A5308002

09921–26020 Bearing remover ☞	09922–46010 Clutch bush remover ☞ / ☞ 
09923–36320 Clutch center guide (15 mm) ☞ 	09923–46020 Joint pipe ☞ 
09923–46030 Joint pipe ☞ 	09924–17810 Flywheel holder (drive plate stopper) ☞ / ☞ / ☞ / ☞ 
09925–98210 Input shaft bearing installer ☞ 	09925–98221 Bearing installer ☞ 
09930–30104 Sliding shaft ☞ / ☞ 	09943–88211 Sliding shaft ☞ 

Section 6

Steering

CONTENTS

Precautions 6-1
Precautions 6-1
Precautions on Steering 6-1

Steering General Diagnosis 6A-1
Precautions 6A-1
Precautions for Steering Diagnosis 6A-1
Diagnostic Information and Procedures 6A-2
Steering Symptom Diagnosis 6A-2

Steering Wheel and Column 6B-1
Precautions 6B-1
Service Precautions of Steering Wheel and Column 6B-1
Diagnostic Information and Procedures 6B-1
Checking Steering Column for Accident Damage 6B-1
Repair Instructions 6B-2
Steering Wheel and Column Construction 6B-2
Steering Wheel Removal and Installation 6B-2
Contact Coil Cable Assembly Removal and Installation 6B-3
Centering Contact Coil Cable Assembly 6B-4
Contact Coil Cable Assembly Inspection 6B-5
Steering Column Removal and Installation 6B-5
Steering Column Inspection 6B-7
Steering Lower Shaft Removal and Installation 6B-7
Specifications 6B-8
Tightening Torque Specifications 6B-8
Special Tools and Equipment 6B-8
Special Tool 6B-8

Power Assisted Steering System 6C-1
Precautions 6C-1
Steering System Note 6C-1
Precautions in Diagnosing Troubles 6C-1
General Description 6C-1
P/S System Description 6C-1
EPS Diagnosis General Description 6C-2
On-Board Diagnostic System Description 6C-2
Schematic and Routing Diagram 6C-3
EPS System Wiring Circuit Diagram 6C-3
Diagnostic Information and Procedures 6C-4
EPS System Check 6C-4
"EPS" Warning Lamp Check 6C-5
DTC Check 6C-6
DTC Clearance 6C-6
DTC Table 6C-6
Scan Tool Data 6C-8
P/S System Symptom Diagnosis 6C-9
Serial Data Link Circuit Check 6C-9
"EPS" Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stop 6C-11
"EPS" Warning Lamp Come ON Steady and Engine Start 6C-13
DTC C1113 / C1117 /C1118: Torque Sensor Circuit Failure 6C-14
DTC C1114: Torque Sensor 5 V Power Supply Circuit Failure 6C-15
DTC C1119: Torque Sensor 12 V Power Supply Circuit Failure 6C-17
DTC C1121 / C1123 / C1124: VSS Circuit Failure 6C-19
DTC C1122: Engine Speed Signal Circuit Failure 6C-21
DTC C1141 / C1142 / C1143 / C1145: Motor Circuit Failure 6C-22
DTC C1153: P/S Control Module Power Supply Circuit Failure 6C-23
DTC C1155: P/S Control Module Failure 6C-25
Inspection of P/S Control Module and Its Circuits 6C-25
Steering Wheel Play Check 6C-28
Steering Force Check 6C-28
Repair Instructions 6C-29
Steering Gear Case Assembly Components 6C-29
Tie-Rod End Boot On-Vehicle Inspection 6C-30
Tie-Rod End Removal and Installation 6C-30
Tie-Rod End Inspection 6C-31
Steering Shaft Joint On-Vehicle Inspection 6C-31
Steering Gear Case Assembly Removal and Installation 6C-31
Steering Rack Boot Inspection 6C-33
Tie-Rod / Rack Boot Removal and Installation 6C-33
Steering Rack Plunger Removal and Installation 6C-35
Steering Rack Plunger Inspection 6C-35
P/S Control Module Removal and Installation 6C-35
Torque Sensor Inspection 6C-36
Motor Assembly Inspection 6C-36
Specifications 6C-37
Tightening Torque Specifications 6C-37
Special Tools and Equipment 6C-38
Recommended Service Material 6C-38

Special Tool 6C-38

Precautions

Precautions

Precautions on Steering

S4RS0A6000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Air Bag System Service Warning
Refer to “Air Bag System Service Warning: in Section 00”.

Precautions for Steering Diagnosis
Refer to “Precautions for Steering Diagnosis: in Section 6A”.

Service Precautions of Steering Wheel and Column
Refer to “Service Precautions of Steering Wheel and Column: in Section 6B”.

P/S System Note
Refer to “Steering System Note: in Section 6C”.

Steering General Diagnosis

Precautions

Precautions for Steering Diagnosis

S4RS0A6100001

Since the problems in steering involve several systems, they must all be considered when diagnosing a complaint. To avoid using the wrong symptom, always road test the vehicle first. Proceed with the following preliminary inspection and correct any defects which are found.

1) Inspect tires for proper pressure and uneven wear.
2) Raise vehicle on a hoist and inspect steering system for loose or damaged parts.
3) Spin front wheels. Inspect for out-of-round tires, out-of-balance tires, bent rims, loosen and/or rough wheel bearings.

Diagnostic Information and Procedures

Steering Symptom Diagnosis

S4RS0A6104001

Condition	Possible cause	Correction / Reference Item
Hard steering	Tire not adequately inflated	*Inflate tires to proper pressure.*
	Malfunction of power steering system	*Check and correct.*
	Bind in tie-rod end ball studs or lower ball joints	*Replace tie-rod end or front suspension arm.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment.*
	Bind in steering column	*Repair or replace steering column.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
Too much play in steering	Wheel bearings worn	*Replace wheel bearing.*
	Loose steering gear case bolts	*Tighten gear case bolts.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
	Worn steering shaft joints	*Replace joint.*
	Worn tie-rod ends or tie-rod inside ball joints	*Replace tie-rod end or tie-rod.*
	Worn lower ball joints	*Replace front suspension control arm.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
Poor returnability	Bind in tie-rod end ball studs	*Replace tie-rod end.*
	Bind in ball joints	*Replace front suspension arm.*
	Bind in steering column	*Repair or replace steering column.*
	Disturbed front end alignment	*Check and adjust front end alignment.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
	Tires not adequately inflated	*Adjust tire pressure.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
Rack and pinion noise (Rattle or chuckle)	Loose steering gear case bolts	*Tighten steering gear case bolts.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
Wander or poor steering stability	Mismatched or uneven tires	*Replace or inflate tires to proper pressure.*
	Loosen ball joints and tie-rod ends	*Replace suspension arm or tie-rod end.*
	Faulty struts or mountings	*Replace strut or repair mounting.*
	Loose stabilizer bar	*Tighten or replace stabilizer bar or bush.*
	Broken or sagging springs	*Replace spring.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
Erratic steering when braking	Worn wheel bearings	*Replace wheel bearing.*
	Broken or sagging springs	*Replace coil spring.*
	Wheel tires are inflated unequally	*Inflate tires to proper pressure.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment.*
	Brakes not working in unison	*Check and repair brake system.*
	Leaking wheel cylinder or caliper	*Repair or replace wheel cylinder or caliper.*
	Warped discs	*Replace brake disc.*
	Badly worn brake linings	*Replace brake shoe lining.*
	Drum is out of round in some brakes	*Replace brake drum.*
	Defective wheel cylinders	*Replace or repair wheel cylinder.*

Steering Wheel and Column

Precautions

Service Precautions of Steering Wheel and Column

S4RS0A6200001

For service precautions, refer to “Precautions on Service and Diagnosis of Air Bag System: in Section 8B”.

Service and Diagnosis

For diagnosis and servicing, refer to “Precautions on Service and Diagnosis of Air Bag System: in Section 8B”.

Disabling Air Bag System

For disabling air bag system, refer to “Disabling Air Bag System: in Section 8B”.

Enabling Air Bag System

For enabling air bag system, refer to “Enabling Air Bag System: in Section 8B”.

Handling and Storage

For handling and storage, refer to “Precautions on Handling and Storage of Air Bag System Components: in Section 8B”.

Disposal

For disposal, refer to “Precautions on Disposal of Air Bag and Seat Belt Pretensioner: in Section 8B”.

Diagnostic Information and Procedures

Checking Steering Column for Accident Damage

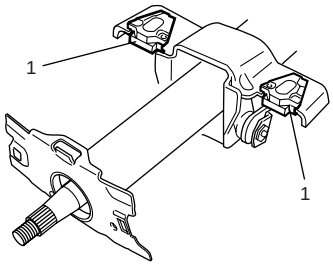
S4RS0A6204003

NOTE:

Vehicles involved in accidents resulting in body damage, where steering column has been impacted or air bag deployed may have a damaged or misaligned steering column.

Checking Procedure

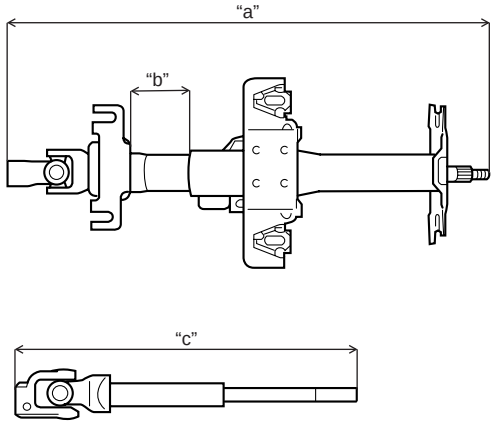
1) Check that two capsules (1) are attached to steering column bracket securely. If found loose, replace steering column assembly.



I4RS0A620001-

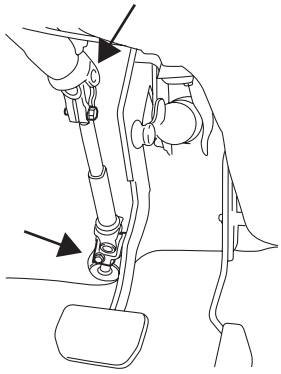
2) Take measurement “a”, “b” and “c” as shown.
If it is shorter than specified length, replace steering column assembly with new one.

Power steering column length
“a”: 454 ± 2 mm (17.8 ± 0.08 in.)
“b”: 64.1 ± 1 mm (2.5 ± 0.03 in.)
“c”: 306.7 ± 1 mm (12.0 ± 0.03 in.)



I4RS0A620002-

3) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play.
If anything is found faulty, replace as lower shaft assembly or steering column assembly.



I4RS0A620003-

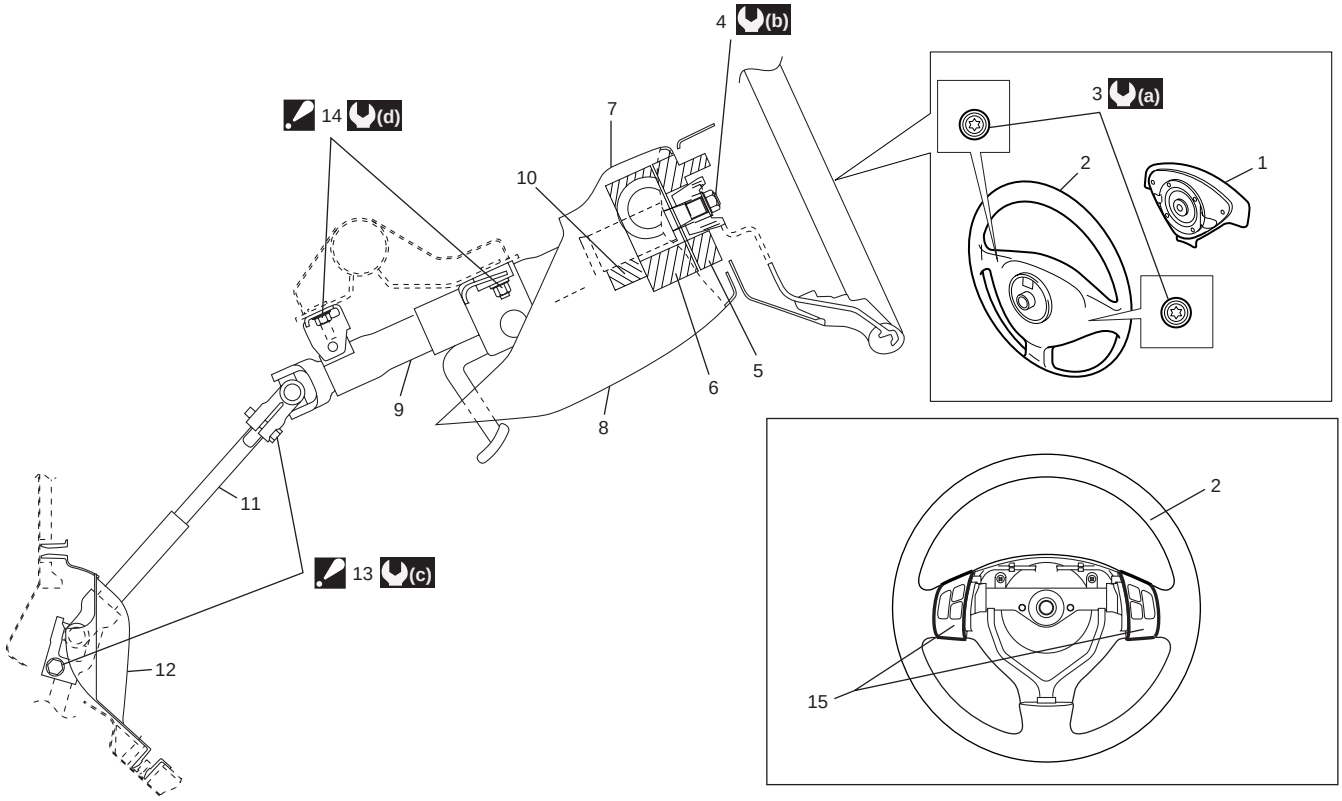
4) Check steering shaft for smooth rotation.
If found defective, replace as steering column assembly.

5) Check steering shaft and steering column for bend, cracks or deformation.
If found defective, replace.

Repair Instructions

Steering Wheel and Column Construction

S4RS0A6206009



I4RS0A620004-

1. Driver air bag (inflator) module	8. Steering column lower cover	15. Audio control switch (if equipped)
2. Steering wheel	9. Steering column	(a) : 9 N·m (0.9 kg-m, 6.5 lb-ft)
3. Driver air bag (inflator) module mounting bolt	10. Steering lock assembly (ignition switch)	(b) : 33 N·m (3.3 kg-m, 24 lb-ft)
4. Steering wheel nut	11. Steering lower shaft	(c) : 25 N·m (2.5 kg-m, 18 lb-ft)
5. Contact coil cable assembly	12. Steering joint cover	(d) : 14 N·m (1.4 kg-m, 10.5 lb-ft)
6. Wiper switch and lighting switch	13. Upper and lower joint bolt : After tightening lower joint bolt, tighten upper joint bolt.	
7. Steering column upper cover	14. Steering column mounting nut : After tightening lower nut, tighten upper nut.	

Steering Wheel Removal and Installation

S4RS0A6206001

CAUTION:

Do not turn the contact coil more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively) with steering wheel removed, or coil will break.

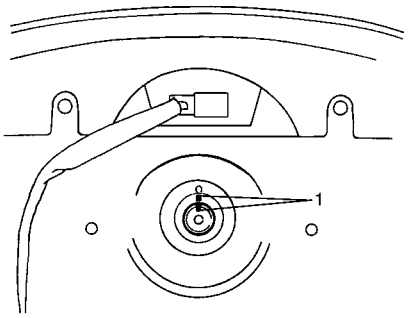
Removal

CAUTION:

Do not hammer the end of the shaft. Hammering it will loosen the plastic shear pins which maintain the column length and impair the collapsible design of the column.

1) Disconnect negative (–) battery cable at battery terminal.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.

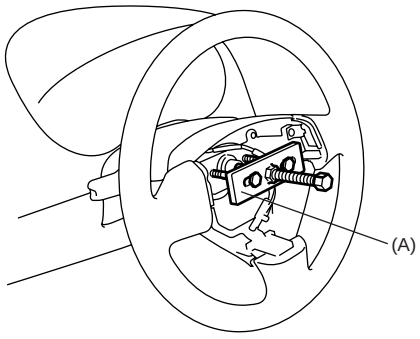
3) Remove driver air bag (inflator) module from steering wheel. Refer to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
4) Disconnect horn connector and audio control switch connector, if equipped.
5) Remove steering shaft nut and then make alignment marks (1) on steering wheel and shaft for a guide during reinstallation.



I4RS0A620005-

6) Remove steering wheel using special tool.

Special tool
(A): 09944-36011



I4RS0A620006-

Installation

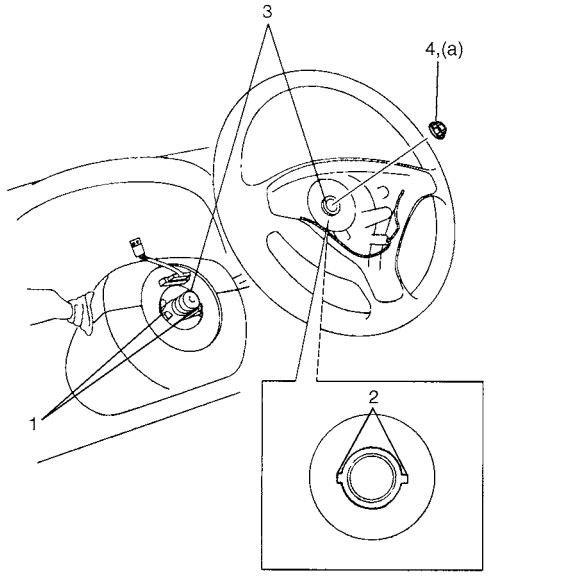
1) Check that vehicle’s front tires are at straight-ahead position and contact coil is centered. If contact coil is turned after removing steering wheel, center contact coil referring to “Centering Contact Coil Cable Assembly: ”.

CAUTION:

These two conditions are prerequisite for installation of steering wheel. If steering wheel has been installed without these conditions, contact coil will break when steering wheel is turned.

2) Install steering wheel to steering shaft with 2 grooves (1) on contact coil fitted in 2 lugs (2) in the back of steering wheel and also aligning marks (3) on steering wheel and steering shaft.
3) Tighten steering shaft nut (4) to specified torque.

Tightening torque
Steering shaft nut (a): 33 N·m (3.3 kg-m, 24.0 lb-ft)



I4RS0A620007-

4) Connect horn connector and audio control switch connector, if necessary.
5) Install driver air bag (inflator) module to steering wheel. Refer to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
6) Connect negative (–) battery cable.
7) Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Contact Coil Cable Assembly Removal and Installation

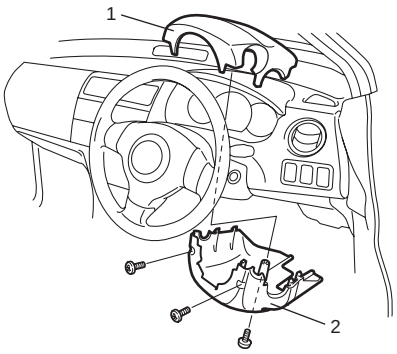
S4RS0A6206002

CAUTION:

Do not turn contact coil more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

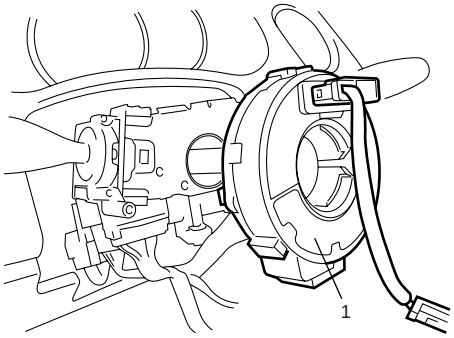
Removal

1) Disconnect negative (–) battery cable at battery terminal.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove steering wheel from steering column referring to “Steering Wheel Removal and Installation: ”.
4) Remove steering column lower cover (2) and upper cover (1).



I4RS0A620008-

5) Remove contact coil cable assembly (1) from steering column.



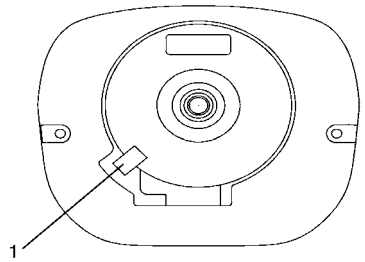
I4RS0A620009-

Installation

1) Check to make sure that vehicle's front tires are set at straight-ahead position and then ignition switch is at LOCK position.
2) Install contact coil cable assembly (1) to steering column securely.

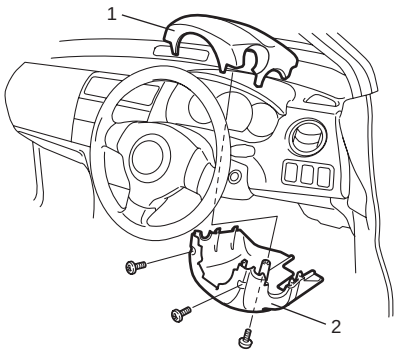
NOTE:

New contact coil cable assembly is supplied with contact coil set and held at its center position with a lock pin (1). Remove this lock pin after installing contact coil cable assembly to steering column.



I4RS0A620010-

3) Install steering column upper cover (1) and lower cover (2).



I4RS0A620011-

4) Install steering wheel to steering column. Refer to "Steering Wheel Removal and Installation: ".
5) Connect battery negative (–) cable.
6) Enable air bag system referring to "Enabling Air Bag System: in Section 8B".

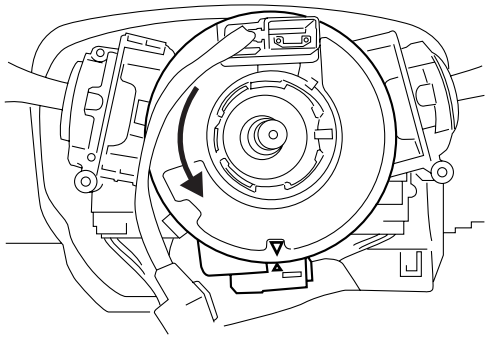
Centering Contact Coil Cable Assembly

S4RS0A6206003

1) Check that vehicle's wheels (front tires) are set at straight-ahead position.
2) Check that ignition switch is at LOCK position.
3) Turn contact coil counterclockwise slowly with a light force till contact coil will not turn any further.

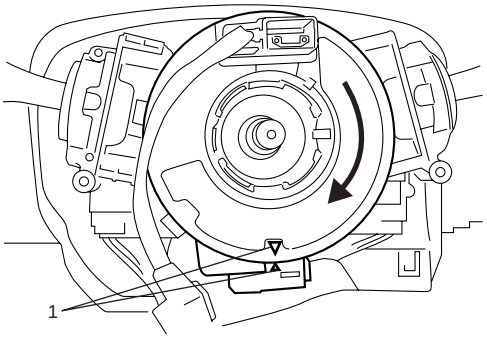
NOTE:

Contact coil can turn about 5 turns at the maximum, that is, if it is at the center position, can turn about two and a half turns both clockwise and counterclockwise.



I4RS0A620012-

4) From the position where contact coil became unable to turn any further (it stopped), turn it back clockwise about two and a half rotations and align center mark with alignment mark (1).

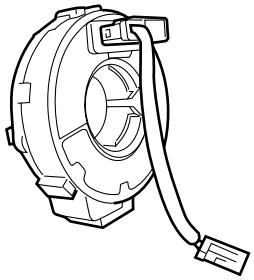


I4RS0A620013-

Contact Coil Cable Assembly Inspection

S4RS0A6206004

Check contact coil cable assembly wire harness for any signs of scorching, melting or other damage.
If it is damaged, replace.



I4RS0A620014-

Steering Column Removal and Installation

S4RS0A6206005

CAUTION:

Once the steering column is removed from the vehicle, the column is extremely susceptible to damage.

- **Dropping the column assembly on its end could collapse the steering shaft or loosen the plastic shear pins which maintain column length.**
- **Leaning on the column assembly could cause it to bend or deform.**

Any of the damage could impair the column's collapsible design.
Steering column mounting nuts should not be loosened with steering shaft joint upper side bolt tightened as this could cause damage to shaft joint bearing.

NOTE:

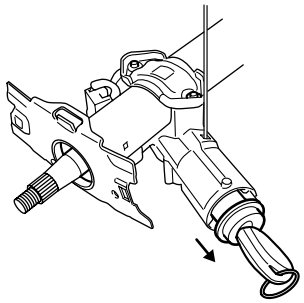
When servicing steering column or any column-mounted component, remove steering wheel. But when removing steering column simply to gain access to instrument panel components, leave steering wheel installed on steering column.

Removal

WARNING:

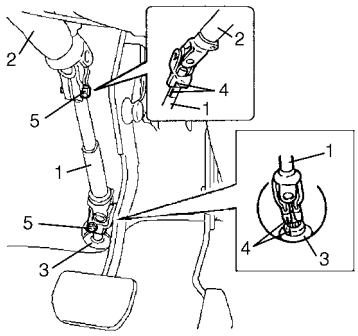
Never rest a steering column assembly on the steering wheel with the air bag (inflator) module face down and column vertical. Otherwise, personal injury may result.

1) Disconnect negative (–) battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System: in Section 8B".
3) Remove steering wheel and contact coil cable assembly referring to "Steering Wheel Removal and Installation: " and "Contact Coil Cable Assembly Removal and Installation: ".
4) Detach lighting switch and wiper switch from steering column.
5) Remove immobilizer control module (if equipped) from steering column.
6) Remove ignition switch cylinder assembly (1) as follows.
   a) Turn ignition switch key to ACC position.
   b) Insert 2 mm (0.078 in.) rod (2) through hole (3) and push ignition switch cylinder lock.



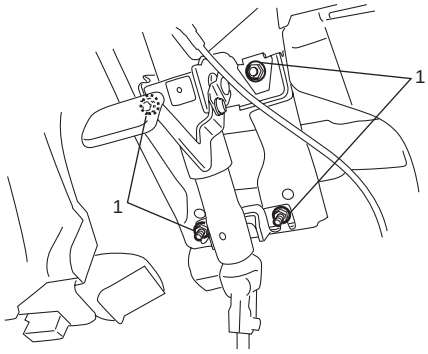
I4RS0A620015-

7) Detach ignition switch assembly from steering column.
8) Remove steering column hole cover.
9) Remove steering joint cover.
10) Make alignment marks (4) on lower shaft (1) and shaft joint of steering column (2) and lower shaft (1) and pinion shaft (3) for a guide during reinstallation.
11) Remove lower shaft joint bolts (5).
12) Remove steering lower shaft (1).



I4RS0A620016-

13) Remove steering column mounting nuts (1).



I4RS0A620017-

14) Remove steering column from vehicle.

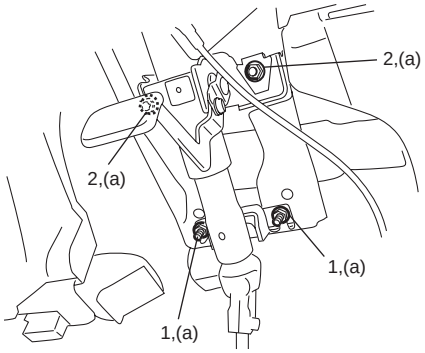
Installation

CAUTION:

After tightening steering column mounting nuts, shaft joint bolts should be tightened. Wrong tightening order could cause a damage to shaft joint.

1) Be sure that front wheels are in straight.
2) Install steering column assembly to lower and upper brackets. Tighten steering column lower nuts (1) first and then upper nuts (2) to specifications as given below.

Tightening torque
Steering column nut (a): 14 N·m (1.4 kg-m, 10.5 lb-ft)



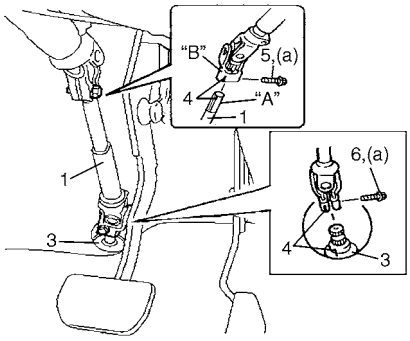
I4RS0A620018-

3) Align flat part “A” of steering lower shaft (1) with bolt hole “B” of shaft joint (2) of column as shown. Then insert lower shaft into shaft joint of steering column with matching marks (4).
4) Insert lower shaft (1) into pinion shaft (3) with matching marks (4).
5) Tighten joint bolt (pinion shaft side) (6) to specified torque first and then joint bolt (steering column side) (5) to specified torque.

CAUTION:

After tightening column nuts, tighten steering shaft upper joint bolt. Otherwise shaft joint bearing is damaged.

Tightening torque
Steering shaft joint bolt (a): 25 N·m (2.5 kg-m, 18.5 lb-ft)



I4RS0A620019-

6) Install steering joint cover.
7) Install ignition switch assembly to steering column.
8) Install ignition switch cylinder assembly as follows.
   a) Turn ignition key of ignition switch cylinder assembly to ACC position.
   b) In this state, push ignition switch cylinder assembly into steering column till it clicks.
9) Install immobilizer control module (if equipped) from steering column.
10) Install lighting switch, wiper switch to steering column.
11) Install contact coil cable assembly and steering wheel referring to “Contact Coil Cable Assembly Removal and Installation: ” and “Steering Wheel Removal and Installation: ”.
12) Install steering column hole cover.
13) Connect negative (–) battery cable.
14) Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Steering Column Inspection

S4RS0A6206006

Check steering column for damage and operation referring to “Checking Steering Column for Accident Damage: ”.

Steering Lower Shaft Removal and Installation

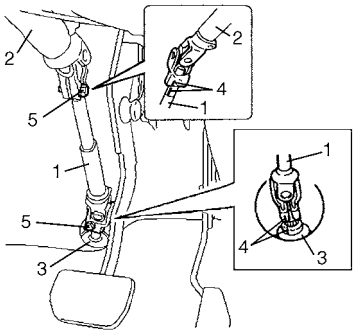
S4RS0A6206008

CAUTION:

Never turn steering wheel while steering lower shaft is removed.
Should it have been turned and contact coil have got out of its centered position, it needs to be centered again. Also, turning steering wheel more than about two and a half turns will break contact coil.

Removal

1) Turn steering wheel so that vehicle’s front tires are at straight-ahead position.
2) Turn ignition switch to LOCK position and remove key.
3) Remove steering joint cover.
4) Make alignment marks (4) on lower shaft (1) and shaft joint of steering column (2) and lower shaft (1) and pinion shaft (3) for a guide during reinstallation.
5) Remove lower shaft joint bolts (5).
6) Remove steering lower shaft (1).

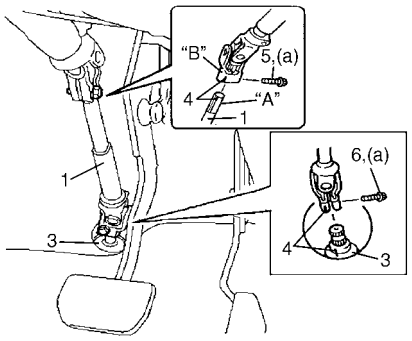


I4RS0A620020-

Installation

1) Be sure that front wheels are in straight forward state.
2) Align flat part “A” of steering lower shaft (1) with bolt hole “B” of shaft joint (2) of column as shown. Then insert lower shaft into shaft joint of steering column with matching marks (4).
3) Insert lower shaft (1) into pinion shaft (3) with matching marks (4).
4) Tighten joint bolt (pinion shaft side) (6) to specified torque first and then joint bolt (steering column side) (5) to specified torque.

Tightening torque
Steering shaft joint bolt (a): 25 N·m (2.5 kg-m, 18.5 lb-ft)



I4RS0A620021-

Specifications

Tightening Torque Specifications

S4RS0A6207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Steering shaft nut	33	3.3	24.0	☞
Steering column nut	14	1.4	10.5	☞
Steering shaft joint bolt	25	2.5	18.5	☞

NOTE:

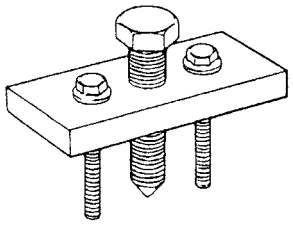
The specified tightening torque is also described in the following.
“Steering Wheel and Column Construction: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A6208002

09944–36011 Steering wheel remover ☞		

Power Assisted Steering System

Precautions

Steering System Note

S4RS0A6300001

NOTE:

All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

Precautions in Diagnosing Troubles

S4RS0A6300002

- Take a note of DTC indicated on the SUZUKI scan tool.
- Before inspection, be sure to read “Precautions for Electrical Circuit Service: in Section 00” and understand what is written there.
- DTC C1122 (engine speed signal failure) is indicated when ignition switch is at ON position and engine is not running, but it means there is nothing abnormal if indication changes to a normal one when engine is started.
- As DTC is stored in memory of the P/S control module, be sure to clear memory after repair by performing the procedure described in “DTC Clearance: ”.

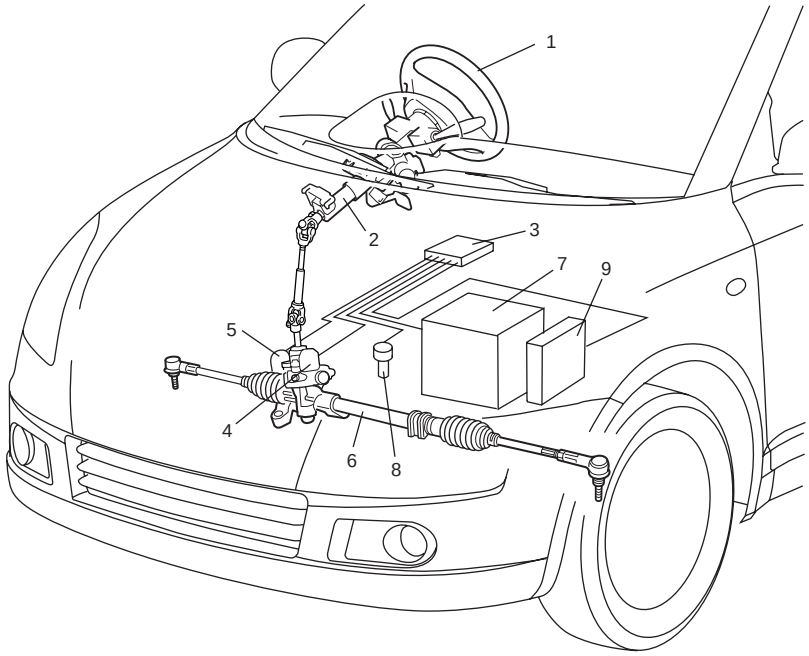
General Description

P/S System Description

S4RS0A6301001

This power steering (P/S) system consists of a P/S control module (3), a torque sensor (4), a motor (5). In this system, the P/S control module determines the level and direction of the assist force for the steering wheel (1) according to the signals from the torque sensor and the vehicle speed sensor (VSS) (8). The P/S control module runs the motor so as to assist the operation of the steering wheel.
The P/S control module diagnoses troubles which may occur in the area including the following components when the ignition switch is ON and the engine is running. When the P/S control module detects any malfunction, it stops the motor operation.

- Torque sensor
- Vehicle speed sensor (VSS) circuit
- Engine speed signal circuit
- Motor
- P/S control module.



I4RS0A630001-

2. Steering column	6. Steering gear case assembly	7. Battery	9. ECM

EPS Diagnosis General Description

S4RS0A6301003

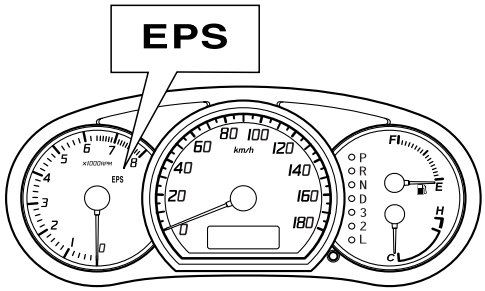
The P/S system in this vehicle is controlled by the P/S control module. The P/S control module has an on-board diagnostic system which detects a malfunction in this system. When diagnosing troubles, be sure to have full understanding of the outline of “On-Board Diagnostic System Description: ” and each item in “Precautions in Diagnosing Troubles: ”, and then execute diagnosis according to “EPS System Check: ”.

On-Board Diagnostic System Description

S4RS0A6301004

The P/S control module performs the on-board diagnosis (self-diagnosis) on the system and operates the “EPS” warning lamp (1) as follows.

- The “EPS” warning lamp lights when the ignition switch is turned to ON position (but the engine at stop) regardless of the condition of the P/S control system. This is only to check if the “EPS” warning lamp is operated properly.
- If the areas monitored by the P/S control module is free from any trouble after the engine start (while engine is running), the “EPS” warning lamp turns OFF.
- When the P/S control module detects a trouble which has occurred in the monitored areas the “EPS” warning lamp flashes ON and OFF while the engine is running to warn the driver of such occurrence of the trouble and at the same time it stores the exact trouble area in memory inside of the P/S control module.



I4RS0A630002-

Driving Cycle

A “Driving Cycle” consists of engine startup and engine shutoff.

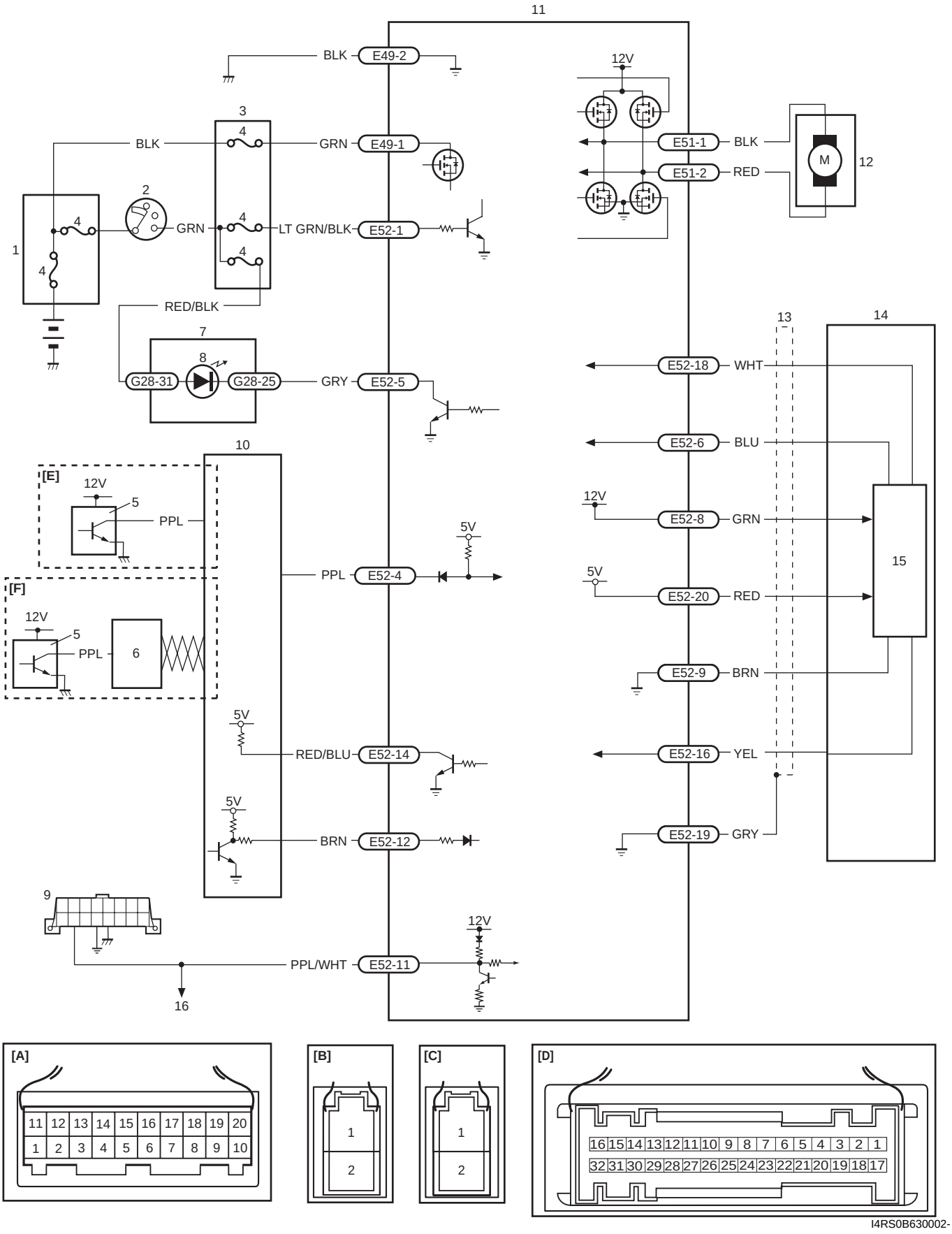
3 Driving Cycles Detection Logic

The malfunction detected in the first and second driving cycle is stored in P/S control module memory (in the form of pending DTC) but the “EPS” warning lamp does not light at these time. It lights up at the third detection of same malfunction also in the next driving cycle.

Schematic and Routing Diagram

EPS System Wiring Circuit Diagram

S4RS0A6302001



I4RS0B630002-

[A]: Connector “E52” (viewed from harness side)	3. Junction block assembly	11. P/S control module
[B]: Connector “E49” (viewed from harness side)	4. Fuse	12. P/S motor
[C]: Connector “E51” (viewed from harness side)	5. VSS	13. Shield
[D]: Connector “G28” (viewed from harness side)	6. TCM	14. Torque sensor
[E]: For M/T vehicle model	7. Combination meter	15. Torque sensor amplifier
[F]: For A/T vehicle model	8. “EPS” warning lamp	16. To ECM, BCM, Air bag SDM and ABS hydraulic unit/control module assembly
1. Main fuse	9. Date link connector (DLC)	
2. Ignition switch	10. ECM	

Diagnostic Information and Procedures

EPS System Check

S4RS0A6304006

WARNING:

Carry out test drive in light traffic area to prevent an accident.

Step	Action	Yes	No
1	1) Record details of the problem. For your record, use of a questionnaire form will facilitate collecting information for proper analysis and diagnosis. 2) Check if the problem described in “Customer questionnaire” actually occurs in the vehicle. (This step should be performed with the customer if possible.) 3) Check for operation of the “EPS” warning lamp referring to ““EPS” Warning Lamp Check: ”. 4) Check for DTC referring to “DTC Check: ”, and then record DTC(s). 5) Clear DTC if any DTC exists referring to “DTC Clearance: ”, and then recheck for DTC. *Is any DTC still detected?*	Go to Step 2.	Go to Step 3.
2	1) Inspect and repair referring to applicable “DTC Table: ”. 2) Clear DTC referring to “DTC Clearance: ”. *Does the trouble recur?*	Go to Step 3.	Go to Step 4.
3	1) Test drive the vehicle and turn the steering wheel fully to the right and left at the stop vehicle. Check if any trouble exists. See WARNING. 2) Inspect and repair basic parts referring to “Steering Symptom Diagnosis: in Section 6A”. 3) If the trouble cannot be repaired in Step 3-2), inspect and repair referring to “P/S System Symptom Diagnosis: ”. *Does the trouble recur?*	Go to Step 5.	Go to Step 4.
4	1) Confirm if the problem is solved and the P/S system is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once and perform the test drive in Step 3-1), and then confirm that no DTC is indicated. *Is any malfunction DTC detected?*	Go to Step 5.	END.
5	1) Check for DTC referring to “DTC Check: ”. *Is any DTC detected?*	Go to Step 2.	Go to Step 3.

NOTE:

- **As execution of "DTC Clearance: " will clear all DTCs, be sure to record all DTCs before service.**
- **DTC C1122 is indicated when ignition switch is at ON position and engine is not running, it means that nothing is abnormal.**
- **Current DTC and history DTC can be identified by condition of the "EPS" warning lamp. "EPS" warning lamp operates as follows.**

	Current DTC is set. (Abnormality exists at present.)	**Only history DTC is set. (Faulty condition occurred once in the past, but normal condition is detected at present.)**	**Current and history DTC exist.**
"EPS" warning lamp after engine started	Remains ON.	Turns OFF.	Remains ON.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

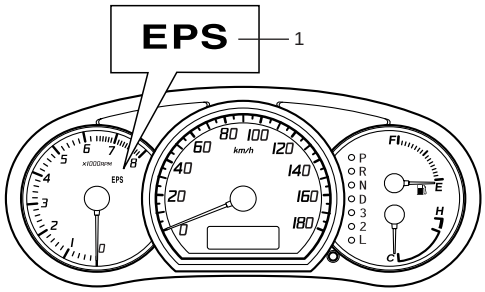
Problem Symptoms	• Steering wheel feels heavy • Vehicle pulls to one side during straight driving • Poor recovery from turns • Too much play in steering • Abnormal noise while vehicle is running: from motor, from rack and pinion, other _____ • Other _____
Frequency of Occurrence	• Continuous/Intermittent (times a day, a month)/other _____
Conditions for Occurrence of Problem	• Vehicle at stop & ignition switch ON: • When starting: at initial start only/at every start/Other _____ • Vehicle speed while: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other _____ • Road surface condition: Paved road/rough road/snow-covered road/other _____ • Chain equipment:
Environmental Condition	• Weather: fair/cloudy/rain/snow/other _____ • Temperature: ˚F (˚C)
DTC	• First check: Normal code/malfunction code ( ) • Second check after driving test: Normal code/malfunction code ( )

I3RM0A630005-

"EPS" Warning Lamp Check

S4RS0A6304007

1) Turn ignition switch to ON position (but without running engine) and check if the "EPS" warning lamp (1) lights up. If the lamp dose not light up, go to ""EPS" Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stop: " of the diagnostic flows.
2) Start engine and check if the "EPS" warning lamp turns OFF. If the lamp comes OFF, the P/S system is in good condition.



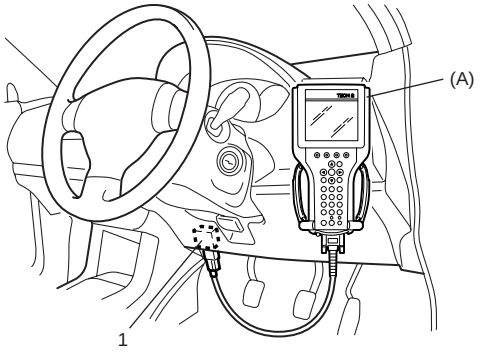
I4RS0A630004-

DTC Check

S4RS0A6304008

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0A630005-

3) Turn ignition switch to ON position.
4) Read DTC according to the instructions displayed on SUZUKI scan tool. For further details, refer to operator's manual for SUZUKI scan tool.

NOTE:

If communication between SUZUKI scan tool and the vehicle can not be established, perform "Serial Data Link Circuit Check: ".

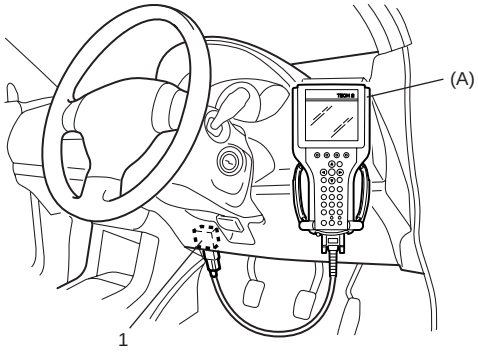
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Clearance

S4RS0A6304009

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0A630005-

3) Turn ignition switch to ON position.
4) Erase DTC according to the instructions displayed on SUZUKI scan tool. For further details, refer to operator's manual for SUZUKI scan tool.
5) After completing the clearance, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Table

S4RS0A6304010

CAUTION:

Be sure to perform the "EPS System Check: " before starting troubleshooting corresponding to each DTC.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
No CODES	Normal	—	—
☞ C1113	Torque sensor main and sub circuit voltage difference high	Difference between voltages from torque sensors at "E52-18" terminal and "E52-6" terminal exceeds specified voltage difference for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1114	Torque sensor 5 V power supply circuit failure	Voltage at "E52-20" terminal (5 V) differs from specified voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1117	Torque sensor failure (signal voltage high)	Voltage at "E52-16" terminal is lower than lower limit voltage for P/S control module diagnosis for specified period or longer after ignition SW is turned ON	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
☞ C1118	Torque sensor failure (signal voltage low)	Voltage at “E52-16” terminal is higher than upper limit voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1119	Torque sensor 12 V power supply circuit failure	Voltage at “E52-8” terminal (12 V) is lower than lower limit voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1121	VSS circuit signal not input (60 seconds or more)	No vehicle speed signal is inputted to P/S control module in either one of the following two conditions 1. More than 60 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 60 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start	1 driving cycle
☞ C1122	Engine speed signal circuit failure	P/S control module detects all the following conditions for 20 seconds or more • Vehicle speed signal 60 km/h (37 mph) or more • Engine speed signal 220 rpm or less	1 driving cycle
☞ C1123	VSS circuit signal not input (30 seconds or more)	No vehicle speed signal is inputted to P/S control module in either one of the following two conditions 1. More than 30 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 30 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start	3 driving cycles
☞ C1124	VSS circuit failure (abnormal deceleration)	Vehicle speed is inputted to P/S control module as having decelerated by more than specified deceleration and lower than 5 km/h vehicle speed continued for 5 seconds after deceleration	1 driving cycle
☞ C1141	Motor circuit voltage abnormal	Voltage at “E51-1” terminal or “E51-2” terminal differs from specified voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1142	Motor circuit current high command with P/S control module target current	Measured value of motor circuit current is 10 A or more higher than specified value of motor circuit current from P/S control module	1 driving cycle
☞ C1143	Motor circuit current excessive	Measured value of motor circuit current is 50 A or more	1 driving cycle
☞ C1145	Motor circuit current low command with P/S control module target current	Measured value of motor circuit current is lower than specified value of motor circuit current from P/S control module	1 driving cycle
☞ C1153	P/S control module power supply circuit failure	Battery voltage is lower than lower limit voltage for P/S control module diagnosis	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
☞ C1155	P/S control module failure	Battery voltage is higher than upper limit voltage for P/S control module diagnosis or internal failure of controller	1 driving cycle

Scan Tool Data

S4RS0A6304011

Scan tool data	Normal condition
☞ BATTERY VOLT	10 – 14 V
☞ TQS POWER SUPPL	7.5 – 10 V
☞ MOTOR VOLT	1.5 – 2 V
☞ TQS MAIN TORQUE	0 N·m
☞ TQS SUB TORQUE	0 N·m
☞ ASSIST TORQUE	0 N·m
☞ MOTOR (CON)	0 A
☞ MOTOR (MON)	0 A
☞ VEHICLE SPEED	0 km/h
☞ ENGINE SPEED	700 ± 50 rpm
☞ IGNITION SWITCH	ON

Scan Tool Data Definitions

BATTERY VOLT
Battery voltage is an analog input signal read by the ECU.

TQS (Torque sensor) POWER SUPPL
This parameter indicates the power supply voltage which the EPS controller supplies to the torque sensor.

MOTOR VOLT
This parameter indicates the voltage between motor terminals.

TQS (Torque sensor) MAIN TORQUE
The torque sensor is installed to detect the steering force and the steering direction. It consists of two potentiometers and the main torque sensor is one of these.

TQS (Torque sensor) SUB TORQUE
The torque sensor is installed to detect the steering force and the steering direction. It consists of two potentiometers and the sub-torque sensor is one of these. Its output characteristics are compared with those of the main torque sensor.

ASSIST TORQUE
This parameter is an internal parameter of the EPS controller. It is obtained by computing the torque sensor input signal.

MOTOR (CON)
Based on the input signal, the EPS controller determines the assist amount and controls the current to the motor suitable for that assist amount. This parameter indicates that control value.

MOTOR (MON)
This parameter indicates the actually measured value of the current flowing to the motor. The motor circuit condition is diagnosed by comparing this parameter with “MOTOR (CON)” parameter described previously.

VEHICLE SPEED
The AC voltage signal produced by the vehicle speed sensor (VSS) is divided and adjusted by the speedometer and thus the vehicle speed signal is obtained. The EPS controller determines the amount of power assist based on this vehicle speed signal and the torque sensor signal.

ENGINE SPEED
Engine speed signal is fed from the ECM so that it can be used for trouble diagnosis of the electric power steering system.

IGNITION SWITCH
This parameter indicates the condition of the power supply through the ignition switch.

P/S System Symptom Diagnosis

S4RS0A6304001

This section describes trouble diagnosis of the P/S system parts whose trouble is not indicated by the on-board diagnostic system (self-diagnostic function). When no malfunction is indicated by the on-board diagnostic system (self-diagnosis function) and assuredly those steering basic parts as described in “Steering Symptom Diagnosis: in Section 6A” are all in good condition, check the following power steering system parts which may be a possible cause for each symptom of the steering.

Condition	Possible cause	Correction / Reference Item
Steering wheel feels heavy (Perform “Steering Force Check: ” before diagnosis.)	Steering wheel installed improperly (twisted)	*Install steering wheel correctly.*
	Poor performance of torque sensor	*Check torque sensor referring to “Torque Sensor Inspection: ”.*
	Poor performance of motor	*Check motor referring to “Motor Assembly Inspection: ”.*
	Steering gear case assembly faulty	*Replace.*
	Poor performance of VSS	*Check VSS referring to “DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: in Section 1A”.*
Vehicle pulls to one side during straight driving	Poor performance of torque sensor	*Check torque sensor referring to “Torque Sensor Inspection: ”.*
Poor recovery after turns	Poor performance of torque sensor	*Check torque sensor referring to “Torque Sensor Inspection: ”.*
	Steering column faulty	*Replace.*

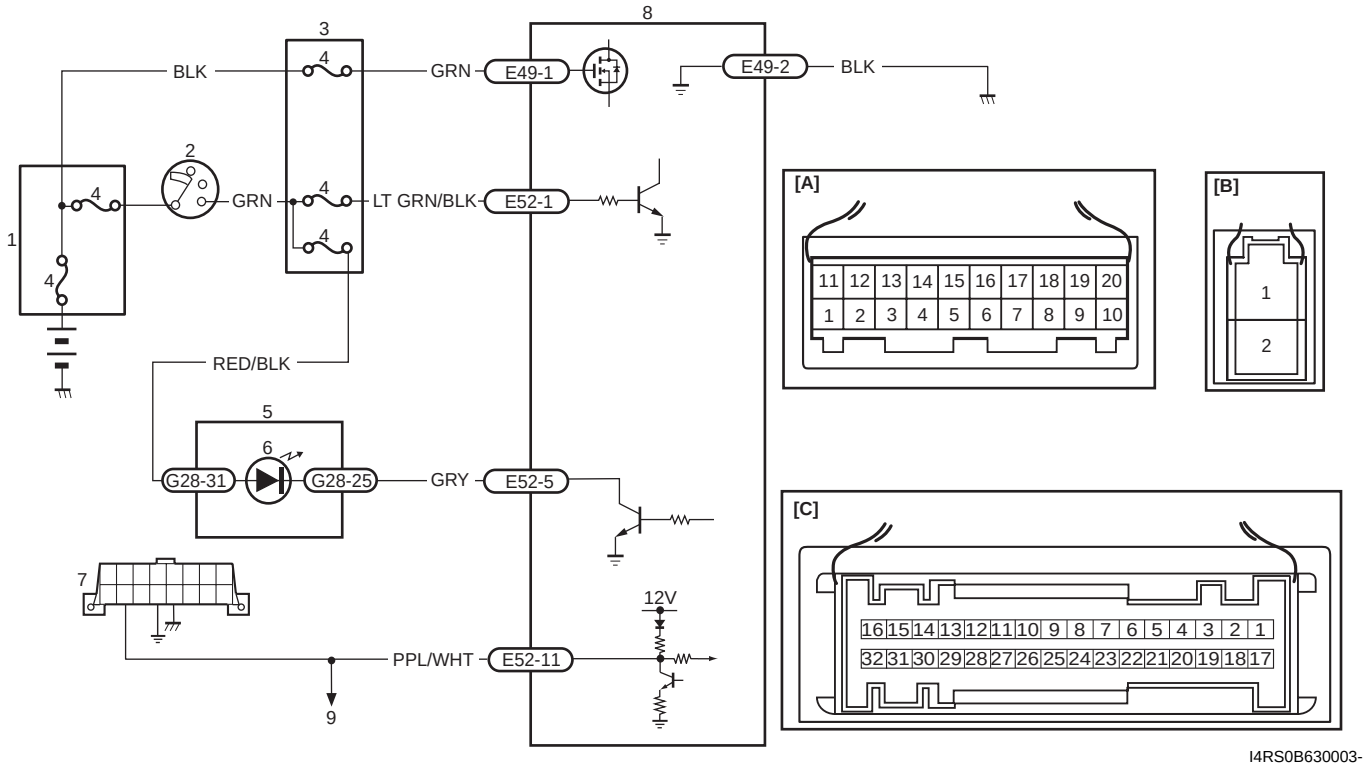
Serial Data Link Circuit Check

S4RS0A6304012

CAUTION:

Be sure to perform “EPS System Check: ” before starting “Troubleshooting”.

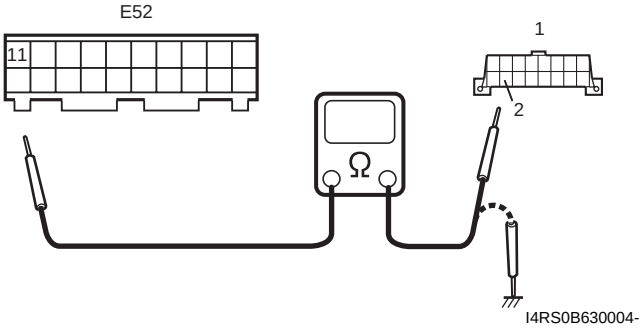
Wiring Diagram



I4RS0B630003-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	6. “EPS” warning lamp
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	7. Date link connector (DLC)
[C]: Connector “G28” (viewed from harness side)	4. Fuse	8. P/S control module
1. Main fuse	5. Combination meter	9. To ECM, BCM, Air bag SDM and ABS hydraulic unit/control module assembly

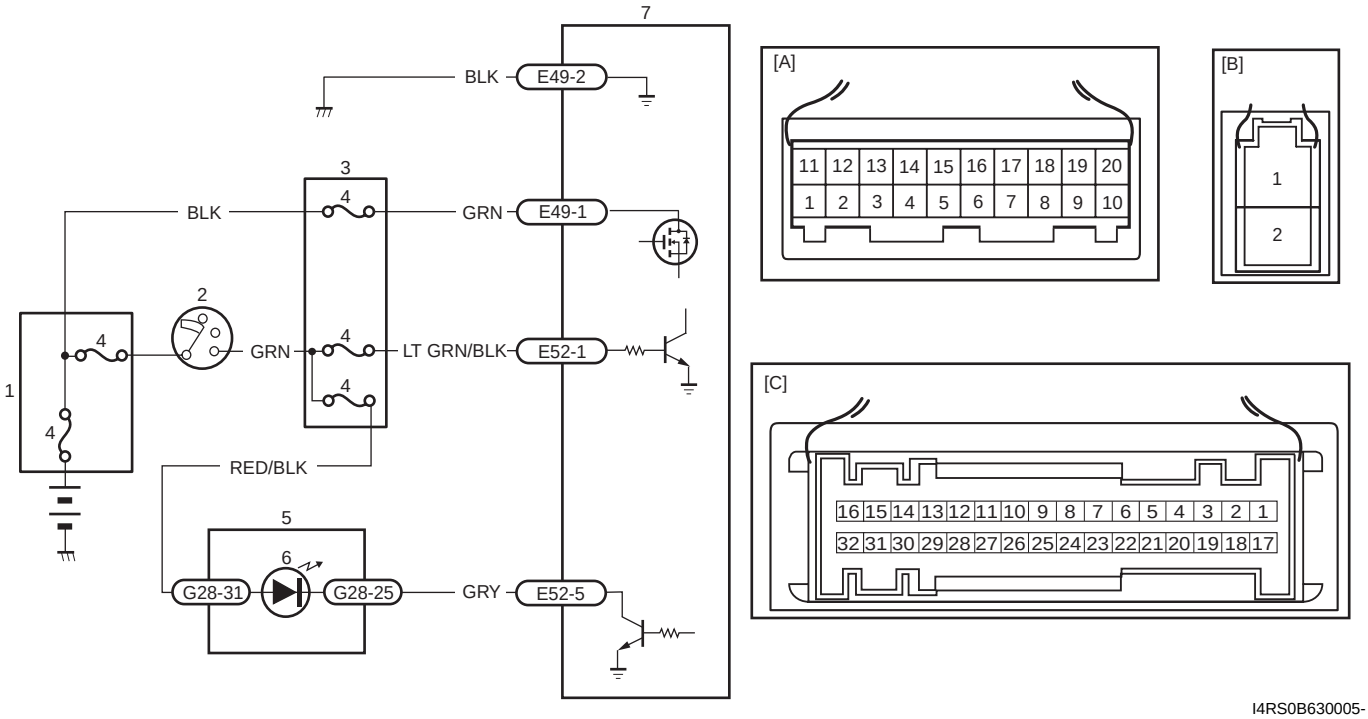
Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check: ".
2	1) Make sure that SUZUKI scan tool is free from malfunction and that correct program card (software) for P/S system is used. 2) Turn ignition switch to OFF position. 3) Check proper connection of SUZUKI scan tool to DLC. *Is connection in good condition?*	Go to Step 3.	Connect SUZUKI scan tool to DLC properly.
3	1) Check if communication is possible by making communication with other controllers (ECM, ABS hydraulic unit/control module assembly (if equipped) or SDM) or other vehicles. *Is it possible to communicate with the other controllers?*	Go to Step 4.	Repair open in common section of serial data circuit ("PPL/WHT" wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit ("PPL/WHT" wire circuit).
4	1) With ignition switch at OFF position, disconnect "E52" connector from P/S control module. 2) Check proper connection at "E52-11" ("PPL/WHT" wire) terminal (2) for serial data circuit. 3) If OK, then check for high resistance, open or short to power circuit or ground in "PPL/WHT" wire circuit for P/S system.  *Is check result in good condition?*	Substitute a known-good P/S control module and recheck.	Repair "PPL/WHT" wire circuit for P/S system.

“EPS” Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stop

S4RS0A6304013

Wiring Diagram



I4RS0B630005-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	6. “EPS” warning lamp
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	7. P/S control module
[C]: Connector “G28” (viewed from harness side)	4. Fuse	
1. Main fuse	5. Combination meter	

Circuit Description

Operation (ON/OFF) of “EPS” warning lamp is controlled by P/S control module through combination meter.
If the P/S system is in good condition, P/S control module turns “EPS” warning lamp ON at the ignition switch ON, and then turns it OFF at the engine start. If an abnormality in the system is detected, “EPS” warning lamp is turned ON continuously by P/S control module. If P/S control module is disconnected, “EPS” warning lamp is not turned ON.

Troubleshooting

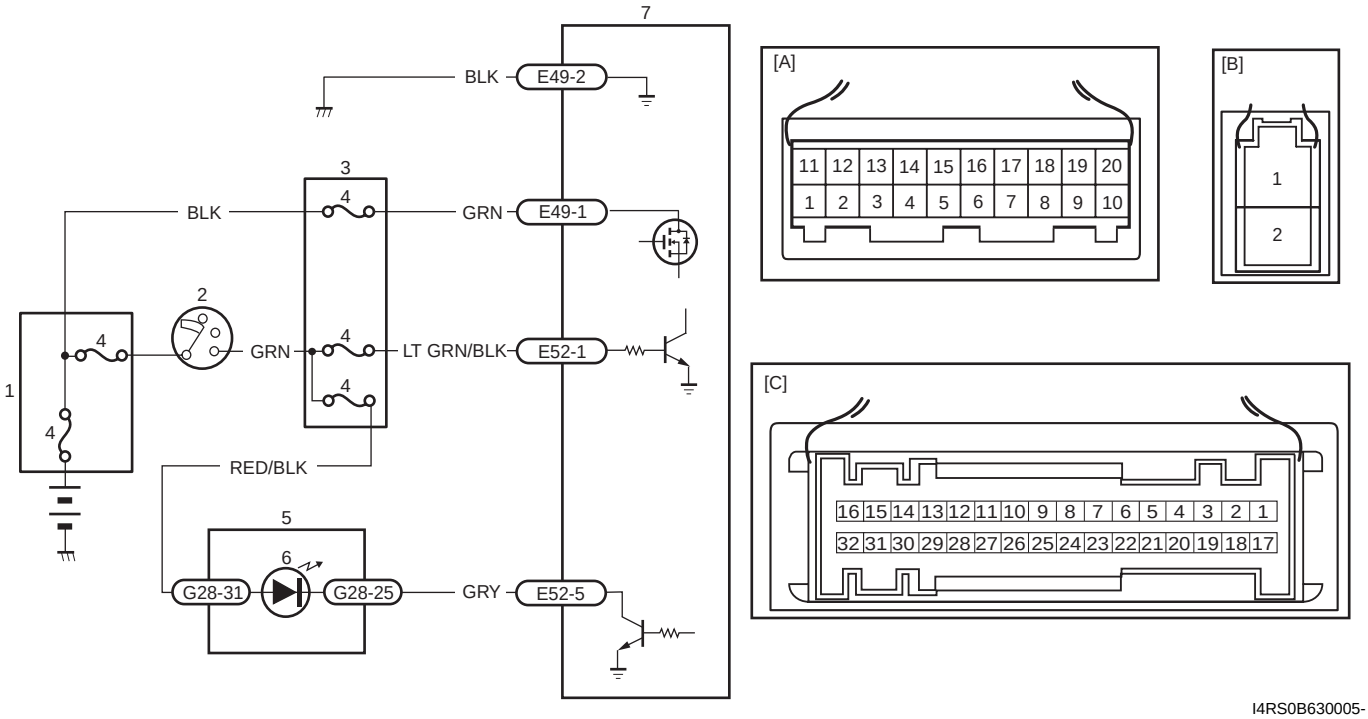
Step	Action	Yes	No
1	1) Turn ignition switch ON. *Do the other warning lamps come on?*	Go to Step 2.	“GRN”, “RED/BLK” wire circuit or ciruit fuse for combination meter open or short to ground.
2	1) Turn ignition switch OFF. 2) Remove and inspect the circuit fuse for P/S control module. *Is fuse in good condition?*	Reinstall fuse, and then go to Step 3.	Check “GRN” wire circuit for short to ground. If OK, replace fuse.
3	1) With ignition switch OFF, disconnect P/S control module connector (“E49”). 2) Check for proper connection to the P/S control module at “E49-2” terminal. 3) Measure resistance between “E49-2” (“BLK” wire) terminal and body ground. *Is it infinite (∞)?*	“BLK” wire circuit open.	Go to Step 4.

Step	Action	Yes	No
4	1) Check for proper connection to P/S control module at "E49-1" terminal. 2) If OK, check for voltage between "E49-1" ("GRN" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 5.	"BLK" or "GRN" wire circuit open or short to ground.
5	1) Check for proper connection to the P/S control module at "E52-1" terminal. 2) If OK, check voltage between "E52-1" ("LT GRN/BLK" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 6.	"LT GRN/BLK" wire circuit open or short to ground.
6	1) Remove combination meter and disconnect combination meter connector ("G28") with ignition switch turned OFF. 2) Check for proper connection to the combination meter at "G28-31" terminal. 3) If OK, check voltage between "G28-31" ("RED/BLK" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 7.	"RED/BLK" wire circuit open or short to ground.
7	1) Check for proper connection to the combination meter at "G28-25" terminal and P/S control module at "E52-5" terminal. 2) Measure resistance between the combination meter at "G28-25" terminal and the P/S control module at "E52-5" terminal. *Is it infinite (∞)?*	"GRY" wire circuit open.	Connect combination meter connector ("G28") with ignition switch turned OFF. Go to Step 8.
8	1) Check for voltage between "E52-5" ("GRY" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Replace the P/S control module.	Replace the combination meter.

“EPS” Warning Lamp Come ON Steady and Engine Start

S4RS0A6304014

Wiring Diagram



I4RS0B630005-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	6. “EPS” warning lamp
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	7. P/S control module
[C]: Connector “G28” (viewed from harness side)	4. Fuse	
1. Main fuse	5. Combination meter	

Circuit Description

Operation (ON/OFF) of “EPS” warning lamp is controlled by P/S control module through combination meter.
If the P/S system is in good condition, P/S control module turns “EPS” warning lamp ON at the ignition switch ON, and then turns it OFF at the engine start. If an abnormality in the system is detected, “EPS” warning lamp is turned ON continuously by P/S control module. If P/S control module is disconnected, “EPS” warning lamp is not turned ON.

Troubleshooting

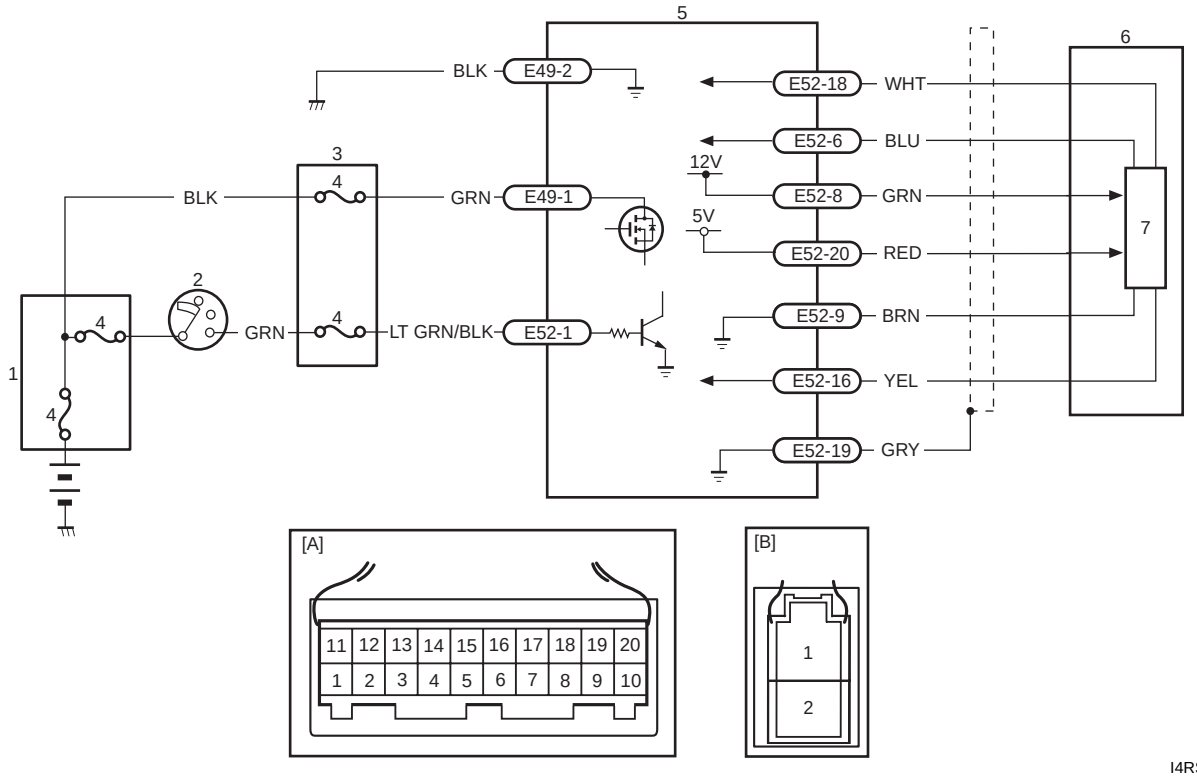
Step	Action	Yes	No
1	1) Perform DTC check. *Is there any DTC (NO CODES on SUZUKI scan tool)?*	Go to Step 5 of “EPS System Check: ”.	Go to Step 2.
2	1) With ignition switch OFF, disconnect P/S control module connector (“E52”). 2) Check for proper connection to the P/S control module at “E52-5” terminal. 3) If OK then ignition switch ON. *Does EPS warning lamp turn on?*	Connect P/S control module connector (“E52”) with ignition switch turned OFF. Go to Step 3.	Replace the P/S control module.
3	1) Remove combination meter and disconnect combination meter connector (“G28”). 2) Check for proper connection to combination meter at “G28-25” terminal. 3) If OK then ignition switch ON. *Does EPS warning lamp turn on?*	Replace the combination meter.	“GRY” wire circuit short to ground.

DTC C1113 / C1117 /C1118: Torque Sensor Circuit Failure

S4RS0A6304015

DTC C1113: Torque Sensor Main and Sub Circuit Voltage Difference High
DTC C1117: Torque Sensor Failure (Signal Voltage High)
DTC C1118: Torque Sensor Failure (Signal Voltage Low)

Wiring Diagram



I4RS0B630006-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	6. Torque sensor
1. Main fuse	4. Fuse	7. Torque sensor amplifier

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1113: Difference between voltages from torque sensors at “E52-18” terminal and “E52-6” terminal exceeds specified voltage difference for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic) **DTC C1117:** Voltage at “E52-16” terminal is lower than lower limit voltage for P/S control module diagnosis for specified period or longer after ignition SW is turned ON (1 driving cycle detection logic) **DTC C1118:** Voltage at “E52-16” terminal is higher than upper limit voltage for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic)	• Torque sensor • P/S control module

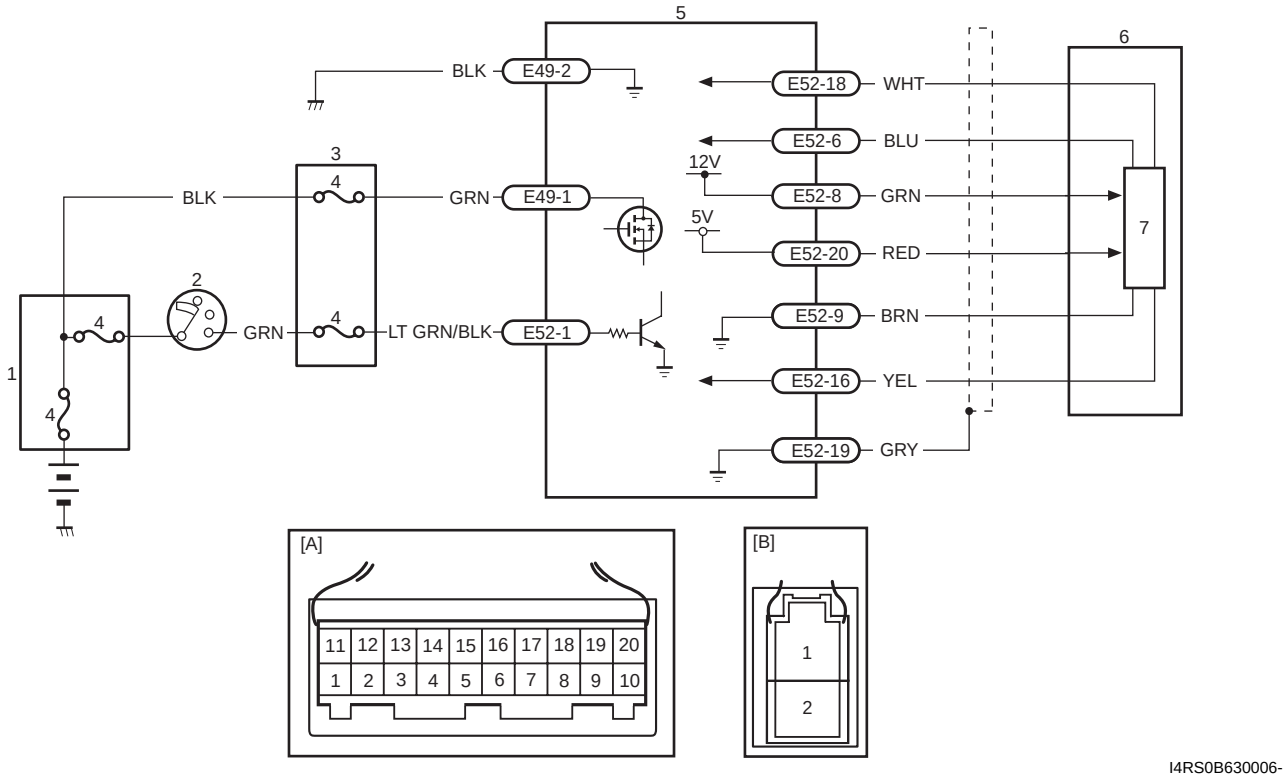
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	*Is DTC C1114 and/or DTC C1119 indicated, too?*	Go to “DTC C1114: Torque Sensor 5 V Power Supply Circuit Failure: ” and/or “DTC C1119: Torque Sensor 12 V Power Supply Circuit Failure: ”.	Go to Step 3.
3	1) Check P/S control module connector (“E52”) for proper connection. 2) If OK, then check for high resistance, open or short to power circuit or ground in “WHT”, “BLU” and “YEL” wire circuit for P/S control module to torque sensor. *Is check result in good condition?*	Go to Step 4.	Repair “WHT”, “BLU” and/or “YEL” wire circuit for P/S control module to torque sensor.
4	1) Check torque sensor and its circuit referring to “Torque Sensor Inspection: ”. *Is torque sensor in good condition?*	Substitute the original P/S control module with a known-good P/S control module, and then recheck.	Replace the steering gear case assembly, and then recheck.

DTC C1114: Torque Sensor 5 V Power Supply Circuit Failure

S4RS0A6304016

Wiring Diagram



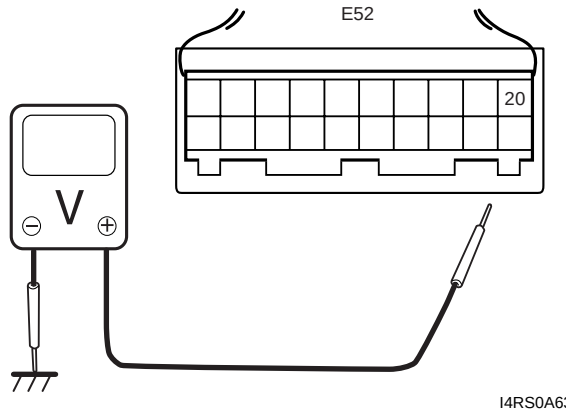
I4RS0B630006-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	6. Torque sensor
1. Main fuse	4. Fuse	7. Torque sensor amplifier

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage at “E52-20” terminal (5 V) differs from specified voltage for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic)	• High resistance, open or short in torque sensor circuit • Torque sensor • P/S control module

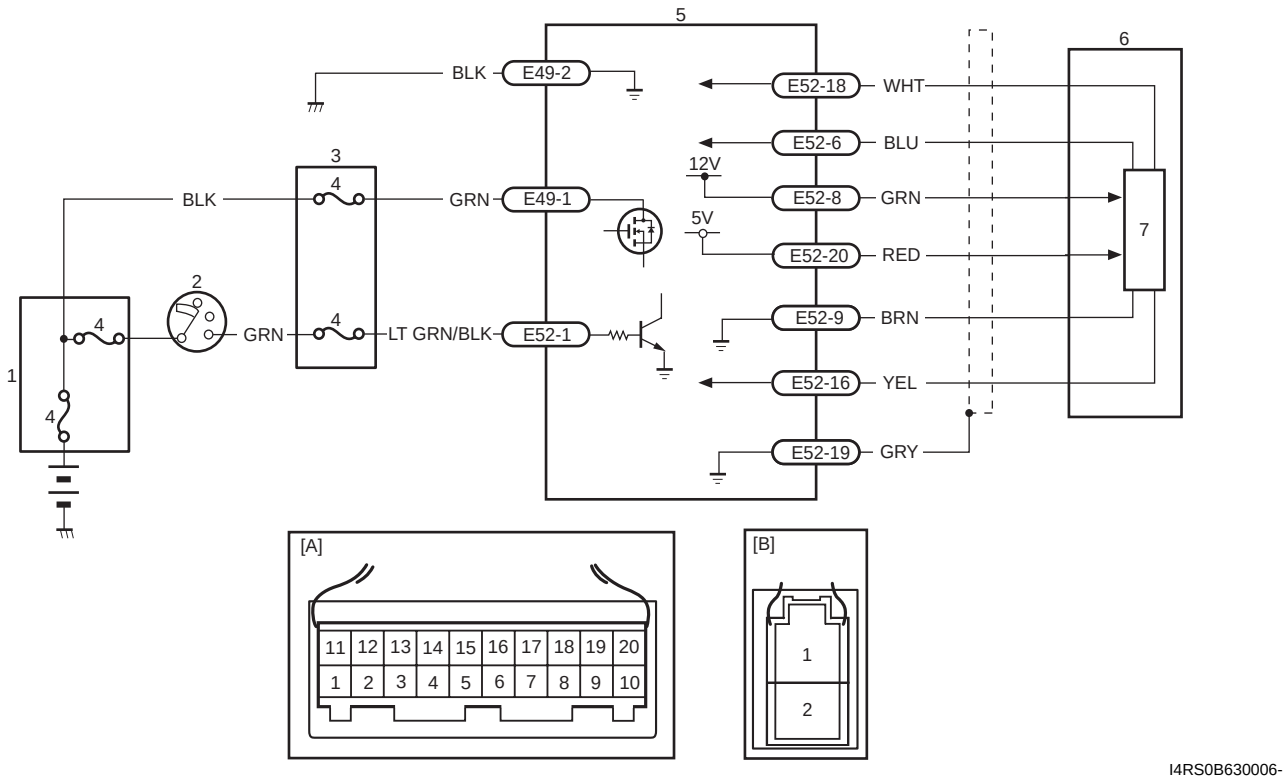
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	*Is DTC C1153 and/or DTC C1155 indicated, too?*	Go to “DTC C1153: P/S Control Module Power Supply Circuit Failure: ” and/or “DTC C1155: P/S Control Module Failure: ”.	Go to Step 3.
3	1) Remove console box. 2) Check P/S control module connector (“E52”) for proper connection. 3) If OK, turn ignition switch ON. 4) Check for voltage between “E52-20” (“RED” wire) terminal and body ground with connector (“E52”) connected to the P/S control module (1).  *Is it about 5 V?*	Go to Step 4.	Repair high resistance, open or short to power circuit or ground in 5 V power supply (“RED” wire) circuit.
4	1) Check torque sensor and its circuit referring to “Torque Sensor Inspection: ”. *Is torque sensor in good condition?*	Check P/S control module power and ground circuit. If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Replace the steering gear case assembly, and then recheck.

DTC C1119: Torque Sensor 12 V Power Supply Circuit Failure

S4RS0A6304020

Wiring Diagram



I4RS0B630006-

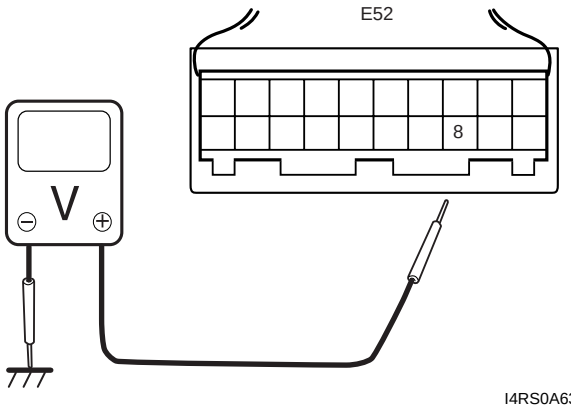
[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	6. Torque sensor
1. Main fuse	4. Fuse	7. Torque sensor amplifier

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage at “E52-8” terminal (12 V) is lower than lower limit voltage for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic)	• High resistance, open or short in torque sensor circuit • Torque sensor • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	*Is DTC C1153, too?*	Go to “DTC C1153: P/S Control Module Power Supply Circuit Failure: ”.	Go to Step 3.

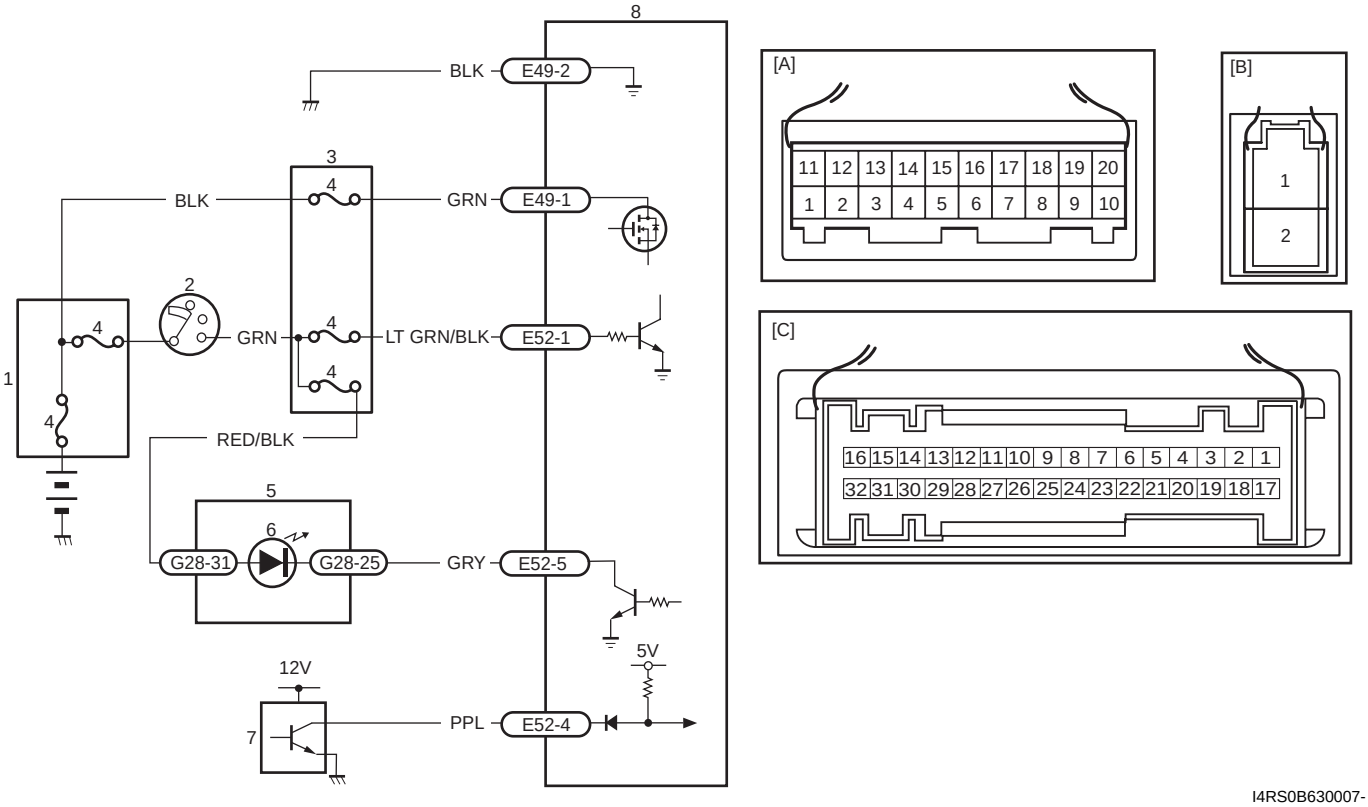
Step	Action	Yes	No
3	1) Remove console box. 2) Check P/S control module connector (“E52”) for proper connection. 3) If OK, turn ignition switch ON. 4) Check for voltage between “E52-8” (“GRN” wire) terminal and body ground with connector (“E52”) connected to the P/S control module.  I4RS0A630021- *Is it about 12 V?*	Go to Step 4.	Repair high resistance, open or short to power circuit or ground in 12 V power supply (“GRN” wire) circuit.
4	1) Check torque sensor and its circuit referring to “Torque Sensor Inspection: ”. *Is torque sensor in good condition?*	Substitute the original P/S control module with a known-good P/S control module, and then recheck.	Replace the steering gear case assembly, and then recheck.

DTC C1121 / C1123 / C1124: VSS Circuit Failure

S4RS0A6304017

DTC C1121: VSS Circuit Signal Not Input (60 Seconds or More)
DTC C1123: VSS Circuit Signal Not Input (30 Seconds or More)
DTC C1124: VSS Circuit Failure (Abnormal Deceleration)

Wiring Diagram



I4RS0B630007-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	6. “EPS” warning lamp
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	7. VSS
[C]: Connector “G28” (viewed from harness side)	4. Fuse	8. P/S control module
1. Main fuse	5. Combination meter	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1121: No vehicle speed signal is inputted to P/S control module in either one of the following two conditions (1 driving cycle detection logic) 1. More than 60 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 60 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start **DTC C1123:** No vehicle speed signal is inputted to P/S control module in either one of the following two conditions (3 driving cycle detection logic) 1. More than 30 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 30 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start **DTC C1124:** Vehicle speed is inputted to P/S control module as having decelerated by more than specified deceleration and lower than 5 km/h vehicle speed continued for 5 seconds after deceleration (1 driving cycle detection logic)	• High resistance, open or short in VSS circuit • VSS • ECM • P/S control module

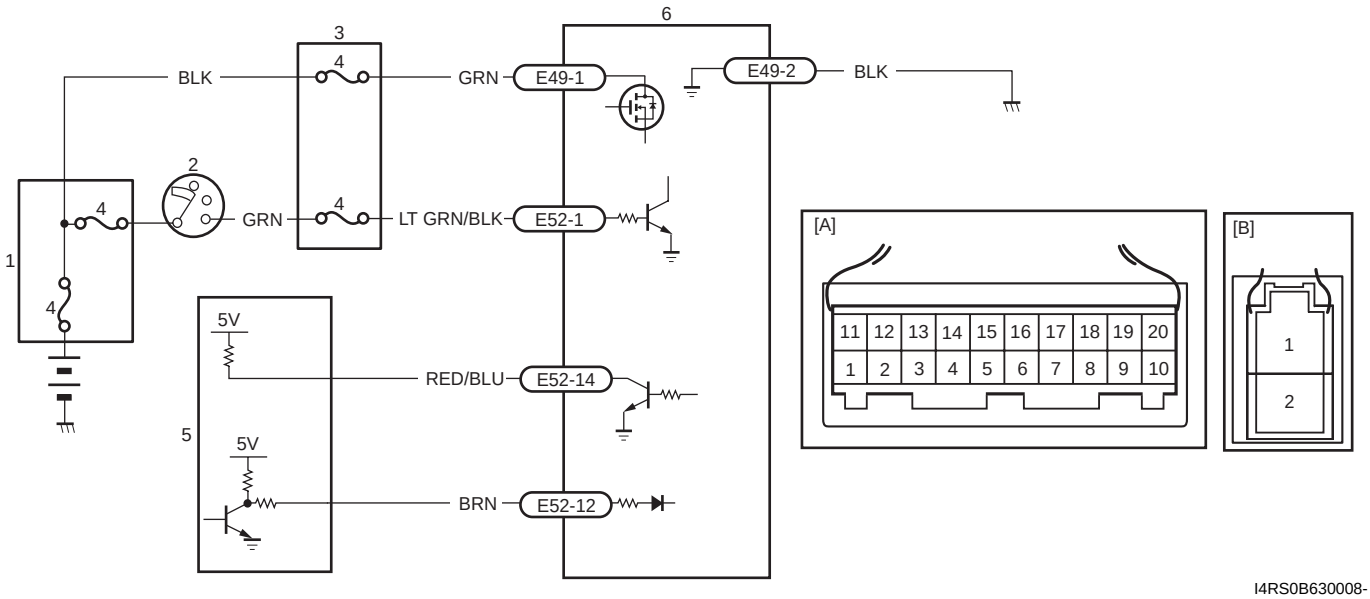
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check: ".
2	DTC Check for ECM referring to "DTC Check: in Section 1A". *Is DTC P0500 detected?*	Go to "DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: in Section 1A".	Go to Step 3.
3	1) Check for proper connection to the P/S control module and ECM at each "PPL" wire terminal (P/S control module side: "E52-4" terminal, ECM side: Refer to "ECM Input / Output Circuit diagram" under "Electronic Control System Description: in Section 1A"). 2) If they are OK, check for high resistance, open or short to power circuit or ground in "BRN" wire circuit. *Is check result in good condition?*	Check P/S control module power and ground circuit. If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Repair "PPL" wire circuit.

DTC C1122: Engine Speed Signal Circuit Failure

S4RS0A6304018

Wiring Diagram



I4RS0B630008-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. ECM
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	6. P/S control module
1. Main fuse	4. Fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P/S control module detects all the following conditions for 20 seconds or more (1 driving cycle detection logic) • Vehicle speed signal 60 km/h (37 rpm) or more • Engine speed signal 220 rpm or more	• High resistance, open or short in engine speed circuit • ECM • P/S control module

DTC Troubleshooting

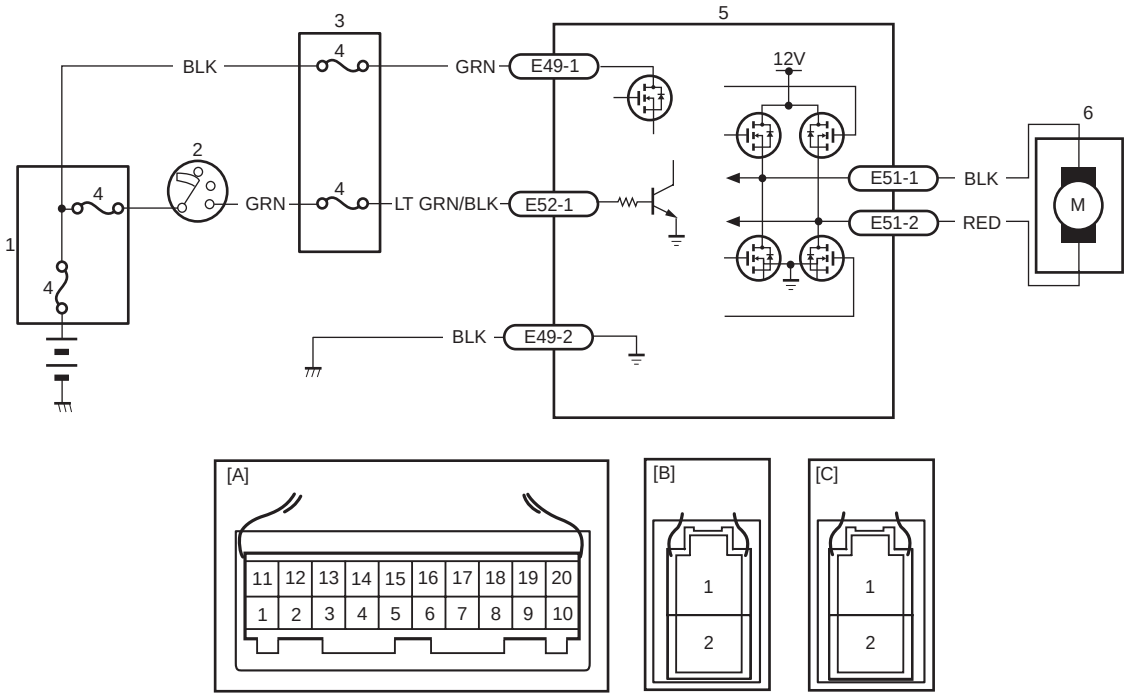
Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	1) Clear DTC(s) referring to “DTC Clearance: ”. 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to “DTC Check: ”. *Is DTC C1122 still detected?*	Go to Step 3.	Check intermittent trouble referring to “Intermittent and Poor Connection Inspection: in Section 00”.
3	DTC Check for ECM referring to “DTC Check: in Section 1A”. *Is DTC P0340 detected?*	Go to “DTC P0340: Camshaft Position (CMP) Sensor Circuit: in Section 1A”.	Go to Step 3.
4	1) Check for proper connection to the P/S control module and ECM at each “BRN” wire terminal (P/S control module side: “E52-12” terminal, ECM side: Refer to “ECM Input / Output Circuit diagram” under “Electronic Control System Description: in Section 1A”. 2) If they are OK, check for high resistance, open or short to power circuit or ground in “BRN” wire circuit. *Is check result in good condition?*	Check P/S control module power and ground circuit. If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Repair “BRN” wire circuit.

DTC C1141 / C1142 / C1143 / C1145: Motor Circuit Failure

S4RS0A6304019

DTC C1141: Motor Circuit Voltage Abnormal
DTC C1142: Motor Circuit Current High Command with P/S Control Module Target Current
DTC C1143: Motor Circuit Current Excessive
DTC C1145: Motor Circuit Current Low Command with P/S Control Module Target Current

Wiring Diagram



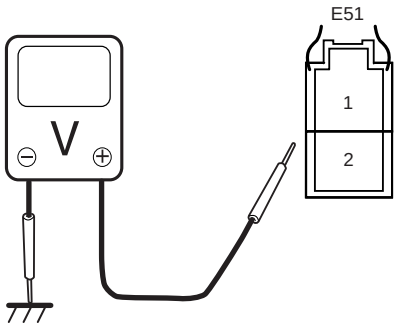
I4RS0B630009-

[A]: Connector “E52” (viewed from harness side)	1. Main fuse	4. Fuse
[B]: Connector “E49” (viewed from harness side)	2. Ignition switch	5. P/S control module
[C]: Connector “E51” (viewed from harness side)	3. Junction block assembly	6. P/S motor

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1141: Voltage at “E51-1” terminal or “E51-2” terminal differs from specified voltage for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic) **DTC C1142:** Measured value of motor circuit current is 10 A or more higher than specified value of motor circuit current from P/S control module (1 driving cycle detection logic) **DTC C1143:** Measured value of motor circuit current is 50 A or more (1 driving cycle detection logic) **DTC C1145:** Measured value of motor circuit current is lower than specified value of motor circuit current from P/S control module (1 driving cycle detection logic)	• High resistance, open or short in P/S motor circuit • P/S motor • P/S control module

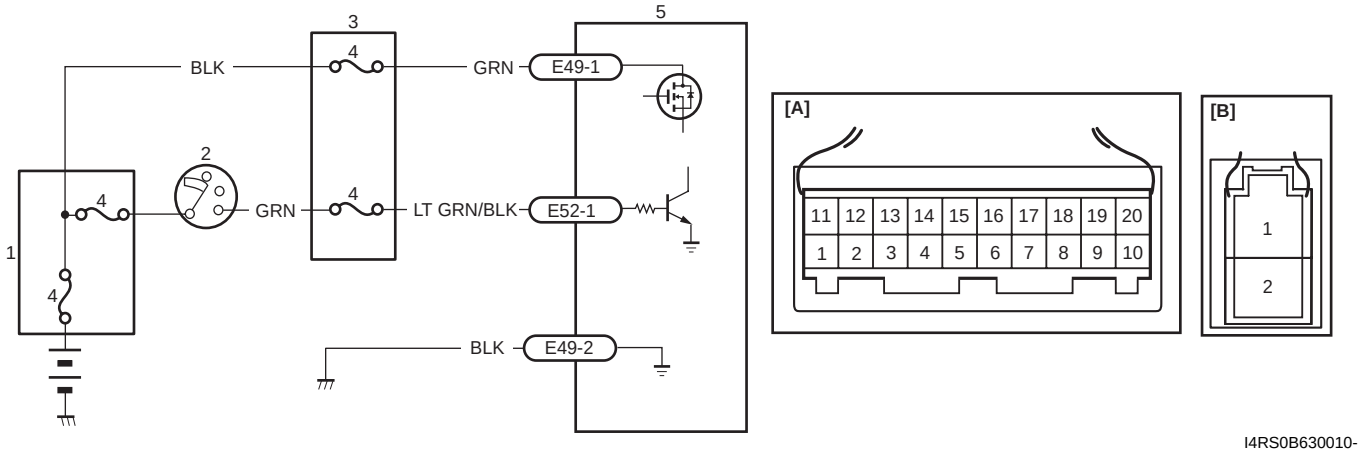
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check: ".
2	*Is DTC C1153 and/or DTC C1155 indicated, too?*	Go to "DTC C1153: P/S Control Module Power Supply Circuit Failure: " and/or "DTC C1155: P/S Control Module Failure: ".	Go to Step 3.
3	1) Remove console box. 2) Check P/S control module connector ("E51") for proper connection. 3) If OK, start engine. 4) Check for voltage between "E51-1" ("BLK" wire) terminal and body ground and "E51-2" ("RED" wire) terminal and body ground with connector ("E51") connected to the P/S control module.  I4RS0A630019- *Are they 5 – 7 V with steering wheel at straight position?*	Go to Step 4.	Repair poor connection, high resistance, open or short to power circuit or ground in "E51-1" ("BLK" wire) or "E51-2" ("RED" wire) circuit and recheck.
4	1) Check motor and its circuit referring to "Motor Assembly Inspection: ". *Is motor in good condition?*	Substitute the original P/S control module with a known-good P/S control module, and then recheck.	Replace the steering gear case assembly, and then recheck.

DTC C1153: P/S Control Module Power Supply Circuit Failure

S4RS0A6304021

Wiring Diagram



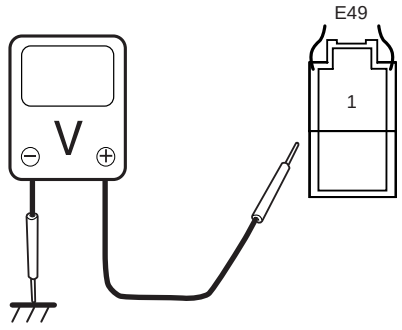
I4RS0B630010-

[A]: Connector "E52" (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector "E49" (viewed from harness side)	3. Junction block assembly	
1. Main fuse	4. Fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Battery voltage is lower than lower limit voltage for P/S control module diagnosis (1 driving cycle detection logic)	• High resistance, open or short in P/S control module power supply circuit • Undercharged Battery • P/S control module

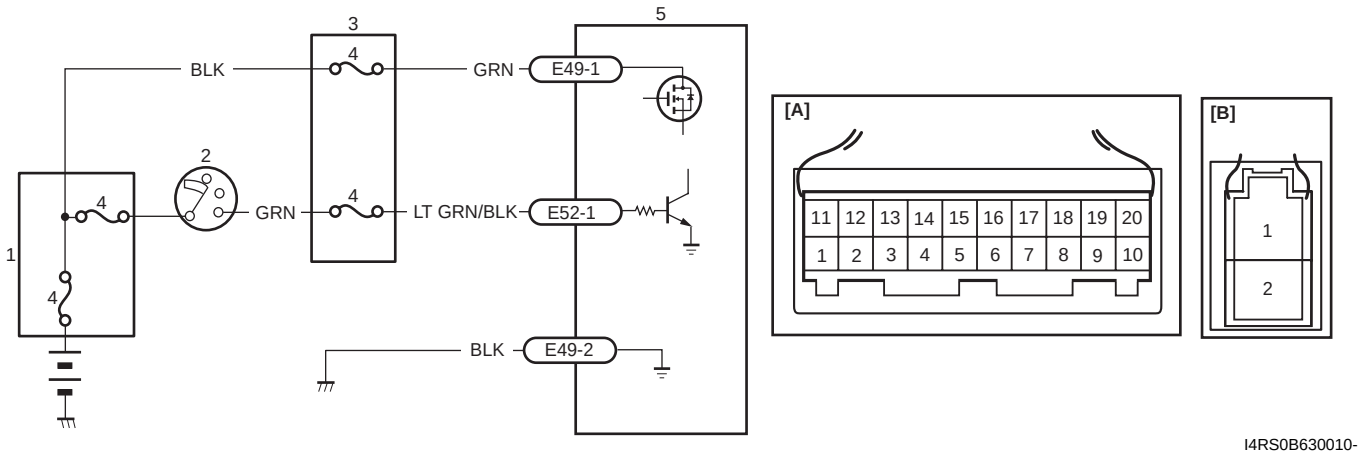
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check: ".
2	1) Check circuit fuse for P/S control module. 2) If OK, measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 10 V or more?*	Go to Step 3.	Check charging system referring to "Generator Test (Undercharged Battery Check): in Section 1J".
3	1) With ignition switch OFF, disconnect P/S control module connector ("E49"). 2) Check for proper connection to the P/S control module at "E49-2" ("BLK" wire) terminal. 3) If OK, then check for high resistance, open or short to power circuit in "BLK" wire circuit. *Is check result in good condition?*	Go to Step 4.	Repair "BLK" wire circuit.
4	1) Remove steering column hole cover with turn ignition switch OFF. 2) Check for proper connection to the P/S control module at "E49-1" ("GRN" wire) terminal. 3) Connect P/S control module connector. 4) If OK, check voltage between "E49-1" terminal and body ground with engine running.  I4RS0A630023- *Is voltage 10 V or more?*	Check for intermittent trouble referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Repair poor connection or high resistance in "E49-1" ("GRN" wire) circuit.

DTC C1155: P/S Control Module Failure

S4RS0A6304022

Wiring Diagram



I4RS0B630010-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	
1. Main fuse	4. Fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Battery voltage is higher than upper limit voltage for P/S control module diagnosis or internal failure of controller (1 driving cycle detection logic)	• Overcharged Battery • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	Measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 15.5 V or less?*	Substitute the original P/S control module with a known-good P/S control module, and then recheck.	Check charging system referring to “Generator Test (Overcharged Battery Check): in Section 1J”.

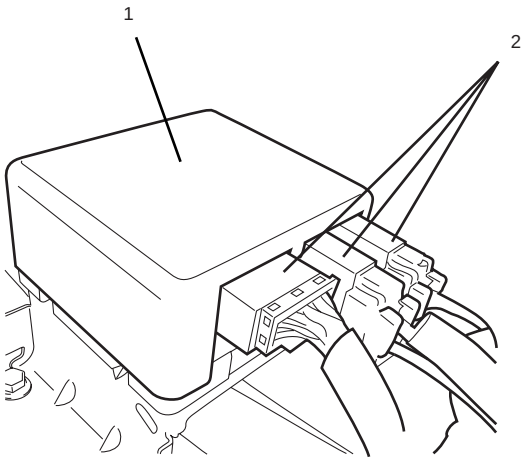
Inspection of P/S Control Module and Its Circuits

S4RS0A6304023

The P/S control module (1) and its circuits can be checked at the P/S control module wiring couplers (2) by measuring voltage and resistance.

CAUTION:

P/S control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to the P/S control module with connectors disconnected from the P/S control module.



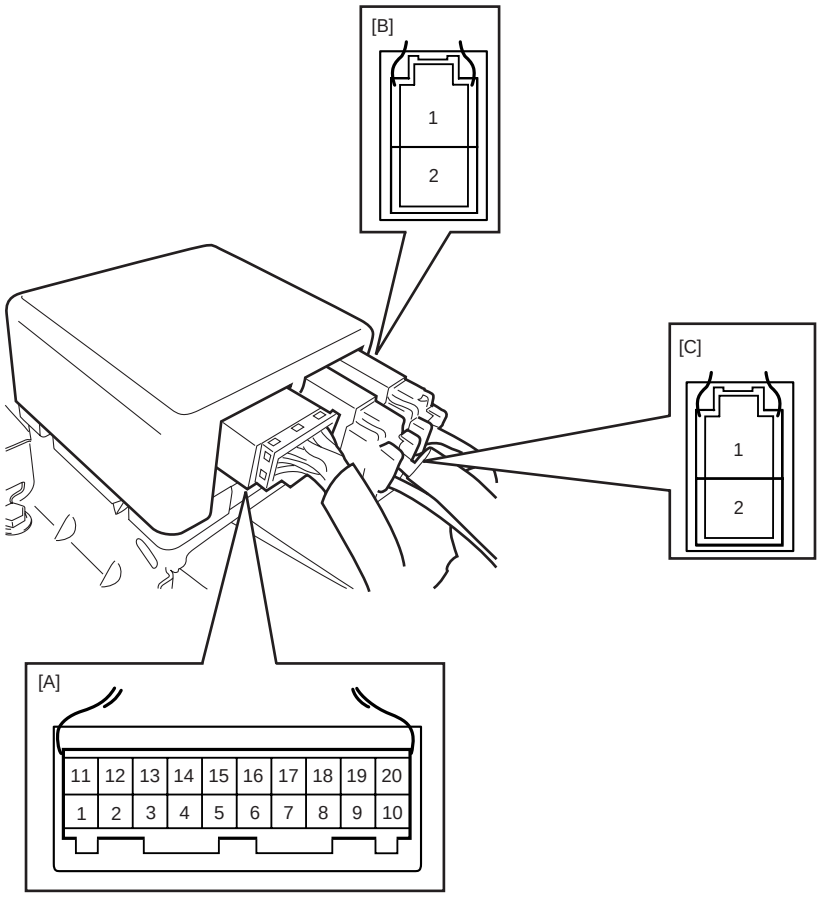
I4RS0A630008-

Voltage Check

1) Remove console box.
2) Check for voltage at each terminal with connectors connected to the P/S control module.

NOTE:

As each terminal voltage is affected by the battery voltage, confirm if the battery voltage is 11 V or more when ignition switch is ON.



I4RS0A630024-

[A]: Connector “E52” (viewed from harness side)
[B]: Connector “E51” (viewed from harness side)
[C]: Connector “E49” (viewed from harness side)

Terminal	Wire color	Circuit	Normal voltage	Condition
E49-1	GRN	P/S control module power supply from battery	10 – 14 V	—
E49-2	BLK	Ground	—	—
E51-1	BLK	Motor output 1	5 – 7 V	Engine idling and steering wheel at straight position
E51-2	RED	Motor output 2	5 – 7 V	Engine idling and steering wheel at straight position
E52-1	LT GRN/BLK	P/S control module power supply from ignition switch	10 – 14 V	Ignition switch ON
E52-2	—	—	—	—
E52-3	—	—	—	—
E52-4	PPL	VSS	*Indicator deflection repeated 0 – 1 V and 10 – 14 V	• Ignition switch ON • Front left tire turned quickly with right tire locked
E52-5	GRY	“EPS” Light	0 V	“EPS” warning lamp ON

Terminal	Wire color	Circuit	Normal voltage	Condition
E52-6	BLU	Torque sensor (Sub)	About 2.5 V	• Ignition switch ON and steering wheel at straight position • Check voltage between “E52-6” and “E52-9” terminals
E52-7	—	—	—	—
E52-8	GRN	12 V power supply for torque sensor	About 12 V	• Ignition switch ON • Check voltage between “E52-8” and “E52-9” terminals
E52-9	BRN	Torque sensor (GND)	0 V	—
E52-10	—	—	—	—
E52-11	PPL/WHT	Data link connector	—	—
E52-12	BRN	Engine speed signal	*Indicator deflection repeated 0 – 1 V and 6 – 10 V	Engine idling
E52-13	—	—	—	—
E52-14	RED/BLU	P/S signal	About 5 V	• Ignition switch ON • Engine idling and turning steering wheel to the right or left as far as it stops
E52-15	—	—	—	—
E52-16	YEL	Torque sensor failure signal	0 V	—
E52-17	—	—	—	—
E52-18	WHT	Torque sensor (Main)	About 2.5 V	• Ignition switch ON and steering wheel at straight position • Check voltage between “E52-18” and “E52-9” terminals
E52-19	GRY	Shield (GND)	—	—
E52-20	RED	5 V power supply for torque sensor	About 5 V	• Ignition switch ON • Check voltage between “E52-20” and “E52-9” terminals

NOTE:

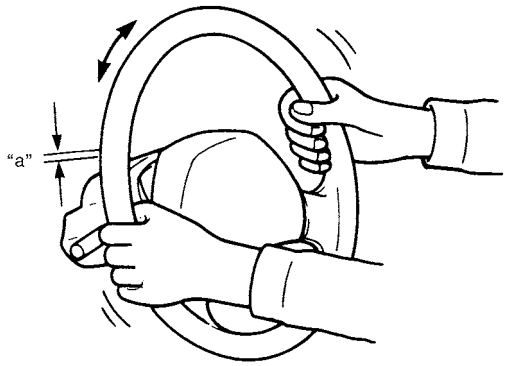
***: The voltage of this circuit may not be checked by voltmeter. If so, use oscilloscope.**

Steering Wheel Play Check

S4RS0A6304002

- Check steering wheel for looseness or rattle by moving it in its shaft direction and lateral direction. If found defective, repair or replace.
- Check steering wheel for play, holding vehicle in straight forward condition on the ground with engine stopped.
  If steering wheel play is not within specification, inspect as follows and replace if found defective.
- Tie-rod end ball stud for wear (Ball stud should move when more than 0.2 N·m (2 kg-cm, 0.44 lb-ft) torque is applied.)
- Lower ball joint for wear
- Steering shaft joint for wear
- Steering pinion or rack gear for wear or breakage
- Each part for looseness

Steering wheel play
"a": 0 – 30 mm (0 – 1.18 in.)



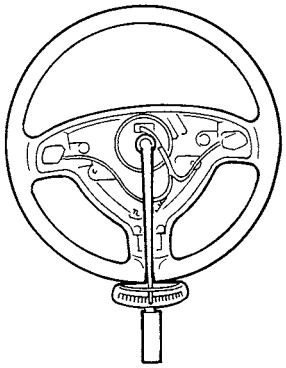
I3RM0A630021-

Steering Force Check

S4RS0A6304003

1) Place vehicle on level road and set steering wheel at straight-ahead position.
2) Check if tire inflation pressure is as specified referring to the tire placard.
3) Remove driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B".
4) Start engine.
5) With engine idling, measure steering force by turning torque wrench.

   Steering force
   Less than 6.4 N·m (0.64 kg-m, 4.6 lb-ft)



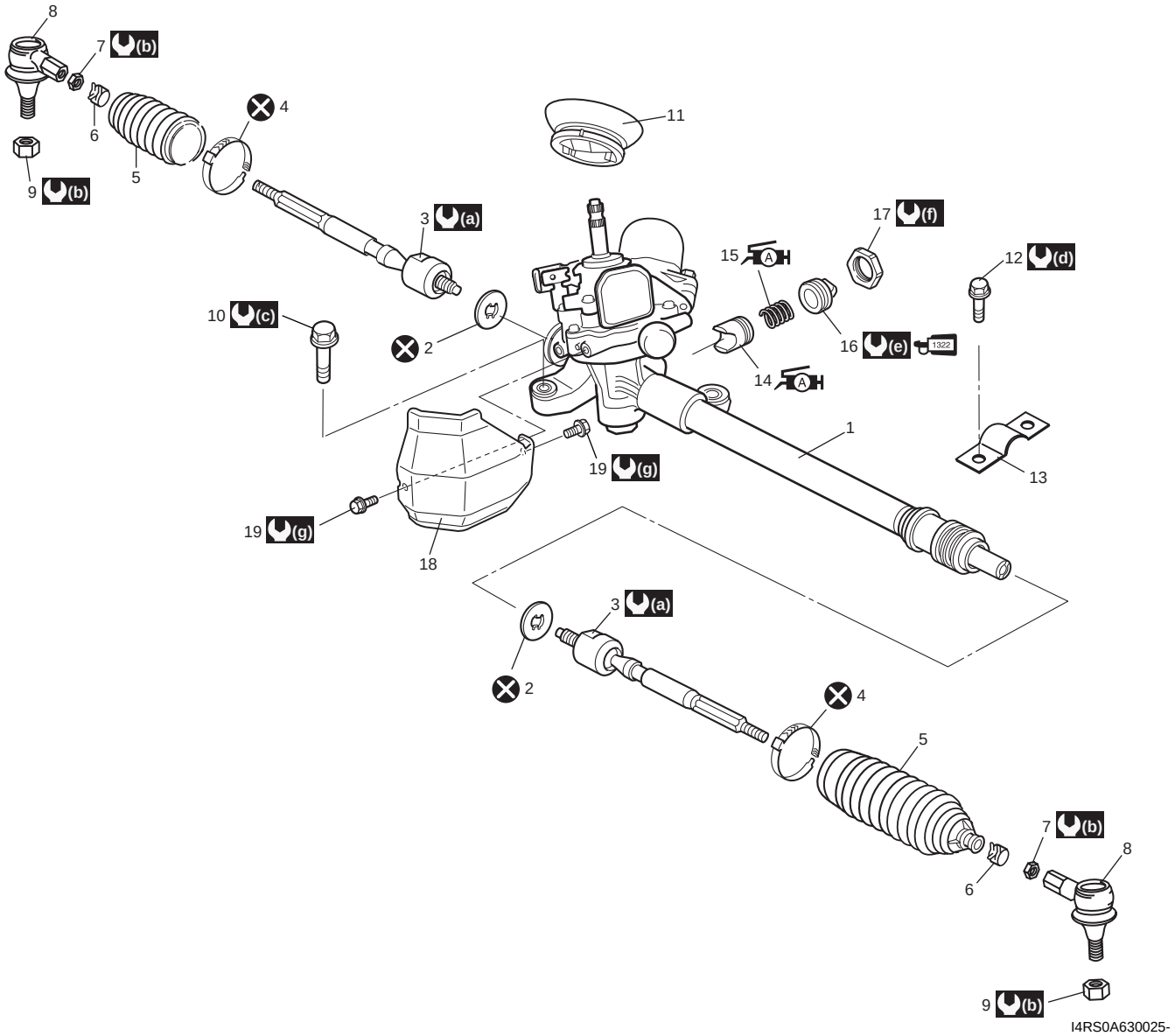
I3RM0A630022-

6) Install driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B".

Repair Instructions

Steering Gear Case Assembly Components

S4RS0A6306020



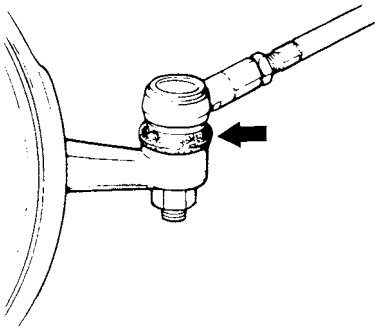
I4RS0A630025-

1. Steering gear case	10. Steering gear case mounting No.1 bolt	19. Heat insulator bolt
2. Tie-rod lock washer	11. Steering gear case grommet	(a) : 93 N·m (9.3 kg-m, 67.5 lb-ft)
3. Tie-rod	12. Steering gear case mounting No.3 bolt	(b) : 45 N·m (4.5 kg-m, 32.5 lb-ft)
4. Band	13. Steering gear case mounting bracket	(c) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
5. Boot	14. Steering rack plunger : Apply grease 99000-25010 to rack plunger.	(d) : 40 N·m (4.0 kg-m, 29.0 lb-ft)
6. Rack boot clip	15. Steering rack plunger spring : Apply grease 99000-25010 to spring end.	(e) : Refer to “Steering Rack Plunger Removal and Installation: ”.
7. Tie-rod end lock nut	16. Steering rack damper screw : Apply thread lock 99000-32110 to all around thread part of rack damper screw.	(f) : 64 N·m (6.4 kg-m, 46.5 lb-ft)
8. Tie-rod end	17. Steering rack damper lock nut	(g) : 9.5 N·m (0.95 kg-m, 7.0 lb-ft)
9. Tie-rod end lock nut	18. Heat insulator	: Do not reuse.

Tie-Rod End Boot On-Vehicle Inspection

S4RS0A6306008

Inspect each boot for tear. If evan a small tear is noted, replace it with a new one.



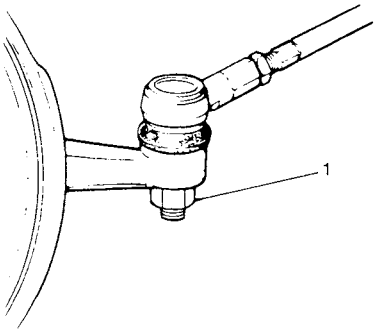
I3RM0A630024-

Tie-Rod End Removal and Installation

S4RS0A6306009

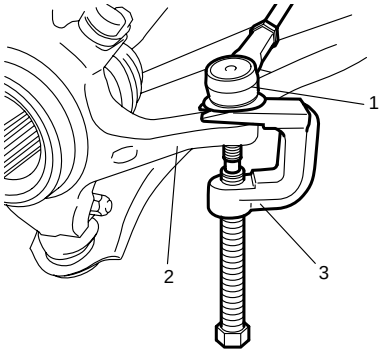
Removal

1) Hoist vehicle, and then remove wheel referring to “Wheel Removal and Installation: in Section 2D”.
2) Remove tie-rod end nut (1) from steering knuckle.



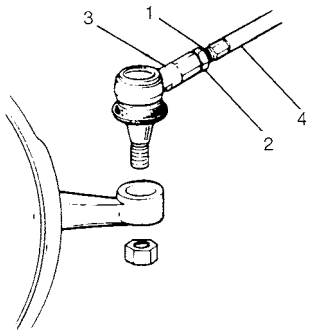
I3RM0A630025-

3) Disconnect tie-rod end (1) from knuckle (2) using puller (3).



I4RS0A630040-

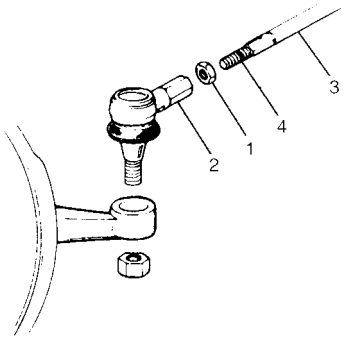
4) For ease of adjustment after installation, make marking (1) of tie-rod end lock nut (2) position on tie-rod end thread. Then, loosen lock nut and remove tie-rod end (3) from tie-rod (4).



I4RS0A630041-

Installation

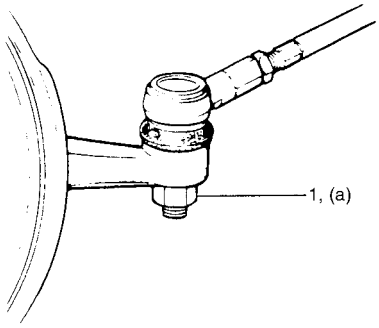
1) Install tie-rod end lock nut (1) and tie-rod end (2) to tie-rod (3). Align lock nut with mark (4) on tie-rod thread.



I4RS0A630042-

2) Connect tie-rod end to knuckle. Tighten tie-rod end nut (1) to specified torque.

Tightening torque
Tie-rod end nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

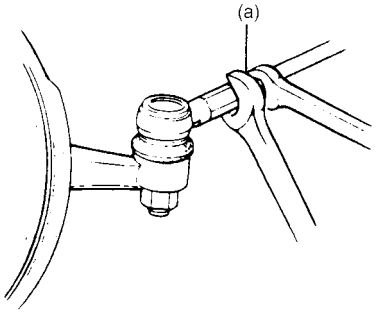


I3RM0A630029-

3) Inspect for proper toe referring to “Front Wheel Alignment Inspection and Adjustment: in Section 2B”.

4) After confirming proper toe, tighten tie-rod end lock nut to specified torque.

Tightening torque
Tie-rod end lock nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)



I3RM0A630030-

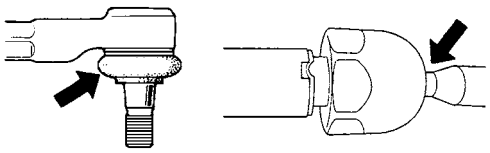
5) Tighten wheel bolts to specified torque and lower hoist.

Tightening torque
Wheel bolt: 85 N·m (8.5 kg-m, 61.5 lb-ft)

Tie-Rod End Inspection

S4RS0A6306010

- Inspect for play in ball joint.
- Inspect for play in rack end ball joint.
  In either case, if found defective, replace.

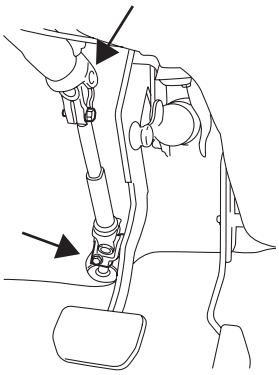


I4RS0A630043-

Steering Shaft Joint On-Vehicle Inspection

S4RS0A6306012

Check shaft joint for wear, breakage and any other damage and replace if any defect exists.



I4RS0A630026-

Steering Gear Case Assembly Removal and Installation

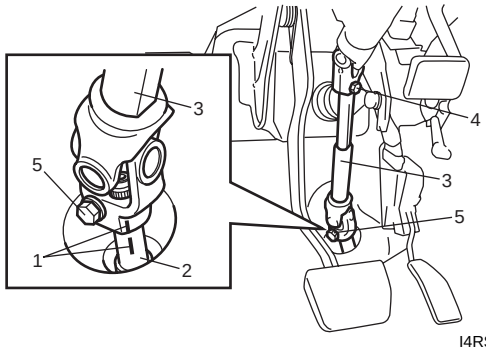
S4RS0A6306013

Removal

CAUTION:

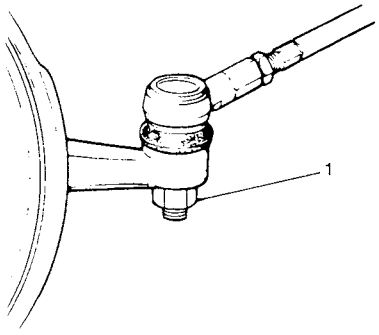
Be sure to set front wheels (tires) in straight direction and remove ignition key from key cylinder before performing the following steps; otherwise, contact coil of air bag system may get damaged.

1) Remove steering joint cover.
2) Make alignment marks (1) on pinion shaft (2) and joint of steering lower shaft (3) for a guide during reinstallation.
3) Loosen joint bolt (steering column side) (4) and remove joint bolt (pinion shaft side) (5) and disconnect steering lower shaft (3) from pinion shaft (2).



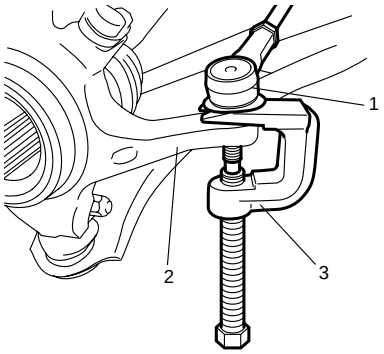
I4RS0B630013-

4) Hoist vehicle and remove both wheels referring to “Wheel Removal and Installation: in Section 2D”.
5) Remove tie-rod nuts (1) from both steering knuckles.



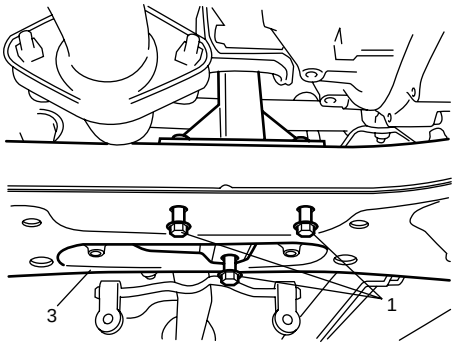
I3RM0A630025-

6) Disconnect both tie-rod ends (1) from knuckles (2), using puler (3).



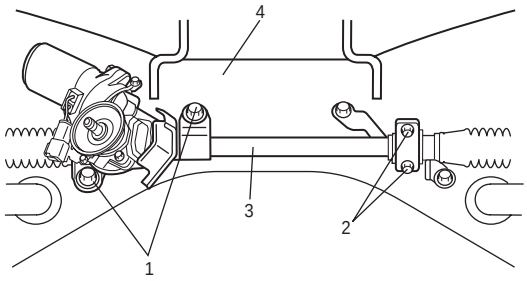
I4RS0A630040-

7) To remove the steering gear case assembly easily, lower the engine with transmission, but don't remove.
8) Support engine with transaxle by supporting device and then remove engine rear mounting bolt (1).



I4RS0A630028-

9) Remove front suspension frame with steering gear case assembly referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
10) Remove steering gear case mounting No.1 bolts (1), No.3 bolts (2) and gear case bracket, then remove gear case (3) from front suspension frame (4).

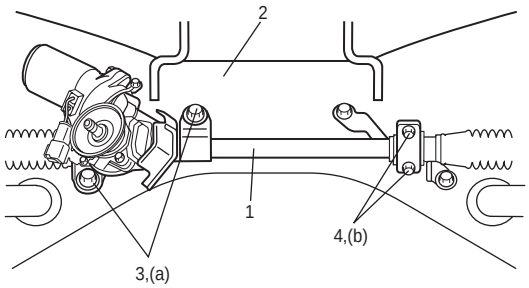


I4RS0A630029-

Installation

1) Mount steering gear case (1) to front suspension frame (2) and tighten gear case mounting No.1 bolts (3) and No.3 bolts (4) to specified torque.

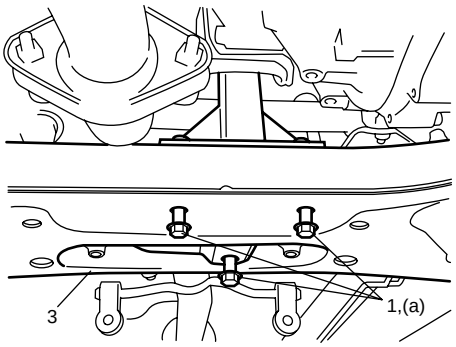
Tightening torque
Steering gear case mounting No.1 bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
Steering gear case mounting No.3 bolt (b): 40 N·m (4.0 kg-m, 29.0 lb-ft)



I4RS0A630030-

2) Install front suspension frame with steering gear case assembly referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
3) Install engine rear mounting bolt (1).

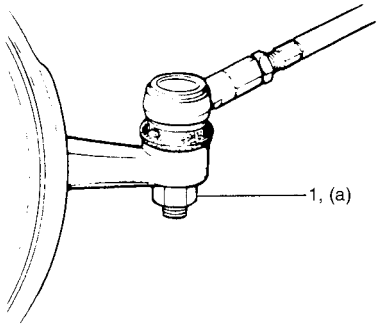
Tightening torque
Engine rear mounting bracket bolt (a): 55 N·m (5.5 kg-m, 40 lb-ft)



I4RS0A630031-

4) Remove supporting device.
5) Install tie-rod ends to knuckles (right & left). Tighten each tie-rod end nut (1) to specified torque.

Tightening torque
Tie-rod end nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

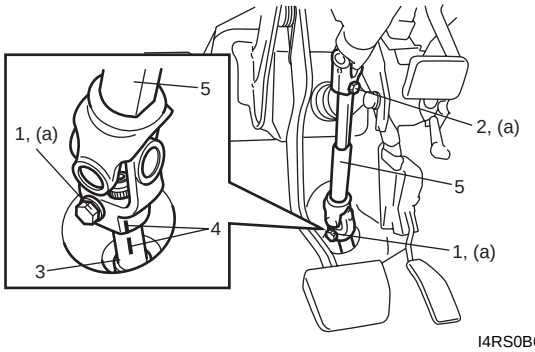


I3RM0A630029-

6) Be sure that steering wheel and brake discs (right & left) are all straight-ahead position and then insert steering lower shaft (5) into steering pinion shaft (3) with matching marks (4).

7) Tighten steering shaft joint lower bolt (1) and upper bolt (2) to specified torque (Lower side first and then upper side).

Tightening torque
Steering shaft joint bolt (a): 25 N·m (2.5 kg-m, 18.5 lb-ft)



I4RS0B630016-

8) Install both wheels and tighten wheel bolts to specified torque.

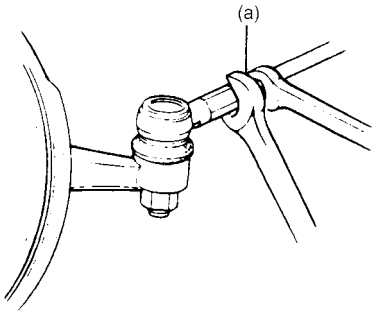
Tightening torque
Wheel bolt: 85 N·m (8.5 kg-m, 61.5 lb-ft)

9) Lower hoist.

10) Check toe setting. Adjust as required refer to “Front Wheel Alignment Inspection and Adjustment: in Section 2B”.

11) Tighten both tie-rod end lock nuts to specified torque.

Tightening torque
Tie-rod end lock nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

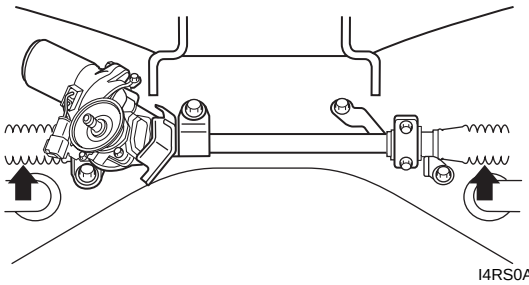


I3RM0A630030-

Steering Rack Boot Inspection

S4RS0A6306014

Hoist vehicle.
Inspect each boot for tear. A torn boot allows entry of dust and water which can cause wear to steering rack and pinion to produce noise as well as rust to result in malfunction of steering system.
If even a small tear is noted, replace with new one.
Also, check each boot for dent. If there is a dent, keep boot in most compressed state for some seconds to correct dent.
Boots should be visually inspected for any damage, dent and tear during every periodical inspection at specified intervals and whenever vehicle is hoisted for any other purpose.



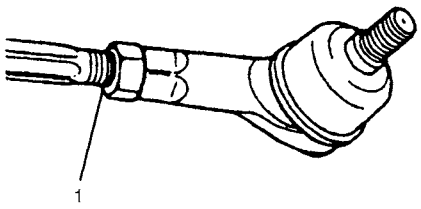
I4RS0A630034-

Tie-Rod / Rack Boot Removal and Installation

S4RS0A6306015

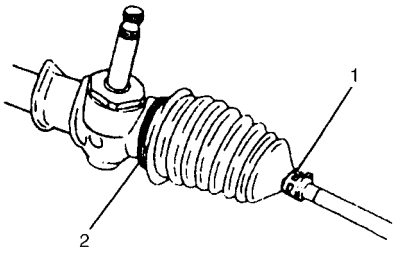
Removal

1) Remove steering gear case assembly referring to “Steering Gear Case Assembly Removal and Installation: ”.
2) For ease of adjustment after installation, make marking (1) of tie-rod end lock nut position of tie-rod thread.



I4RS0A630044-

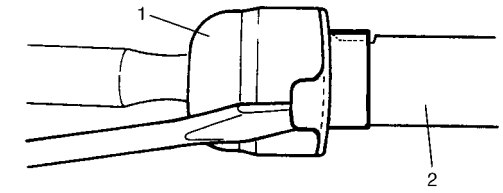
3) Loosen tie-rod end lock nut and remove tie-rod end.
4) Remove boot band (2) and clip (1).
5) Remove boot from tie-rod.

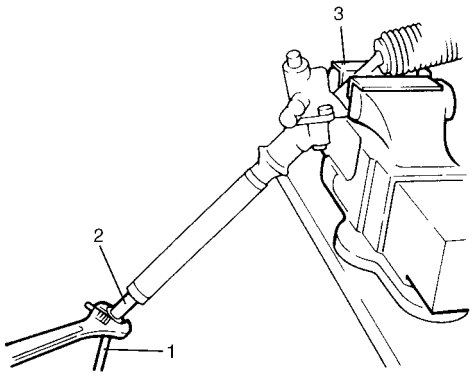


IYSQ01630034-

6) Unbend bent part of tie-rod (1).

7) Hold rack with soft jawed vise (3) and remove tie-rod from rack (2).



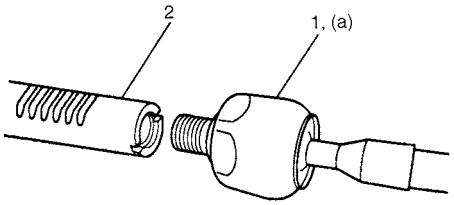


I4RS0A630033-

Installation

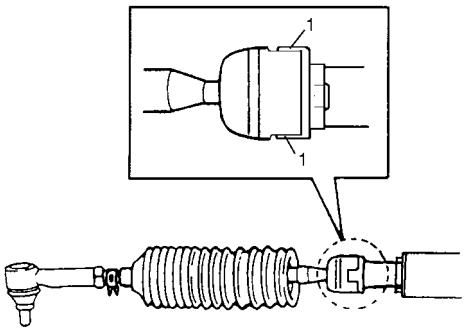
1) Install tie-rod (1) to rack (2).
2) Hold rack with soft jawed vise and tighten tie-rod to specified torque.

Tightening torque
Tie-rod (a): 93 N·m (9.3 kg-m, 67.5 lb-ft)



I3RM0A630048-

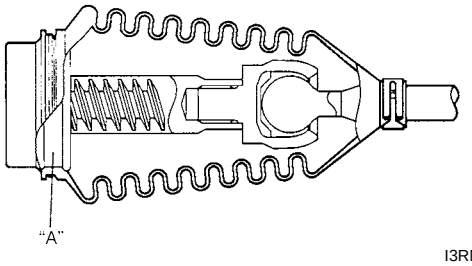
3) Bend lock washer at 2 places (1) as shown in figure.



I4RS0A630035-

4) Apply sealant to gear case groove “A” indicated in the figure. Position boot properly in grooves of gear case (or rack side mount) and tie-rod.
After this, check to ensure that boot is free from twist and dent.

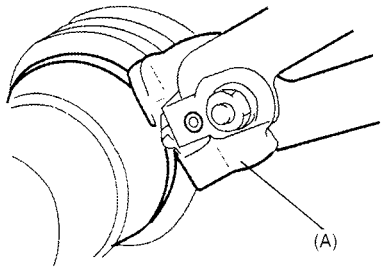
“A”: Sealant 99000–31120



I3RM0A630050-

5) Fasten boot with new band and clip securely.

Special tool
(A): 09943–55010

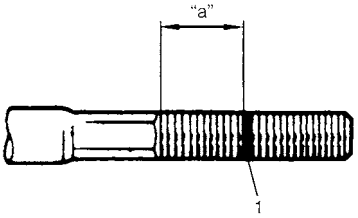


I3RM0A630051-

6) Install tie-rod end lock nut and tie-rod end to tie-rod. Position lock nut to marking (1) made in removal.

NOTE:

When tie-rod was replaced, measure length “a” on removed tie-rod and use it on new replacement tie-rod so as to position lock nut properly.



I3RM0A630052-

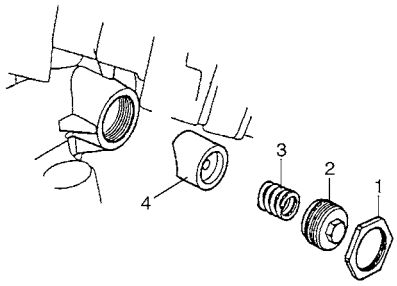
7) Install steering gear case assembly referring to “Steering Gear Case Assembly Removal and Installation: ”.

Steering Rack Plunger Removal and Installation

S4RS0A6306030

Removal

1) Remove gear case assembly referring to “Steering Gear Case Assembly Removal and Installation: ”.
2) Loosen lock nut (1) with holding damper screw (2).
3) Remove lock nut (1), rack damper screw (2), rack plunger spring (3) and rack plunger (4).



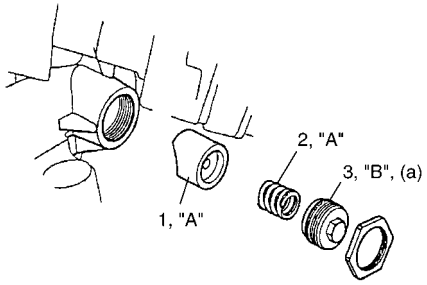
I4RS0A630045-

Installation

1) Apply grease lightly to sliding part of plunger (1) against rack.
2) Install plunger and spring (2) as shown.
3) Apply thread lock cement to rack damper screw (3) and tighten them as follows.
   a) Tighten damper screw to 25 N·m (2.5 kg-m, 18.0 lb-ft).
   b) Loosen damper screw until 180°.
   c) Retighten damper screw to 3.9 N·m (0.39 kg-m, 3.0 lb-ft).
   d) After tightening rack damper screw to specified torque, turn it back by 10° or less.

   “A”: Grease 99000–25050
   “B”: Thread lock cement 99000–32110

   Tightening torque
   Rack damper screw (a): Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft) and loosen 180° and then tighten 3.9 N·m (0.39 kg-m, 3.0 lb-ft) and turn it back by 10° or less by the specified procedure.

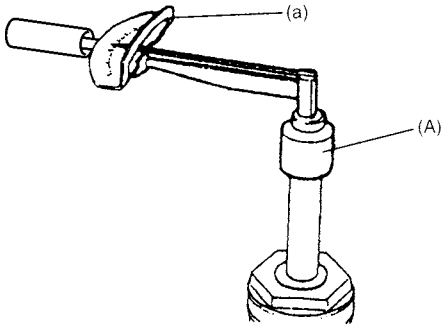


I4RS0A630046-

4) Pinion rotation torque should be checked with rack position centered.
   Also, check if rack as a whole moves smoothly.

   Special tool
   (A): 09944–18310

   Tightening torque
   Rotation torquer of pinion (a): 2.0 N·m (0.2 kg-m, 1.5 lb-ft)



I3RM0A630055-

5) After adjustment, tighten lock nut to specified torque with holding damper screw at the position.

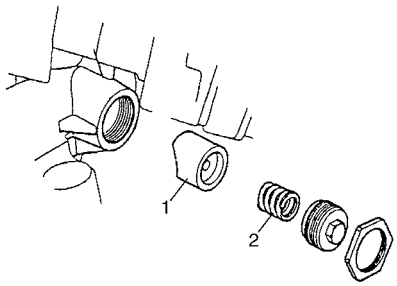
   Tightening torque
   Rack damper screw lock nut (a): 64 N·m (6.4 kg-m, 46.5 lb-ft)

   Install gear case assembly referring to “Steering Gear Case Assembly Removal and Installation: ”.

Steering Rack Plunger Inspection

S4RS0A6306031

- Inspect rack plunger (1) for wear or damage.
- Inspect rack plunger spring (2) for deterioration.



I4RS0A630047-

P/S Control Module Removal and Installation

S4RS0A6306027

Removal

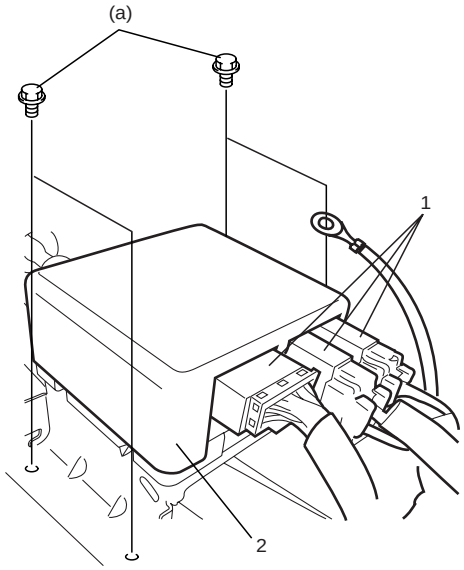
1) Disconnect negative cable at battery.
2) Remove console box.
3) Disconnect connectors (1) from P/S control module.
4) Remove P/S control module (2) from floor panel.

Installation

Reverse removal procedure for installation noting the following.

- Tighten P/S control module screw to the specified torque.

  Tightening torque
  P/S control module mounting bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



I4RS0A630036-

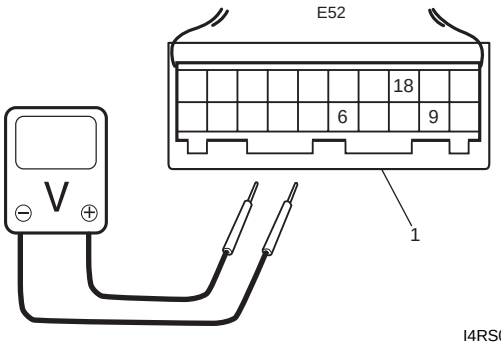
Torque Sensor Inspection

S4RS0A6306028

1) Remove console box.
2) Turn ignition switch to ON position.
3) Check for voltage between terminals of connector (“E52”) with connecting it to P/S control module and not running engine. If check result is not satisfactory, replace steering gear case assembly.

Torque sensor specification

	Steering wheel fully turned right	Steering wheel held at position for run straight	Steering wheel fully turned left
Main sensor (“E52-18” – “E52-9”)	**Approx 5.0 V**	**Approx 2.5 V**	**Approx 0.4 V**
Sub sensor (“E52-6” – “E52-9”)	**Approx 5.0 V**	**Approx 2.5 V**	**Approx 0.4 V**



I4RS0A630037-

1. Connector “E52” (viewed from harness side)

Motor Assembly Inspection

S4RS0A6306029

1) Remove console box.
2) Disconnect motor connector (“E51”) from P/S control module with ignition switch OFF.
3) Check for resistance between terminals of motor connector (“E51”).
   If check result is not as specified, replace steering gear case assembly.

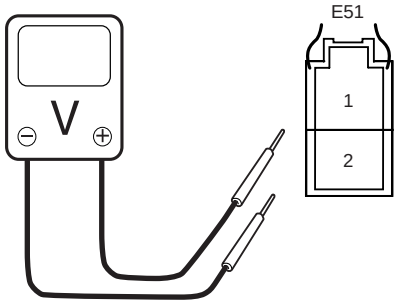
Motor circuit resistance

“E51-1” and “E51-2” (For motor)	**About 1 Ω**

4) Check for continuity between terminal of motor connector (“E51”) and body ground.
   If check result is not as specified, replace steering gear case assembly.

Motor circuit resistance

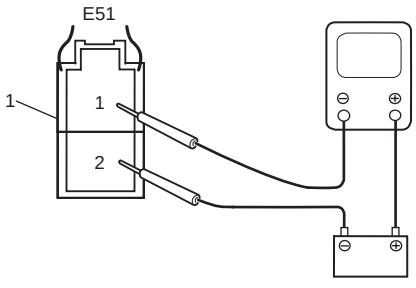
“E51-2” and body ground	**No continuity**



I4RS0A630038-

5) Connect battery (1) between “E51-1” and “E51-2”. Check if motor rotates smoothly, and then measure current between “E51-1” and “E51-2” using ammeter (2) as shown in the figure. If check result is not satisfactory, replace steering gear case assembly.

Motor circuit current (reference value)
Standard: About 0.65 A



I4RS0A630039-

Specifications

Tightening Torque Specifications

S4RS0A6307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Tie-rod end nut	45	4.5	32.5	☞ / ☞
Tie-rod end lock nut	45	4.5	32.5	☞ / ☞
Wheel bolt	85	8.5	61.5	☞ / ☞
Steering gear case mounting No.1 bolt	55	5.5	40.0	☞
Steering gear case mounting No.3 bolt	40	4.0	29.0	☞
Engine rear mounting bracket bolt	55	5.5	40	☞
Steering shaft joint bolt	25	2.5	18.5	☞
Tie-rod	93	9.3	67.5	☞
Rack damper screw	Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft) and loosen 180° and then tighten 3.9 N·m (0.39 kg-m, 3.0 lb-ft) and turn it back by 10° or less by the specified procedure.			☞
Rotation torquer of pinion	2.0	0.2	1.5	☞
Rack damper screw lock nut	64	6.4	46.5	☞
P/S control module mounting bolt	9	0.9	6.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Steering Gear Case Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A6308001

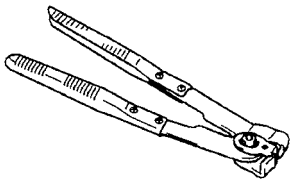
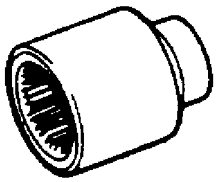
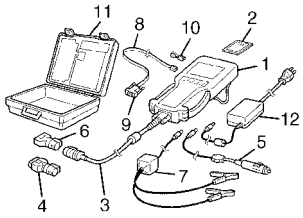
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease E	P/No.: 99000–25050	☞
Sealant	Silicone Sealant	P/No.: 99000–31120	☞
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞

NOTE:

Required service material is also described in the following.
“Steering Gear Case Assembly Components: ”

Special Tool

S4RS0A6308002

09943–55010 Boot clamp plier ☞ 	09944–18310 Pinion torque checking socket ☞ 
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞ 	

Section 7

HVAC

CONTENTS

Precautions 7-1
Precautions 7-1
Precautions on HVAC 7-1

Heater and Ventilation 7A-1
General Description 7A-1
Heater and Ventilation Construction 7A-1
Schematic and Routing Diagram 7A-2
Heater and Ventilation Wiring Circuit Diagram 7A-2
Diagnostic Information and Procedures 7A-3
Heater and Ventilation Symptom Diagnosis 7A-3
Repair Instructions 7A-4
HVAC Unit Components 7A-4
HVAC Unit Removal and Installation 7A-5
Blower Motor Removal and Installation 7A-5
Blower Motor Inspection 7A-5
Blower Motor Resistor Removal and Installation 7A-6
Blower Motor Resistor Inspection 7A-6
HVAC Control Unit Components 7A-7
HVAC Control Unit Removal and Installation 7A-7
Blower Speed Selector Inspection 7A-8
Air Intake Switch Inspection 7A-9
Air Intake Control Actuator Removal and Installation 7A-9
Air Intake Control Actuator Inspection 7A-9
Center Ventilation Louver Removal and Installation 7A-10
Side Ventilation Louver Removal and Installation 7A-10
Air Filter Removal and Installation 7A-11
Air Filter Cleaning 7A-11

Air Conditioning System 7B-1
Precautions 7B-1
A/C System Caution 7B-1
Precautions on Servicing A/C System 7B-1
General Description 7B-3
Refrigerant Type Construction 7B-3
Sub-Cool A/C System Description 7B-3
Schematic and Routing Diagram 7B-5
Major Components of A/C System 7B-5
A/C System Wiring Diagram 7B-6
Diagnostic Information and Procedures 7B-7
A/C System Symptom Diagnosis 7B-7
Abnormal Noise Symptom Diagnosis of A/C System 7B-9
A/C System Performance Inspection 7B-10
A/C System Inspection at ECM 7B-15
Repair Instructions 7B-17
Operation Procedure for Refrigerant Charge 7B-17
Condenser Assembly On-Vehicle Inspection 7B-22
Condenser Assembly Removal and Installation 7B-22
Desiccant Removal and Installation 7B-23
HVAC Unit Components 7B-24
HVAC Unit Removal and Installation 7B-25
Evaporator Inspection 7B-25
Evaporator Thermistor (Evaporator Temperature Sensor) Removal and Installation 7B-25
Evaporator Thermistor (Evaporator Temperature Sensor) Inspection 7B-26
Expansion Valve Removal and Installation 7B-26
Expansion Valve Inspection 7B-27
A/C Refrigerant Pressure Sensor and Its Circuit Inspection 7B-27
A/C Refrigerant Pressure Sensor Removal and Installation 7B-27
A/C Switch Inspection 7B-27
Compressor Relay Inspection 7B-28
Compressor Drive Belt Inspection and Adjustment 7B-28
Compressor Drive Belt Removal and Installation 7B-29
Compressor Assembly Removal and Installation 7B-29
Compressor Assembly Components 7B-30
Magnet Clutch Inspection 7B-30
Magnet Clutch Removal and Installation 7B-30
Relief Valve Inspection 7B-32
Relief Valve Removal and Installation 7B-32
Specifications 7B-33
Tightening Torque Specifications 7B-33
Special Tools and Equipment 7B-34
Recommended Service Material 7B-34
Special Tool 7B-34

Precautions

Precautions

Precautions on HVAC

S4RS0A7000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

A/C System Caution
Refer to “A/C System Caution: in Section 7B”.

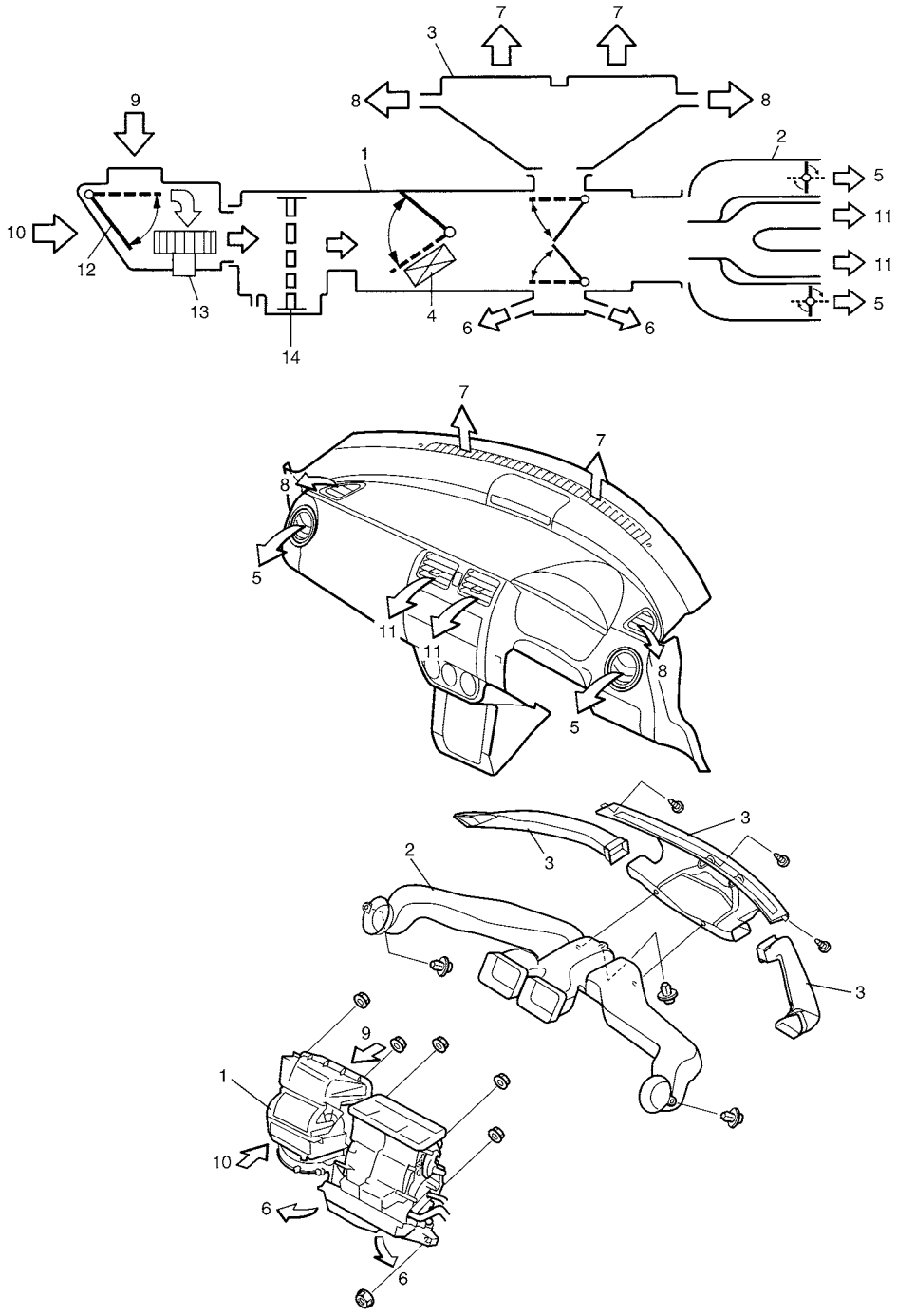
Precautions on Servicing A/C System
Refer to “Precautions on Servicing A/C System: in Section 7B”.

Heater and Ventilation

General Description

Heater and Ventilation Construction

S4RS0A7101001



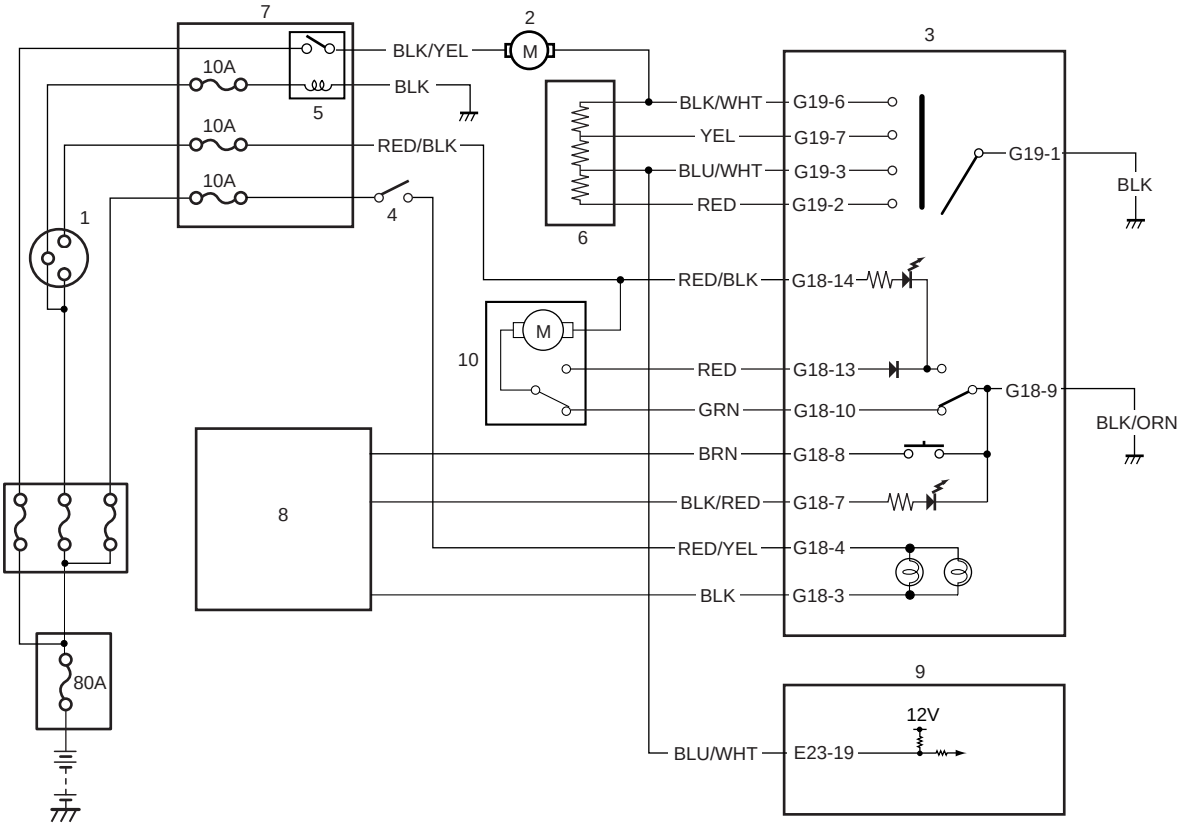
I4RS0A710001-

1. HVAC unit	6. Foot air	11. Center ventilation air
2. Ventilator duct	7. Front defroster air	12. Air intake door
3. Defroster nozzle	8. Side defroster air	13. Blower motor
4. Heater core	9. Fresh air	14. Resistance board
5. Side ventilation air	10. Recirculation air	

Schematic and Routing Diagram

Heater and Ventilation Wiring Circuit Diagram

S4RS0A7102001



I4RS0A710002-

1. Ignition switch	4. Lighting switch	7. Junction block assembly	10. Air intake control actuator
2. Blower motor	5. Blower motor relay	8. BCM	
3. HVAC control unit	6. Blower motor resistor	9. ECM	

Diagnostic Information and Procedures

Heater and Ventilation Symptom Diagnosis

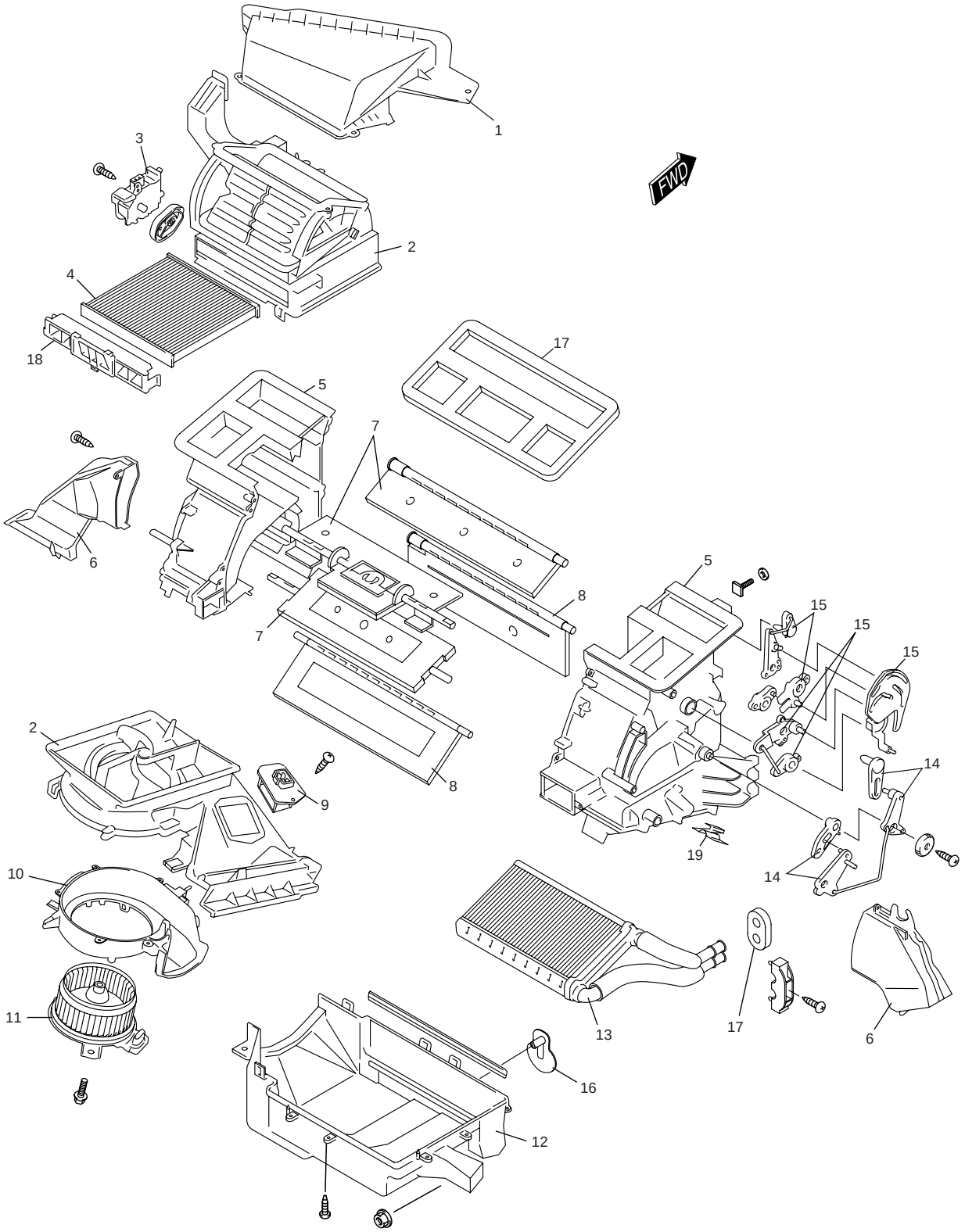
S4RS0A7104001

Condition	Possible cause	Correction / Reference Item
Blower motor does not operate with blower speed selector ON.	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Blower motor resistor faulty	*Check blower motor resistor referring to "Blower Motor Resistor Inspection: ".*
	Blower speed selector faulty	*Check blower speed selector referring to "Blower Speed Selector Inspection: ".*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: ".*
	Wiring or grounding faulty	*Repair as necessary.*
Incorrect temperature output	Temperature control cable broken or bent	*Check temperature control cable.*
	Temperature control lever faulty	*Check temperature control lever.*
	Incorrect installation of temperature control cable	*Check position and adjust it as necessary.*
	Temperature control door assembly broken	*Repair temperature control door assembly.*
	Air ducts clogged	*Repair air ducts.*
	Heater core leaked or clogged	*Replace heater core.*
	Heater hoses leaked or clogged	*Replace heater hoses.*
	Thermostat faulty	*Check thermostat referring to "Thermostat Inspection: in Section 1F".*
Air outlet port does not change or does not agree with airflow selector's position even if airflow selector is changed.	Airflow control cable broken or bent	*Check airflow control cable.*
	Airflow control lever faulty	*Check airflow control lever.*
	Incorrect installation of temperature control cable	*Check position and adjust it as necessary.*
	Airflow control door assembly broken	*Repair airflow control door assembly.*
	Air ducts leaked or clogged	*Repair air ducts.*
Air intake door does not change even if air intake mode is changed.	Air intake door broken	*Repair air intake door.*
	Air intake control actuator faulty	*Check air intake control actuator referring to "Air Intake Control Actuator Inspection: ".*
	Air intake switch faulty	*Check air intake switch referring to "Air Intake Switch Inspection: ".*
	Wiring or grounding faulty	*Repair as necessary.*

Repair Instructions

HVAC Unit Components

S4RS0A7106001



I4RS0A710003-

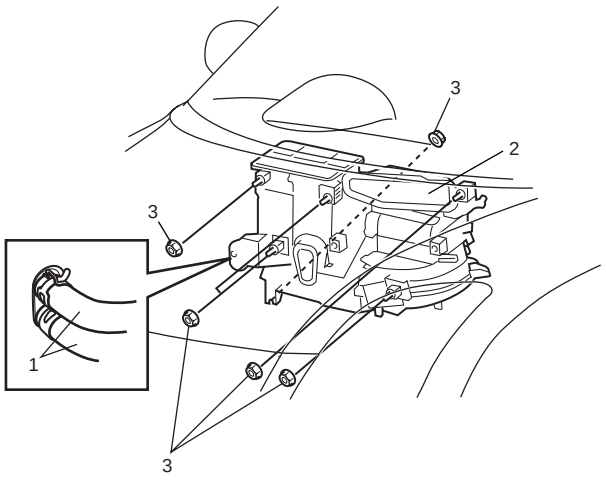
1. Fresh air inlet duct	6. Foot duct	11. Blower motor	16. Drain hose
2. Blower upper case	7. Airflow control door assembly	12. Heater unit lower case	17. Packing
3. Air intake control actuator	8. Temperature control door assembly	13. Heater core	18. Filter cover
4. Air filter	9. Blower motor resistor	14. Temperature control lever	19. Cable lock clamp
5. Heater unit upper case	10. Blower lower case	15. Airflow control lever	

HVAC Unit Removal and Installation

S4RS0A7106002

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove cowl top panel from vehicle body referring to “Cowl Top Components: in Section 9K”.
4) Drain engine coolant, and then disconnect heater hoses (1) from HVAC unit (2).
5) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation: in Section 9C”.
6) Remove nuts (3).
7) Remove HVAC unit from vehicle body.



I4RS0A710004-

Installation

Reverse removal procedure noting the following instructions.

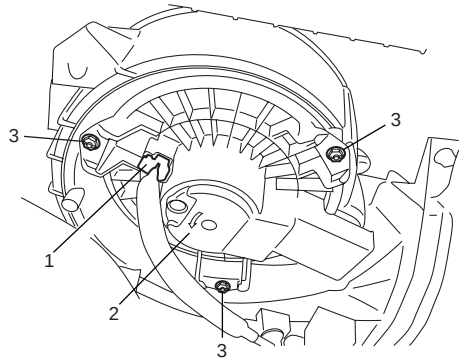
- Be careful not to catch any cable and wiring harness in inappropriate position.
- Adjust control cables of HVAC control unit referring to “HVAC Control Unit Removal and Installation: ”.
- Fill engine coolant to radiator.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Blower Motor Removal and Installation

S4RS0A7106003

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Disconnect connector (1) from blower motor (2).
4) Remove blower motor from HVAC unit by removing screws (3).



I4RS0A710005-

Installation

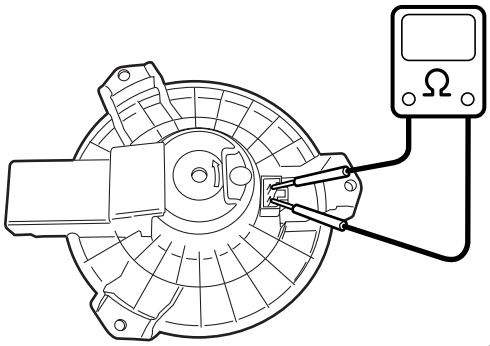
Reverse removal procedure noting the following instruction.

- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Blower Motor Inspection

S4RS0A7106004

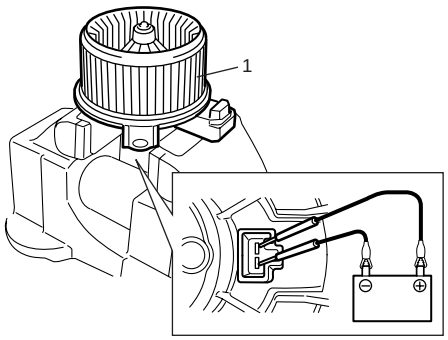
- Check for continuity between two terminals as shown. If there is no continuity, replace blower motor.



I4RS0A710006-

- Check for operation and current.
  a. Put blower motor (1) in a soft-jawed vise.
  b. Connect battery to blower motor as shown.
  c. Check if blower motor operates smoothly without noise.
  d. Check if ammeter indicates the specified current. If measured current is out of specification, replace blower motor.

  Blower motor specified current at 12 V
  16 A maximum



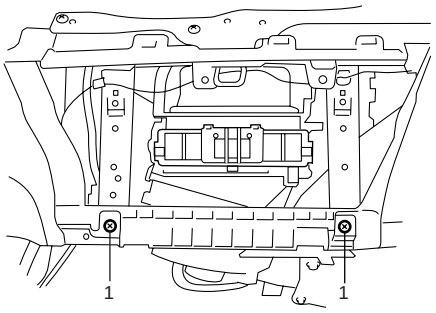
I4RS0A710007-

Blower Motor Resistor Removal and Installation

S4RS0A7106005

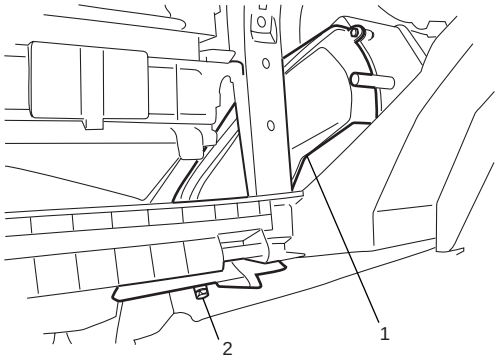
Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove glove box from instrument panel.
4) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
5) Remove bolts (1) from instrument panel.



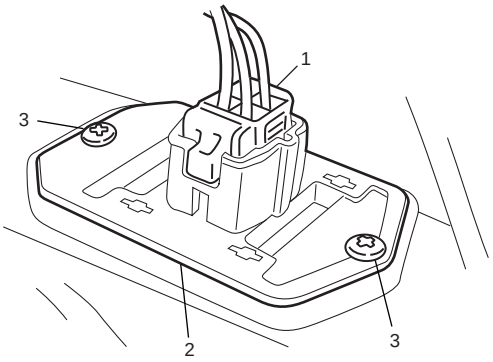
I4RS0A710008-

6) Remove foot duct (1) from HVAC unit by removing screw (2).



I4RS0A710009-

7) Remove connector (1) from blower motor resistor (2), and then remove blower motor resistor from HVAC unit by removing screws (3).



I4RS0A710010-

Installation

Reverse removal procedure noting the following instruction.

- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

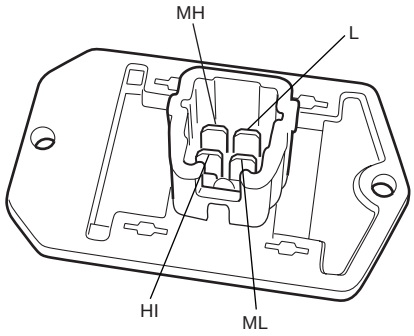
Blower Motor Resistor Inspection

S4RS0A7106006

Measure each terminal-to-terminal resistance. If measured resistance is out of specification, replace blower motor resistor.

Blower motor resistor resistance

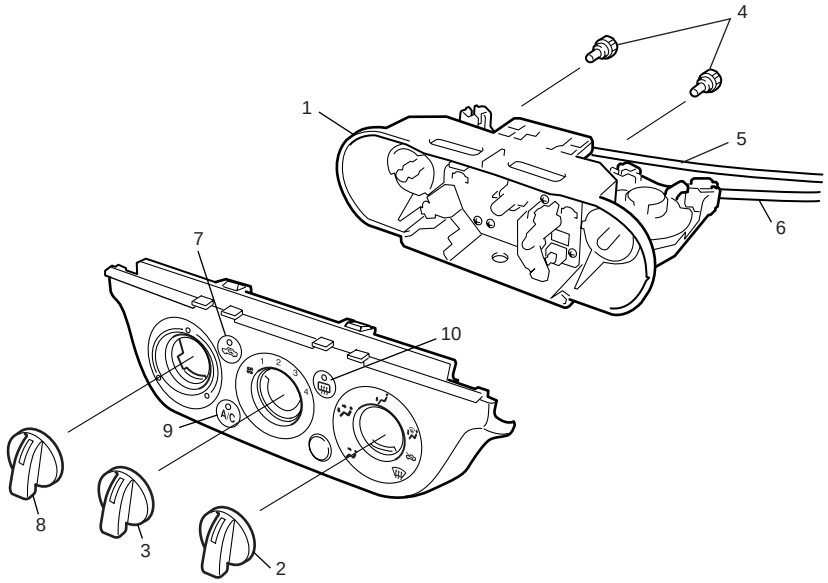
“H” – “MH”: Approximately 0.6 Ω at 20 – 25 °C (68 – 77 °F)
“MH” – “ML”: Approximately 1.6 Ω at 20 – 25 °C (68 – 77 °F)
“ML” – “L”: Approximately 3.4 Ω at 20 – 25 °C (68 – 77 °F)



I4RS0A710011-

HVAC Control Unit Components

S4RS0A7106008



I4RS0A710012-

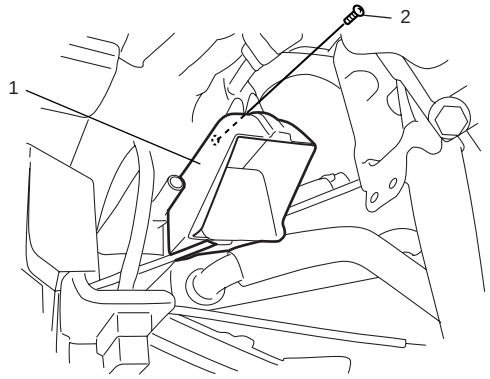
1. Heater control body assembly	4. Bulb	7. Air intake switch	10. Rear defogger switch
2. Airflow selector	5. Temperature control cable	8. Temperature selector	
3. Blower speed selector	6. Airflow control cable	9. A/C switch	

HVAC Control Unit Removal and Installation

S4RS0A7106010

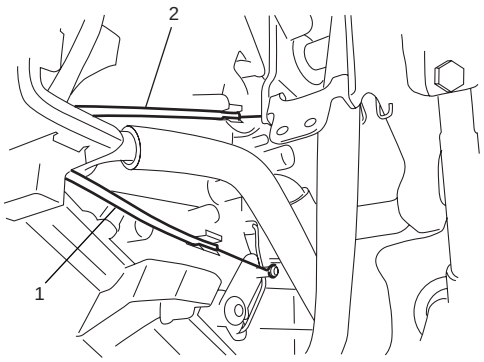
Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
4) Remove radio assembly from instrument panel referring to “Radio Assembly Removal and Installation: in Section 9C”.
5) Remove foot duct (1) from HVAC unit by removing screw (2).



I4RS0A710013-

6) Disconnect temperature control cable (1) and airflow control cable (2) from HVAC unit.

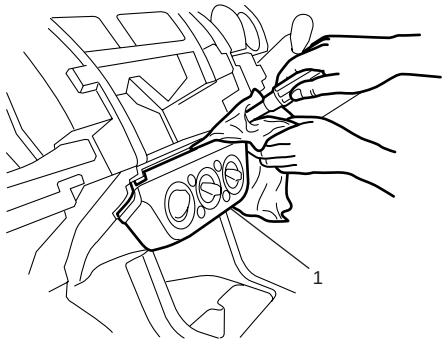


I4RS0A710014-

7) Remove two connectors from HVAC control unit.
8) Remove HVAC control unit (1) from instrument panel.

NOTE:

Be careful not to damage HVAC control unit and instrument panel by using rag.

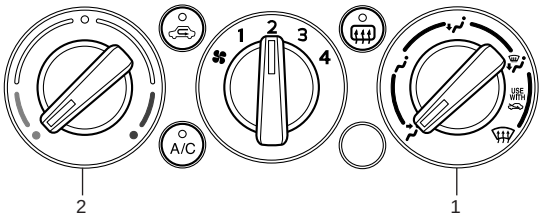


I4RS0A710015-

Installation

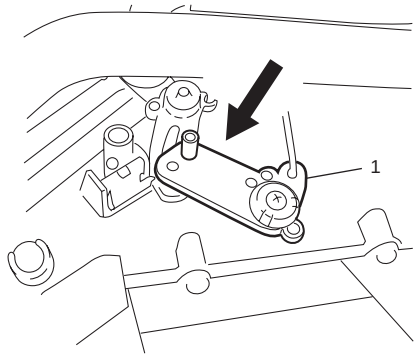
Reverse removal procedure noting the following instructions.

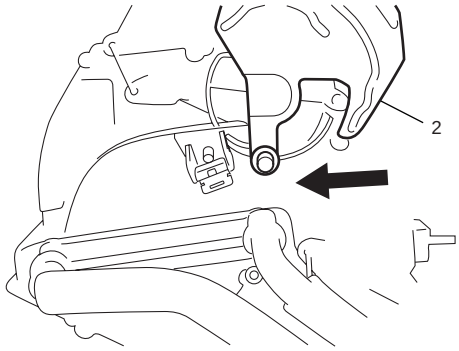
- Connect temperature control cable and airflow control cable of HVAC control unit to links of HVAC unit.
  a. Set airflow selector (1) to “VENT” position and temperature selector (2) to “MAX COOL” position.



I4RS0A710016-

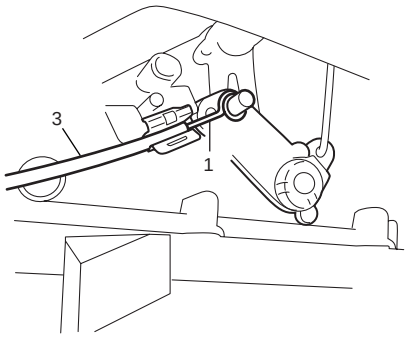
  b. Move temperature control lever (1) and airflow control plate (2) fully to the arrow direction.

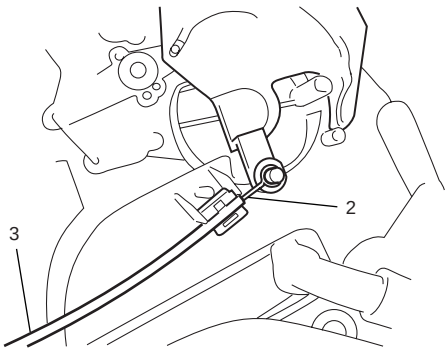




I4RS0A710017-

  c. Fix temperature control inner cable (1) to pin of temperature control lever and air flow control inner cable (2) to pin of airflow control plate, and then fix each outer cable (3) to each cable lock clamp.





I4RS0A710018-

NOTE:

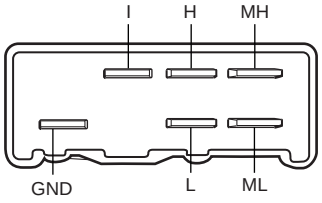
After installing control cables, make sure that control lever and plate move smoothly and stop at proper position.

- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.
- Make sure that airflow outlet changes correctly as airflow selector is changed.

Blower Speed Selector Inspection

S4RS0A7106011

Check blower speed selector for each terminal to terminal continuity. If check result does not meet the following conditions, replace HVAC control unit.



Terminal / Position	GND	I	L	ML	MH	H
OFF	○					
1	○	○	○			
2	○	○		○		
3	○	○			○	
4	○	○				○

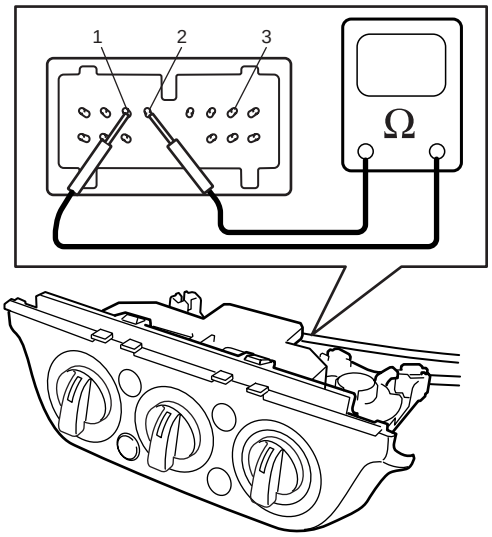
I4RS0A710019-

Air Intake Switch Inspection

S4RS0A7106018

- Check that there is continuity between terminal (1) and terminal (2) when air intake switch is at fresh position.
- Check that there is no continuity between terminal (1) and terminal (2) and there is continuity between terminal (1) and terminal (3) when air intake switch is at recirculation position.

If check result does not meet the above conditions, replace HVAC control unit.



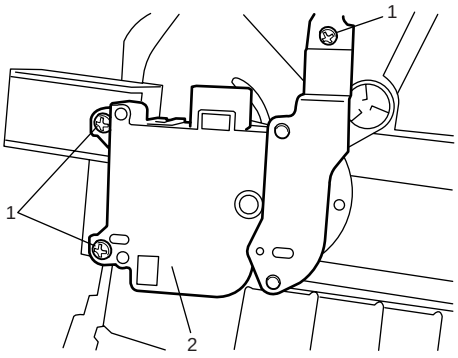
I4RS0A710020-

Air Intake Control Actuator Removal and Installation

S4RS0A7106020

Removal

1) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation: in Section 9C”.
2) Remove screws (1).
3) Remove air intake control actuator (2) from HVAC unit.

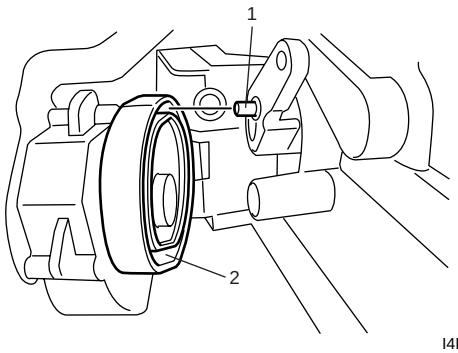


I4RS0A710021-

Installation

Reverse removal procedure noting the following instruction.

- Be sure to insert the linkage pin (1) into the groove (2) of air intake control actuator.



I4RS0A710022-

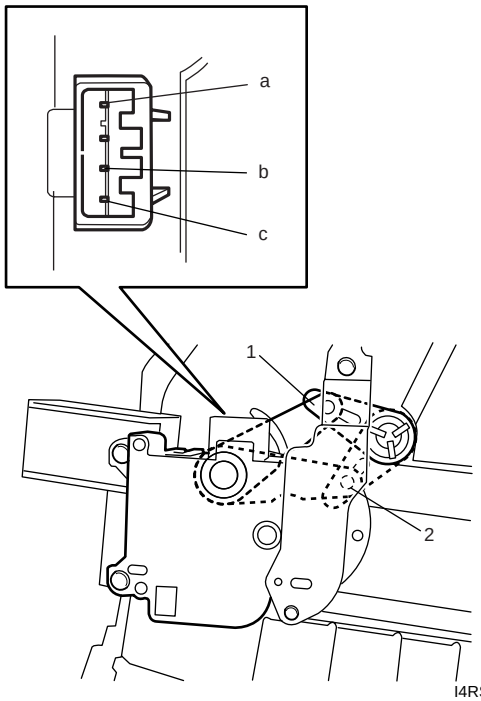
Air Intake Control Actuator Inspection

S4RS0A7106019

Check air intake control actuator as follows:

1) Using service wire, connect battery positive terminal to “a” terminal and battery negative terminal to terminal “b”. And, check if air intake selector link operates smoothly and it stops at fresh position (1).
2) Using service wire, connect battery positive terminal to “a” terminal and battery negative terminal to terminal “c”. And, check if air intake selector link operates smoothly and it stops at recirculation position (2).

If malfunction is found, replace air intake control actuator.



I4RS0A710023-

Center Ventilation Louver Removal and Installation

S4RS0A7106014

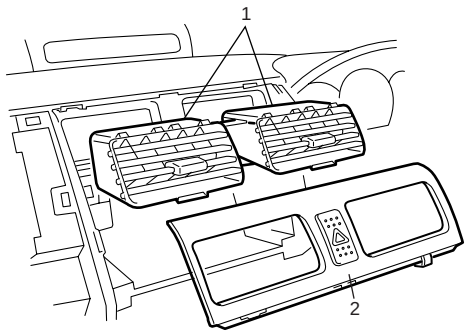
Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
4) Remove radio assembly from instrument panel referring to “Radio Assembly Removal and Installation: in Section 9C”.
5) Remove center ventilation louver (1) with garnish (2) from instrument panel, and then disconnect connector from hazard switch.

NOTE:

Garnish is fitted to instrument panel with six clips. When removing garnish from instrument panel, be careful not to break them.

6) Separate center ventilation louver and garnish.



I4RS0A710024-

Installation

Reverse removal procedure.

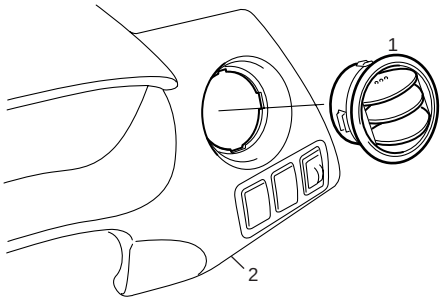
Side Ventilation Louver Removal and Installation

S4RS0A7106015

Right side ventilation louver

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove steering column hole cover from instrument panel.
4) Remove combination meter cluster panel from instrument panel, and then disconnect connector from front fog lamp switch of combination meter cluster panel.
5) Separate right side ventilation louver (1) and combination meter cluster (2).

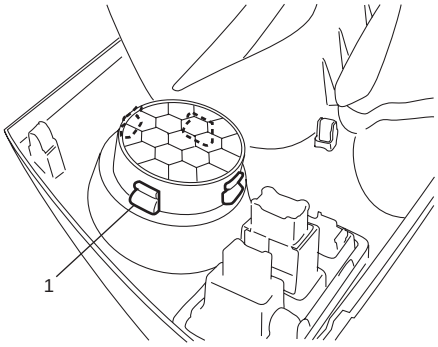


I4RS0A710025-

Installation

Reverse removal procedure noting the following instruction.

- Right side ventilation louver is fitted to combination meter cluster panel with four clips (1). When installing right side ventilation louver to combination meter cluster panel, position the smallest clip to the top.



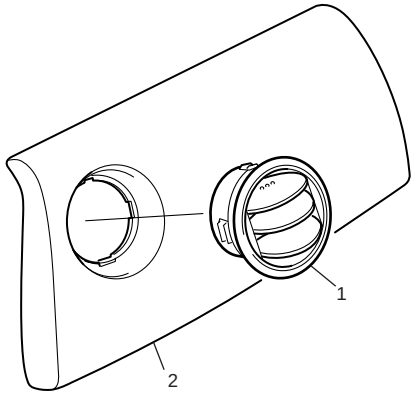
I4RS0A710026-

Left side ventilation louver

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove glove box from instrument panel.

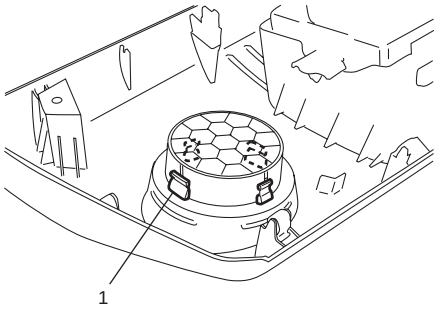
4) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
5) Separate left side ventilation louver (1) and passenger air bag module (2).



I4RS0A710027-

Installation
Reverse removal procedure noting the following instruction.

- Left side ventilation louver is fitted to passenger air bag module with four clips (1). When installing left side ventilation louver to passenger air bag module, position the smallest clip to the top.

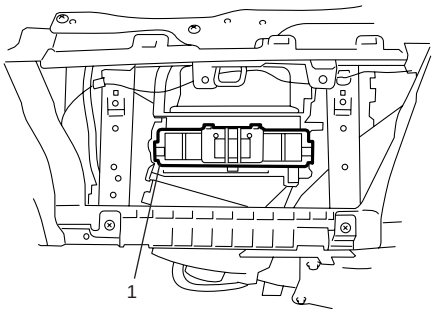


I4RS0A710028-

Air Filter Removal and Installation

S4RS0A7106023

Removal
1) Remove glove box from instrument panel.
2) Remove air filter cover (1) from HVAC unit.

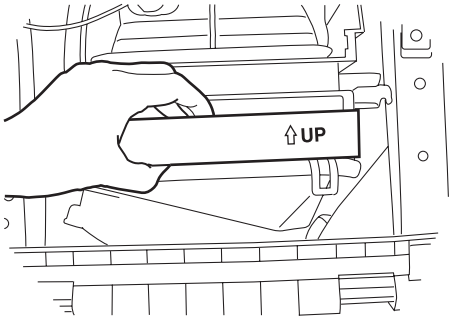


I4RS0A710029-

3) Pull out air filter from HVAC unit.

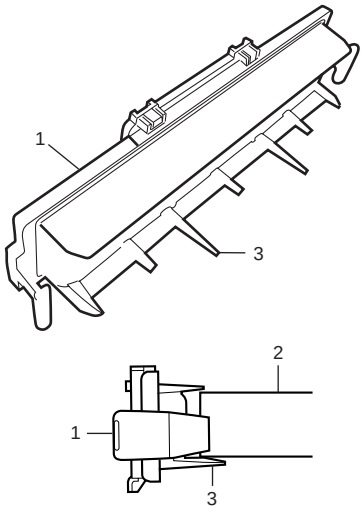
Installation
Reverse removal procedure noting the following instructions.

- Position air filter by directing its arrow mark to the upward.



I4RS0A710030-

- Fit air filter cover (1) to HVAC unit so as not to stick air filter (2) by air filter cover’s claw (3). Otherwise, air filter is deformed and loses its functionality.

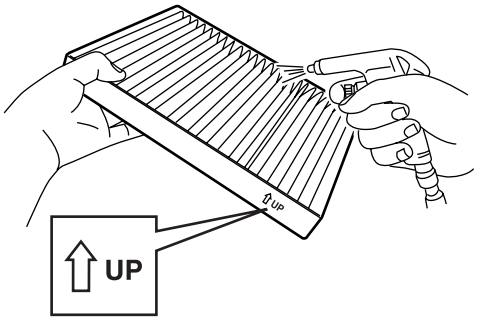


I4RS0A710031-

Air Filter Cleaning

S4RS0A7106022

Blow compressed air to the air outlet side of air filter.



I4RS0A710032-

Air Conditioning System

Precautions

A/C System Caution

S4RS0A7200001

CAUTION:

The air conditioning system of this vehicle uses refrigerant HFC-134a (R-134a).
None of refrigerant, compressor oil and component parts is interchangeable between two types of A/C: one using refrigerant HFC-134a (R-134a) and the other using refrigerant CFC-12 (R-12).
Be sure to check which refrigerant is used before any service work including inspection and maintenance. For identification between these two types, refer to "Refrigerant Type Construction: ".
When replenishing or changing refrigerant and compressor oil and when replacing parts, make sure that the material or the part to be used is appropriate to the A/C installed in the vehicle being serviced.
Use of incorrect one will result in leakage of refrigerant, damage in parts or other faulty condition.

Precautions on Servicing A/C System

S4RS0A7200004

WARNING:

Should refrigerant HFC-134a (R-134a) is exposed to your eye(s), consult a doctor immediately.

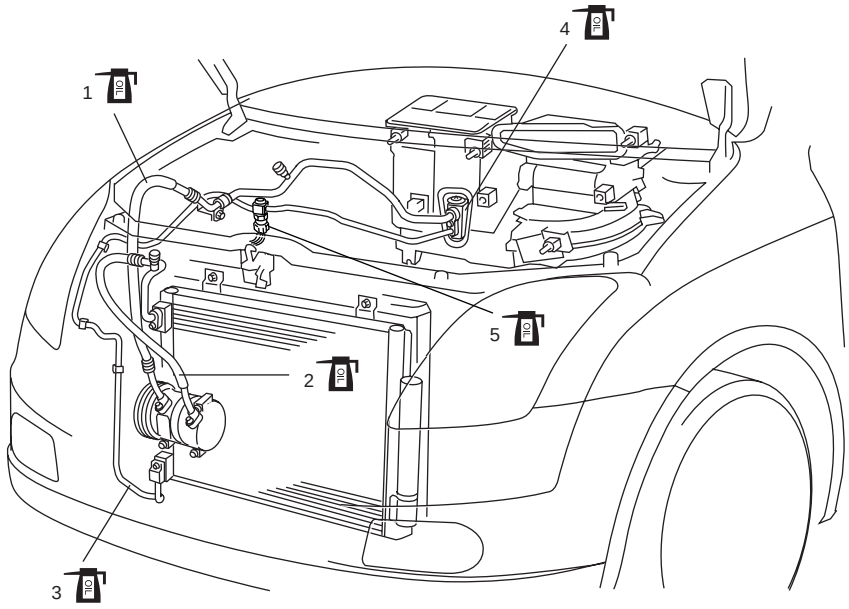
- **Do not use your hand to rub affected eye(s). Instead, use fresh cold water to splash it over affected area to thus gradually raise its temperature above the freezing point.**
- **Obtain proper treatment as soon as possible from a doctor or eye specialist. Should liquid refrigerant HFC-134a (R-134a) is exposed to your skin, such affected part should be treated in the same manner as when skin is frostbitten or frozen.**

Handling Refrigerant HFC-134a (R-134a)

- Always wear goggles to protect your eyes.
- Avoid direct contact to liquid refrigerant.
- Do not heat refrigerant container higher than 40 °C (104 °F).
- Do not discharge refrigerant into atmosphere.
- Do not expose bright metals to liquid refrigerant. Refrigerant combined with moisture is corrosive and tarnishes surfaces of bright metals including chrome.

Refrigerant Line

: Compressor oil 99000–99015–00A



I4RS0A720001-

1. Suction hose : Apply compressor oil (refrigerant oil) to O-ring.	4. Expansion valve : Apply compressor oil (refrigerant oil) to O-ring.
2. Discharge hose : Apply compressor oil (refrigerant oil) to O-ring.	5. A/C refrigerant pressure sensor : Apply compressor oil (refrigerant oil) to O-ring.
3. Liquid pipe : Apply compressor oil (refrigerant oil) to O-ring.	

- Never use heat for bending pipes. When bending a pipe, try to make its bending angle as smooth as possible.
- Keep internal parts of air conditioning free from moisture and dirt. When disconnecting any line from system, install a blind plug or cap to the fitting immediately.
- When connecting hoses and pipes, apply a few drops of compressor oil (refrigerant oil) to O-ring.
- When tightening or loosening a fitting, use two wrenches, one for turning and the other for support.
- Route drain hose so that drained water does not make any contact to vehicle components.
- If pipes or hoses are replaced, replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.

Refrigerant Recovery

When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment because discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environments.

Refrigerant Charge

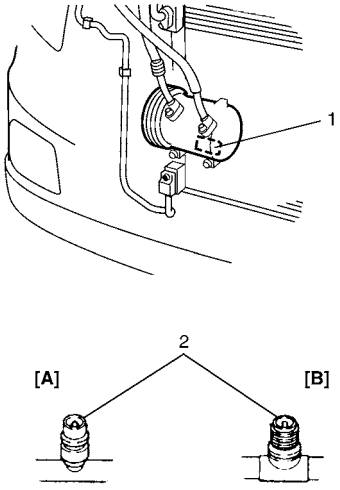
After performing compressor oil replenishment and evacuation, charge a proper amount of refrigerant to A/C system referring to “Charge” in “Operation Procedure for Refrigerant Charge: ”.

General Description

Refrigerant Type Construction

S4RS0A7201002

Whether the A/C system in the vehicle uses HFC-134a (R-134a) or CFC-12 (R-12) is indicated on label (1) on the compressor. Also, it can be checked by the shape of the service (charge) valve (2).



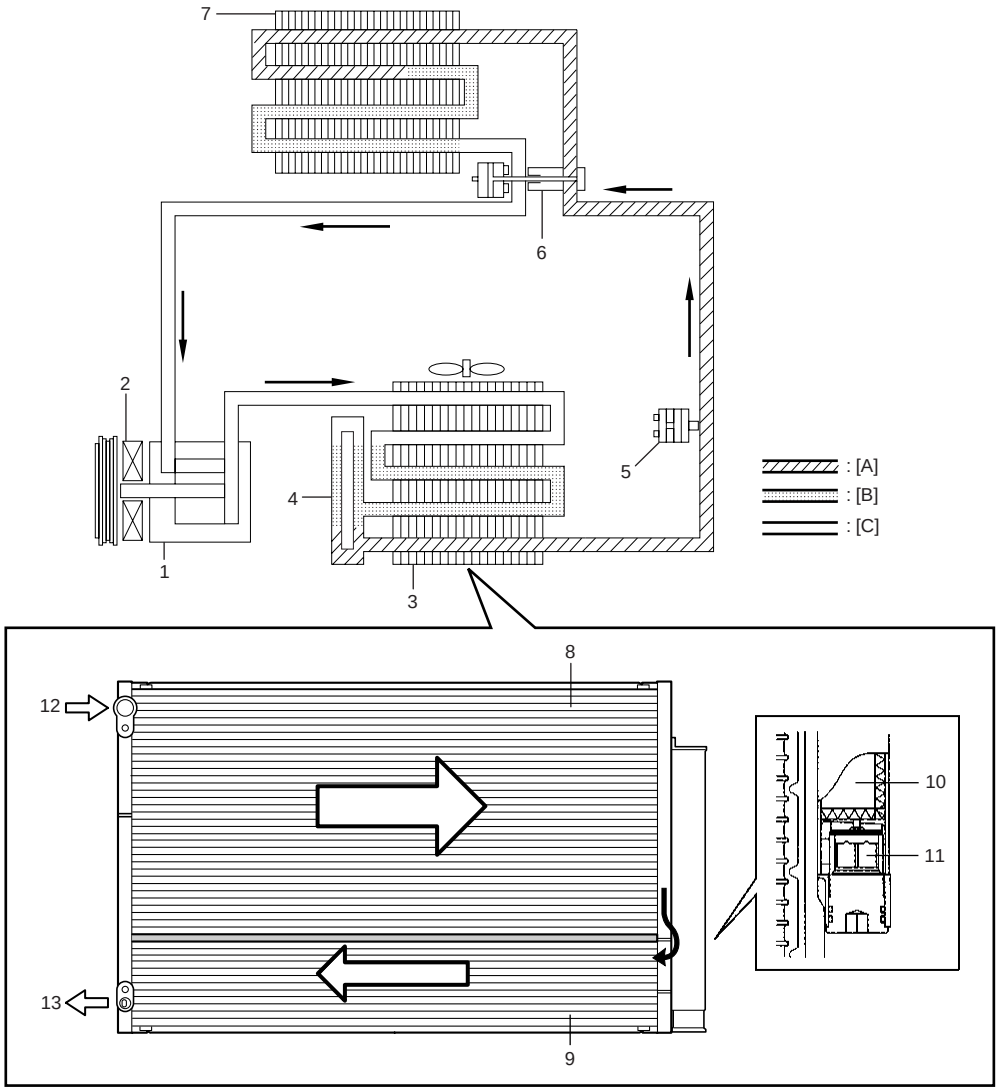
I4RS0A720002-

[A]: HFC-134a (R-134a)
[B]: CFC-12 (R-12)

Sub-Cool A/C System Description

S4RS0A7201004

In the sub-cool A/C system (condenser integrated with receiver / dryer), the inside of the condenser is divided into the condensation part and the sub-cooler part, and the receiver / dryer is located between those. In the receiver / dryer, the refrigerant is separated into the vapor refrigerant and the liquid refrigerant. Only the liquid refrigerant is delivered to the sub-cooler part of the condenser. The refrigerant is supercooled by the sub-cooler part of the condenser.



I4RS0A720051-

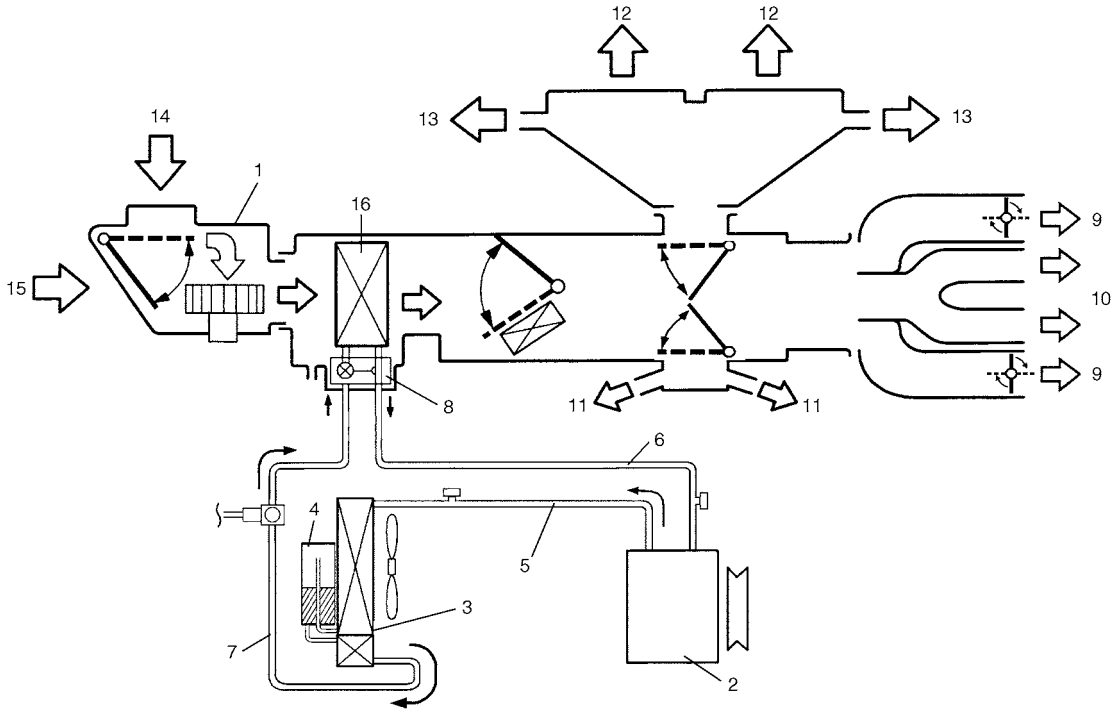
[A]: Liquid	2. Magnet clutch	6. Expansion valve	10. Desiccant
[B]: Vapor	3. Condenser	7. A/C evaporator	11. Filter
[C]: Superheated vapor	4. Receiver/dryer	8. Condensation part	12. Vapor refrigerant
1. Compressor	5. Refrigerant pressure switch	9. Sub-cooler part	13. Liquid refrigerant

Schematic and Routing Diagram

Major Components of A/C System

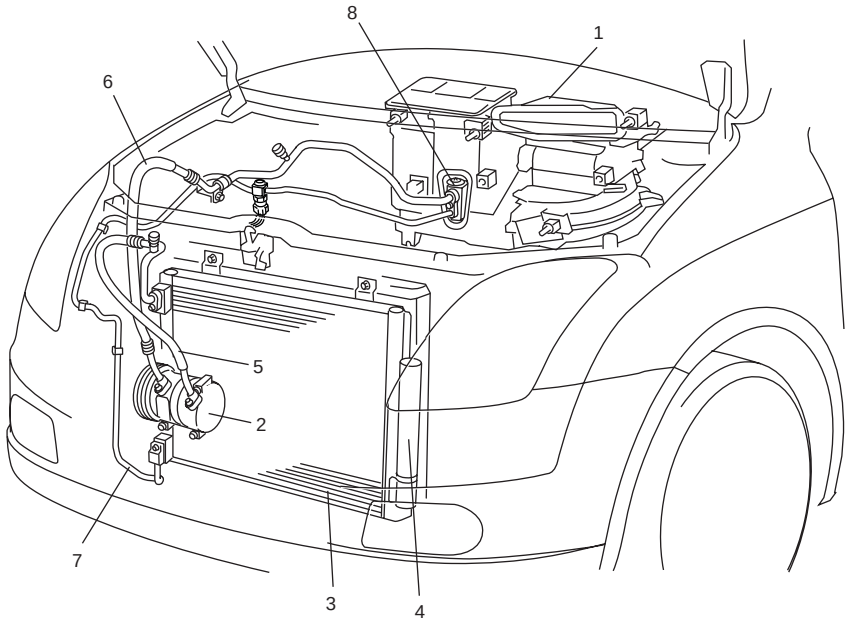
S4RS0A7202001

Airflow diagram



I4RS0A720003-

Major components of A/C system

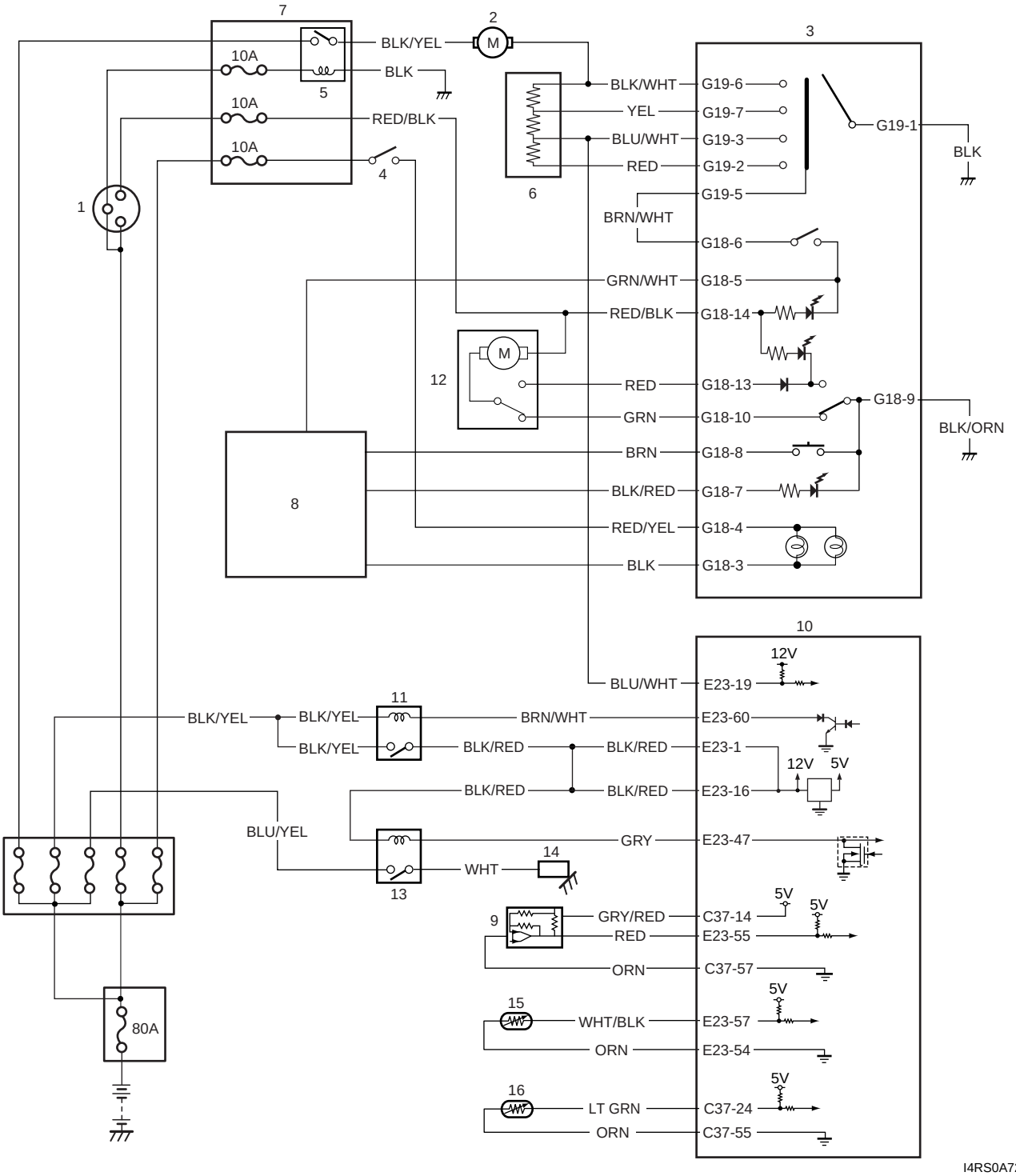


I4RS0A720004-

1. HVAC	5. Discharge hose	9. Side ventilation air	13. Side defroster air
2. Compressor	6. Suction hose	10. Center ventilation air	14. Fresh air
3. Condenser assembly	7. Liquid pipe	11. Foot air	15. Recirculation air
4. Receiver/dryer	8. Expansion valve	12. Front defroster air	16. Evaporator

A/C System Wiring Diagram

S4RS0A7202002



I4RS0A720005-

1. Ignition switch	5. Blower motor relay	9. A/C refrigerant pressure sensor	13. Compressor relay
2. Blower motor	6. Blower motor resistor	10. ECM	14. Compressor
3. HVAC control unit	7. Junction block assembly	11. Main relay	15. Evaporator thermistor (evaporator temperature sensor)
4. Lighting switch	8. BCM	12. Air intake control actuator	16. ECT sensor

Diagnostic Information and Procedures

A/C System Symptom Diagnosis

S4RS0A7204001

Condition	Possible cause	Correction / Reference Item
No cool air comes out (A/C system does not operate)	No refrigerant	*Perform recovery, evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".*
	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	A/C switch faulty	*Check A/C switch referring to "A/C Switch Inspection: ".*
	Blower speed selector faulty	*Check blower speed selector referring to "Blower Speed Selector Inspection: in Section 7A".*
	Evaporator thermistor (Evaporator temperature sensor) faulty	*Check A/C evaporator temperature sensor referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*
	A/C refrigerant pressure sensor faulty	*Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor Removal and Installation: ".*
	Wiring or grounding faulty	*Repair as necessary.*
	ECM and/or its circuit faulty	*Check ECM and/or its circuit referring to "A/C System Inspection at ECM: ".*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection: ".*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Compressor faulty	*Check compressor.*
	Compressor relay faulty	*Check compressor relay referring to "Compressor Relay Inspection: ".*
No cool air comes out (radiator cooling fan motor does not operate)	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Wiring or grounding faulty	*Repair as necessary.*
	Radiator cooling fan motor relay faulty	*Check radiator cooling fan motor relay referring to "Radiator Cooling Fan Relay Inspection: in Section 1F".*
	Radiator cooling fan motor faulty	*Check radiator cooling fan motor referring to "Radiator Cooling Fan Removal and Installation: in Section 1F".*
	ECM and/or its circuit faulty	*Check ECM and/or its circuit referring to "A/C System Inspection at ECM: ".*
No cool air comes out (Blower motor does not operate)	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Blower motor resistor faulty	*Check blower motor resistor referring to "Blower Motor Resistor Inspection: in Section 7A".*
	Blower speed selector faulty	*Check blower speed selector referring to "Blower Speed Selector Inspection: in Section 7A".*
	Wiring or grounding faulty	*Repair as necessary.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: in Section 7A".*

Condition	Possible cause	Correction / Reference Item
Cool air does not come out or insufficient cooling (A/C system normal operation)	Insufficient or excessive charge of refrigerant	*Check the amount of refrigerant and system for leaks.*
	Condenser clogged	*Check condenser referring to "Condenser Assembly On-Vehicle Inspection: ".*
	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Inspection: " and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*
	A/C evaporator temperature sensor faulty	*Check A/C evaporator temperature sensor referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*
	Expansion valve faulty	*Check expansion valve referring to "Expansion Valve Inspection: ".*
	Desiccant clogged	*Check desiccant.*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection: ".*
	Compressor faulty	*Check compressor.*
	Air in A/C system	*Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".*
	Air leaking from HVAC unit or air duct	*Repair as necessary.*
	Heater and ventilation system faulty	*Check HVAC unit.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: in Section 7A".*
	Excessive compressor oil in A/C system	*Drain excessive compressor oil from A/C system circuit and compressor.*
Cool air does not come out only intermittently	Wiring connection faulty	*Repair as necessary.*
	Expansion valve faulty	*Check expansion valve referring to "Expansion Valve Inspection: ".*
	Excessive moisture in A/C system	*Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection: ".*
	Excessive amount of refrigerant	*Check the amount of refrigerant.*
Cool air comes out only at high speed	Condenser clogged	*Check condenser referring to "Condenser Assembly On-Vehicle Inspection: ".*
	Insufficient charge of refrigerant	*Check the amount of refrigerant and system for leaks.*
	Air in A/C system	*Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Compressor faulty	*Check compressor.*
Cool air does not come out only at high speed	Excessive amount of refrigerant	*Check the amount of refrigerant.*
	A/C evaporator frosted	*Check A/C evaporator and evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Inspection: " and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*

Condition	Possible cause	Correction / Reference Item
Insufficient airflow of cooled air	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Inspection: " and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*
	Air leaking from HVAC unit or air duct	*Repair as necessary.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: in Section 7A".*
	Wiring or grounding faulty	*Repair as necessary.*

Abnormal Noise Symptom Diagnosis of A/C System

S4RS0A7204002

Abnormal Noise from Compressor

Condition	Possible cause	Correction / Reference Item
During compressor operation, a rumbling noise is heard proportional to engine revolutions	Inadequate clearance in scroll area	*Replace compressor.*
A loud noise is heard at a certain rpm, disproportionately to engine revolution	Loose or faulty compressor drive belt	*Adjust drive belt tension or replace drive belt.*
	Loose compressor mounting bolts	*Retighten mounting bolts.*
A loud rattle is heard at low engine rpm	Loose compressor clutch plate bolt	*Retighten clutch plate bolt.* *Replace compressor if it was operated in this condition for a long time.*

Abnormal Noise from Magnetic Clutch

Condition	Possible cause	Correction / Reference Item
A rumbling noise is heard when compressor is not in operation	Worn or damaged bearings	*Replace magnet clutch assembly.*
A chattering noise is heard when compressor is in operation	Faulty magnet clutch clearance (excessive clearance)	*Adjust magnet clutch clearance.*
	Worn magnet clutch friction surface	*Replace magnet clutch assembly.*
	Compressor oil leaked from shaft seal, contaminating the friction surface	*Replace compressor body assembly.*

Abnormal Noise from Tubing

Condition	Possible cause	Correction / Reference Item
A droning noise is heard from inside of the vehicle, but not particularly noticeable in engine compartment	Faulty tubing clamps	*Reposition clamps or increase the number of clamps.*
	Resonance caused by pulsation from variations in refrigerant pressure	*Attach a silencer to tubing, or modify its position and length.*

Abnormal Noise from Condenser Assembly

Condition	Possible cause	Correction / Reference Item
Considerable vibration in condenser assembly	Resonance from condenser assembly bracket and body	*Firmly insert a silencer between condenser assembly bracket and body.*

Abnormal Noise from Crankshaft Pulley

Condition	Possible cause	Correction / Reference Item
A large rattling noise is heard at idle or sudden acceleration	Loosen crankshaft pulley bolt	*Retighten bolt.*

Abnormal Noise from Tension Pulley

Condition	Possible cause	Correction / Reference Item
Clattering noise is heard from pulley	Worn or damaged bearing	*Replace tension pulley.*
Pulley cranks upon contact	Cracked or loose bracket	*Replace or retighten bracket.*

Abnormal Noise from A/C Evaporator

Condition	Possible cause	Correction / Reference Item
Whistling sound is heard from A/C evaporator	Depending on the combination of the interior / exterior temperatures, engine rpm and refrigerant pressure, the refrigerant flowing out of the expansion valve may, under certain conditions, make a whistling sound	*At times, slightly decreasing refrigerant volume may stop this noise.* *Inspect expansion valve and replace if faulty.*

Abnormal Noise from Blower Motor

Condition	Possible cause	Correction / Reference Item
Blower motor emits a chirping sound in proportion to its speed of rotation	Worn or damaged motor brushes or commutator	*Replace blower motor.*
Fluttering noise or large droning noise is heard from blower motor	Leaves or other debris introduced from fresh air inlet to blower motor	*Remove debris and make sure that the screen at fresh air inlet is intact.*

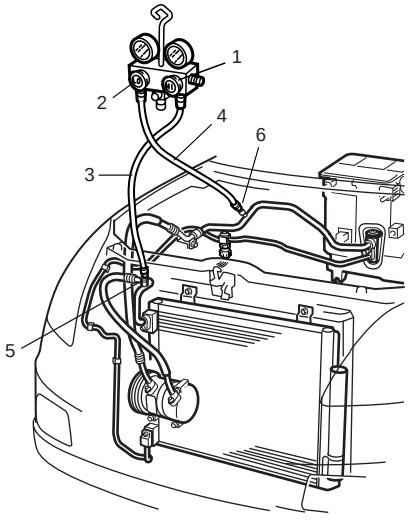
A/C System Performance Inspection

S4RS0A7204003

1) Confirm that vehicle and environmental conditions are as follows.
   - Vehicle is put indoors.
   - Ambient temperature is within 25 – 35 °C (77 – 95 °F).
   - Relative humidity is within 30 – 70%.
   - There is no wind indoors.
   - HVAC unit is normal.
   - Blower motor is normal.
   - There is no air leakage from air ducts.
   - Condenser fins are clean.
   - Are filter is not clogged with dirt and dust.
   - Battery voltage is about 12 V.
   - Radiator cooling fan operates normally.
2) Make sure that high pressure valve (1) and low pressure valve (2) of manifold gauge are firmly closed.
3) Connect high pressure charging hose (3) to high pressure service valve (5) on vehicle and low pressure charging hose (4) to low pressure service valve (6).
4) Bleed the air in charging hoses (3) and (4) by loosening their nuts respectively utilizing the refrigerant pressure. When a hissing sound is heard, immediately tighten nut.

CAUTION:

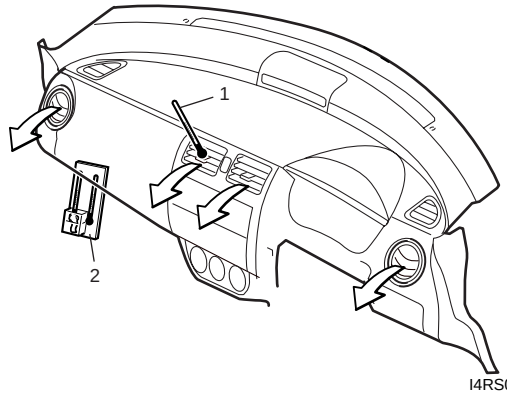
Do not connect high and low pressure charging hoses in reverse.



I4RS0A720006-

5) Warm up engine to the normal operating temperature and keep it at the specified idle speed.
6) Turn A/C switch ON, set blower speed selector at maximum speed position, temperature selector at maximum cold position, airflow selector at face position, and air intake switch at recirculation position. (Confirm that A/C compressor and condenser fans are working.)
7) Wait for ten minutes to stabilize the A/C operation.

8) Open front windows, front doors and engine food.
9) With about 20 mm (0.8 in.) of dry bulb thermometer (1) put right in front of center ventilation louver and a wet and dry bulb thermometer (2) near air inlet of HVAC unit.



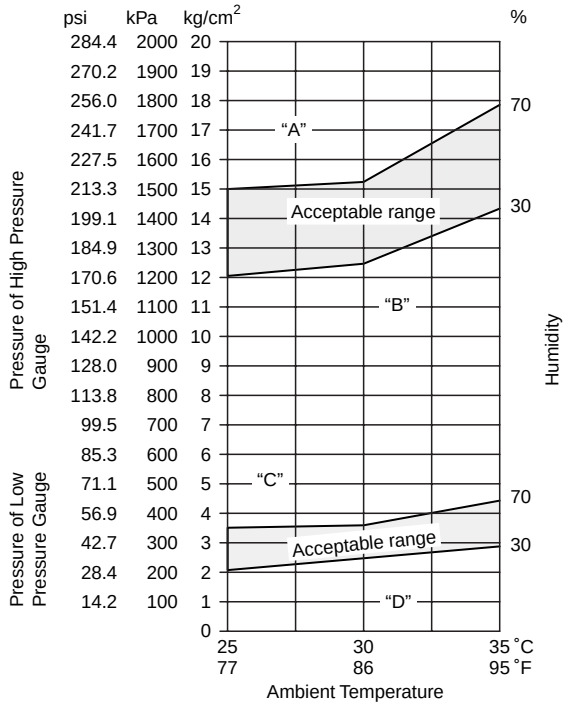
I4RS0A720007-

10) Check for each pressure of low side and high side if it is within shaded range of graph. If each gauge reading is out of specified pressure, correct defective part referring to the following table.

NOTE:

Pressure registered on gauge varies with ambient temperature. Therefore, use the graphs when determining if pressures are normal or not.

Low side and high side pressure example, Gauges should read as follows when ambient temperature is 30 °C (86 °F)
Pressure on high pressure gauge (HI): 1240 – 1520 kPa (12.4 – 15.2 kg/cm²)
Pressure on low pressure gauge (LO): 250 – 360 kPa (2.5 – 3.6 kg/cm²)



I4RS0A720008-

High pressure gauge

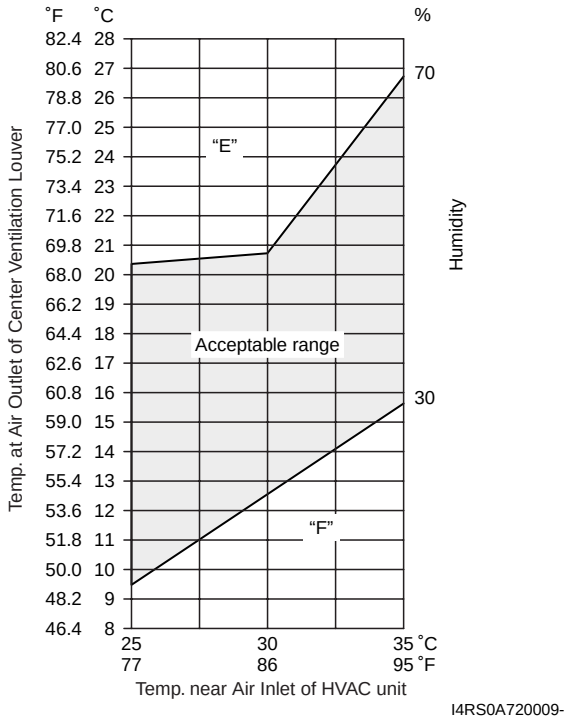
Condition	Possible cause	Correction
Pressure is higher than acceptable range (“A” area)	Refrigerant overcharged	Recharge.
	Expansion valve frozen or clogged	Check expansion valve.
	Clogged refrigerant passage of high pressure side	Clean or replace.
	Radiator cooling fan malfunction (Insufficient cooling of condenser)	Check radiator cooling fan.
	Dirty or bent condenser fins (Insufficient cooling of condenser)	Clean or repair.
	Compressor malfunction (Insufficient oil etc.)	Check compressor.
	Engine overheat	Check engine cooling system referring to “Engine Cooling Symptom Diagnosis: in Section 1F”.
Pressure is lower than acceptable range (“B” area)	Insufficient refrigerant (Insufficient charge or leakage)	Check for leakage, repair if necessary and recharge.
	Expansion valve malfunction (valve opens too wide)	Check expansion valve.
	Compressor malfunction (Insufficient compression)	Check compressor.

Low pressure gauge

Condition	Possible cause	Correction
Pressure is higher than acceptable range (“C” area)	Expansion valve malfunction (valve opens too wide)	Check expansion valve.
	Compressor malfunction (Insufficient compression)	Check compressor.
Pressure is lower than acceptable range (“D” area)	Insufficient refrigerant (Insufficient charge or leakage)	Check for leakage, repair if necessary and recharge.
	Expansion valve malfunction (valve opens too narrow)	Check expansion valve.
	Clogged refrigerant passage (crashed pipe)	Repair or replace.

11) Check inlet port temperature-to-outlet port temperature relationship using the graph. For example, if temperature near air inlet of HVAC unit is 30 °C (86 °F) and the one at air outlet of center ventilation louver is 17 °C (62.6 °F), their crossing point is within acceptable range as shown in the graph. In this case, cooling performance is satisfactory and proper.

12) If crossing point is out of acceptable range, diagnose trouble referring to the following table.



Thermometer at center duct

Condition	Possible cause	Correction
Crossing point is higher than acceptable range ("E" area)	Insufficient or excessive charge of refrigerant	Check refrigerant pressure.
	Dirty or bent A/C evaporator fins	Clean or repair.
	Air leakage from cooling (heater) unit or air duct	Repair or replace.
	Malfunctioning, switch over function of door in cooling (heater) unit	Repair or replace.
	Compressor malfunction	Check compressor.
Crossing point is lower than acceptable range ("F" area)	Insufficient air volume from center duct (Heater blower malfunction)	Check blower motor and fan.
	Compressor malfunction	Check compressor.

NOTE:

If ambient temperature is approximately 30 °C (86 °F), it is possible to diagnose A/C system in detail referring to the following table.

Condition			Possible cause	Correction
Manifold gauge	MPa (kg/cm^2) (psi)	Detail		
Lo	Hi			
0.23 – 0.36 (2.3 – 3.6) (33 – 51)	1.24 – 1.52 (12.4 – 15.2) (176 – 216)	Normal condition	—	—
Negative pressure	0.5 – 0.6 (5 – 6) (71.2 – 85.3)	The low pressure side reads a negative pressure, and the high pressure side reads an extremely low pressure. Presence of frost around tubing to and from receiver/dryer and expansion valve.	Dust particles or water droplets are either stuck or frozen inside expansion valve, preventing the refrigerant from flowing.	Clean expansion valve. Replace it if it cannot be cleaned. Replace receiver/dryer. Evacuate the A/C system and recharge with fresh refrigerant.

Condition			Possible cause	Correction
Manifold gauge	MPa (kg/cm^2) (psi)	Detail		
Lo	Hi			
Normal: 0.23 – 0.36 (2.3 – 3.6) (33 – 51) ↑ ↓ Abnormal: Negative pressure	Normal: 1.24 – 1.52 (12.4 – 15.2) (176 – 216) ↑ ↓ Abnormal: 0.7 – 1.0 (7 – 10) (100 – 142)	During A/C operation, the low pressure side sometimes indicates negative pressure, and sometimes normal pressure. Also high pressure side reading fluctuates between the abnormal and normal pressure.	Expansion valve is frozen due to moisture in the system, and temporarily shuts off the refrigeration cycle.	Replace expansion valve. Replace desiccant. Evacuate A/C system and recharge with fresh refrigerant.
0.05 – 0.15 (0.5 – 1.5) (4.2 – 21.3)	0.7 – 1.0 (7 – 10) (100 – 142)	Both low and high pressure sides indicate low readings. Output air is slightly cold.	Insufficient refrigerant in system (Refrigerant leaking).	Using leak detector, check for leaks and repair as necessary. Recharge refrigerant to a specified amount. If the pressure reading is almost 0 when the manifold gauges are attached, check for any leaks, repair them, and evacuate the system.
0.4 – 0.6 (4 – 6) (56.9 – 85.3)		Pressure on low pressure side is high. Pressure on high pressure side is low. Both pressure becoming equal right after A/C is turned OFF.	Internal leak in compressor.	Inspect compressor and repair or replace as necessary.
0.35 – 0.45 (3.5 – 4.5) (50 – 64)	2.0 – 2.5 (20 – 25) (285 – 355)	High pressure reading on both low and high pressure sides.	Overcharged A/C system. Faulty condenser cooling operation. Faulty radiator cooling fan operation.	Adjust refrigerant to specified amount. Clean condenser. Inspect and repair radiator cooling fan.
		High pressure reading on both low and high pressure sides. Low pressure side tubing is not cold when touched.	Presence of air in A/C system (Improperly evacuated).	Replace desiccant. Inspect quantity of compressor oil and presence of contaminants in oil. Evacuate system and recharge with fresh refrigerant.
0.45 – 0.55 (4.5 – 5.5) (64 – 78)		High pressure reading on both low and high pressure sides. Large amount of frost or dew on the low pressure side tubing.	Faulty expansion valve. Refrigerant flow is not regulated properly.	Replace expansion valve.

A/C System Inspection at ECM

S4RS0A7204004

Voltage Check

ECM and its circuits can be checked at ECM wiring couplers by measuring voltage.

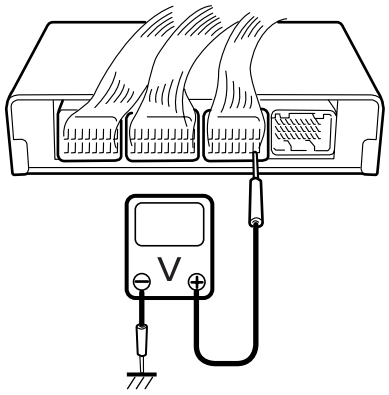
CAUTION:

- **ECM connectors are waterproofed. Each terminal of the ECM connectors is sealed up with the grommet. Therefore, do not measure circuit voltage and resistance by inserting the tester's probe into the sealed terminal at the harness side. Or, ECM and its circuits may be damaged by water.**
- **ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with couplers disconnected from ECM.**

1) Remove ECM from its bracket referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C".
2) Connect ECM couplers to ECM.
3) Check voltage at each terminal.

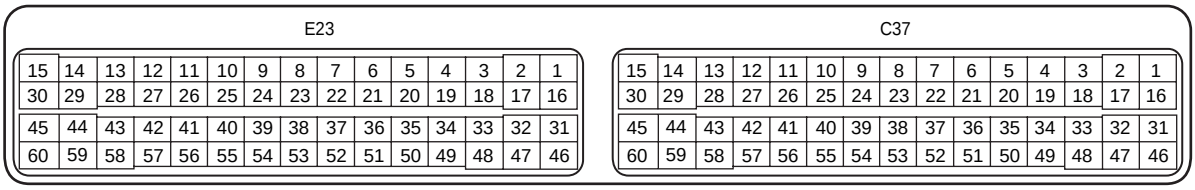
NOTE:

As each terminal voltage is affected by the battery voltage, confirm that the battery voltage is 11 V or more when ignition switch is ON position.



I4RS0A720050-

Terminal arrangement of ECM coupler (Viewed from harness side)



I4RS0A720010-

ECM Voltage Values Table for Relation of A/C Control

Terminal	Wire Color	Circuit	Normal Value	Condition
C37-14	GRY/RED	Output of 5 V power source	4.5 – 5.5 V	Ignition switch turned ON
C37-24	LT GRN	Engine coolant temp. (ECT) sensor signal	3.3 – 3.6 V	Ignition switch turned ON, ECT at 0 °C (32 °F)
			1.1 – 1.5 V	Ignition switch turned ON, ECT at 50 °C (122 °F)
C37-55	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
C37-57	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
C37-58	BLK/ORN	Ground for ECM	Below 0.3 V	Ignition switch turned ON
E23-1	BLK/RED	Main power supply	10 – 14 V	Ignition switch turned ON
E23-16	BLK/RED	Main power supply	10 – 14 V	Ignition switch turned ON
E23-19	BLU/WHT	Electric load signal for blower motor	10 – 14 V	Ignition switch turned ON, blower fan selector at OFF position
			0 – 1 V	Ignition switch turned ON, blower fan selector at 2nd speed position or more
E23-47	GRY	A/C compressor relay output	10 – 14 V	Engine running, A/C request signal high input
			0 – 1 V	Engine running, A/C request signal low input
E23-54	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
E23-55	RED	A/C refrigerant pressure sensor signal	1.46 – 1.71 V	Engine running, A/C refrigerant pressure at 0.8 MPa (8.0 kg/cm^2)(A/C refrigerant pressure measured by manifold gauge)
			2.55 – 2.80 V	Engine running, A/C refrigerant pressure at 1.6 MPa (16.0 kg/cm^2)(A/C refrigerant pressure measured by manifold gauge)
E23-57	WHT/BLK	Evaporator thermistor (evaporator temperature sensor) signal	3.45 – 3.65 V	Ignition switch turned ON, evaporator thermistor (evaporator temperature sensor) at 0 °C (32 °F)
			2.55 – 2.85 V	Ignition switch turned ON, evaporator thermistor (evaporator temperature sensor) at 15 °C (59 °F)
			1.7 – 2.1 V	Ignition switch turned ON, evaporator thermistor (evaporator temperature sensor) at 30 °C (86 °F)
E23-60	BRN/WHT	Main power supply relay output	10 – 14 V	Ignition switch turned OFF
			0 – 2 V	Ignition switch turned ON

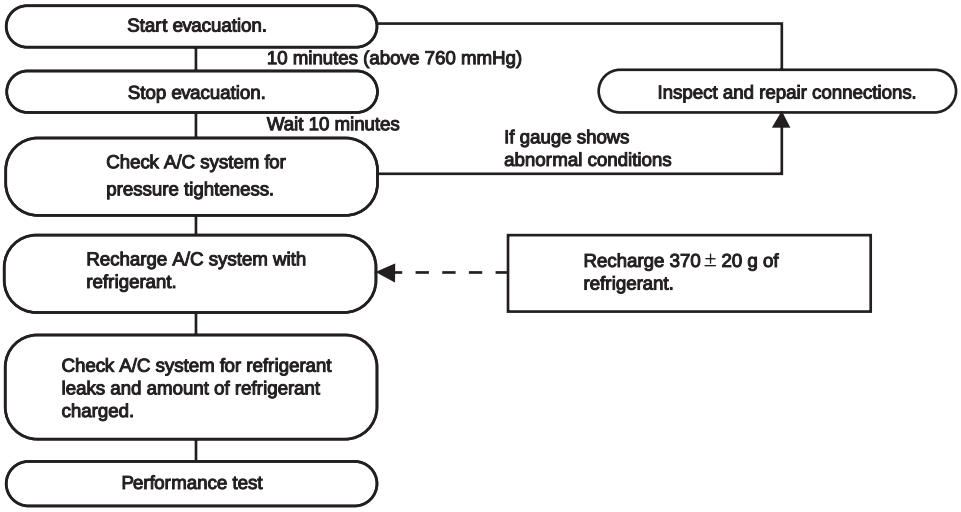
Repair Instructions

Operation Procedure for Refrigerant Charge

S4RS0A7206002

WARNING:

- **Your eyes should not be exposed to refrigerant (liquid).**
  Any liquid HFC-134a (R-134a) escaping by accident shows a temperature as low as approximately –6 °C (21.2 °F) below freezing point. Should liquid HFC-134a (R-134a) is exposed to your eyes, it may cause a serious injury. To protect your eyes from such accident, it is necessary to always wear goggles. Should it occur that HFC-134a (R-134a) is exposed to your eyes, consult a doctor immediately.
  - **Do not use your hand to rub the affected eye(s). Instead, use fresh cold water to splash it over the affected area to gradually raise temperature of such area above freezing point.**
  - **Obtain proper treatment as soon as possible from a doctor or eye specialist.**
- **Should the liquid refrigerant HFC-134a (R-134a) is exposed to your skin, the affected area should be treated in the same manner as when skin is frostbitten or frozen.**
- **Do not handle refrigerant near any place where welding or steam cleaning is performed.**
- **Refrigerant should be kept in a cold and dark place. It should never be stored in any place where temperature is high, e.g. where exposed to direct sun light, close to fire or inside vehicle (including trunk room).**
- **Avoid breathing fume produced when HFC-134a (R-134a) is burned. Such fume may be hazardous to your health.**

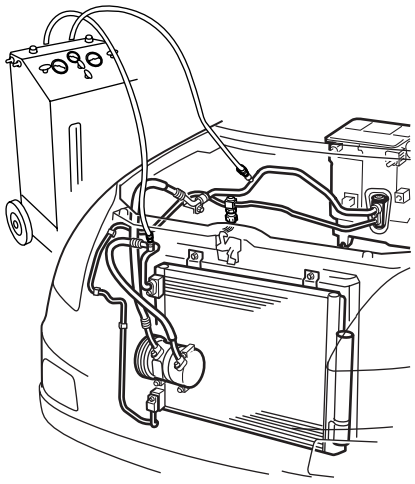


I4RS0A720011-

Recovery
When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment because discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environments.

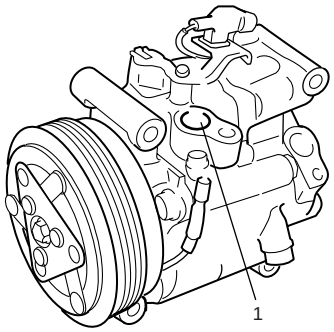
NOTE:

- **After recovering refrigerant from system, the amount of removed compressor oil must be measured for replenishing compressor oil.**
- **When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.**



I4RS0A720012-

Replenishing Compressor Oil
It is necessary to replenish specified amount of compressor oil to compressor from compressor suction side hole (1) before evacuating and charging refrigerant.



I4RS0A720013-

When charging refrigerant only
When charging refrigerant without replacing any component , replenish the same amount of measured oil when recovering refrigerant (if not measure, replenish 30 cm^3 (30 cc) oil).

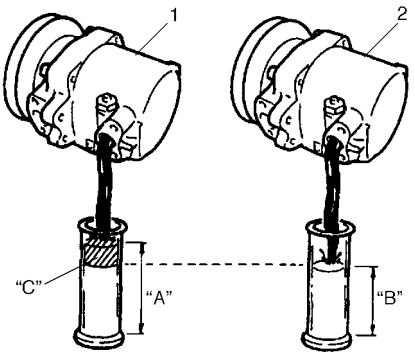
When replacing compressor

CAUTION:

Be sure to use P/N: 99000-99015-00A compressor oil or an equivalent compressor oil.

Compressor oil is sealed in each new compressor by the amount required for A/C system. Therefore, when using a new compressor, drain the calculated amount of oil from it.
"C" = "A" – "B"
"C": Amount of oil to be drained
"A": Amount of oil in a new compressor
"B": Amount of oil in removed compressor

Oil amount in compressor
90 ± 5 cm^3 (80 ± 5 cc, 4.88 ± 0.31 in^3)



I2RH01720015-

1.	New compressor
2.	Removed compressor

When replacing other parts
Replenish the following amount of oil to compressor.

Amount of compressor oil to be replenished
Evaporator: 25 cm^3 (25 cc, 1.53 in^3)
Condenser: 15 cm^3 (15 cc, 0.92 in^3)
Dryer: 20 cm^3 (20 cc, 1.22 in^3)
Hoses: 10 cm^3 (10 cc, 0.61 in^3) each
Pipes: 10 cm^3 (10 cc, 0.61 in^3) each

Evacuation

CAUTION:

Do not evacuate before recovering refrigerant in A/C system.

NOTE:

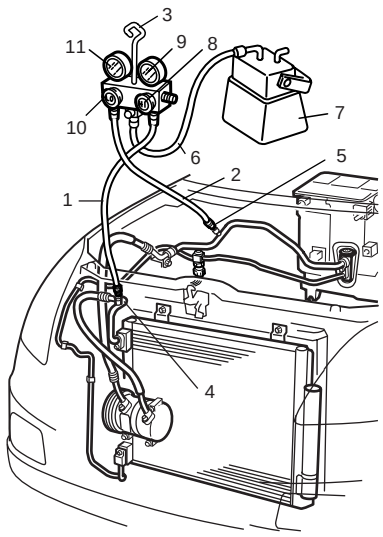
Once air conditioning system circuit is opened (exposed) to atmospheric air, system must be evacuated by using a vacuum pump. The A/C system should be attached with a manifold gauge set, and should be evacuated for approximately 15 minutes.

1) Connect high charging hose (1) and low charging hose (2) of manifold gauge set (3) respectively as follows:
   High charging hose → High pressure charging valve (4) on condenser outlet pipe
   Low charging hose → Low pressure charging valve (5) on suction pipe
2) Attach center charging hose (6) of manifold gauge set to vacuum pump (7).
3) Operate vacuum pump, and then open discharge side valve (Hi) (8) of manifold gauge set.
   If there is no blockage in the system, there will be an indication on high pressure gauge (9).
   In this case, open the other side valve (Lo) (10) of the set and repair the system.
4) Approximately 10 minutes later, low pressure gauge (11) should show a vacuum lower than –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.7 psi) providing no leakage exists.

NOTE:

- **If the system does not show a vacuum below –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.7 psi), close both valves, stop vacuum pump and watch movement of low pressure gauge.**
- **Increase in the gauge reading suggests existence of leakage. In this case, repair the system before continuing its evacuation.**
- **If the gauge shows a stable reading (suggesting no leakage), continue evacuation.**

5) Evacuation should be carried out for a total of at least 15 minutes.
6) Continue evacuation until low pressure gauge indicates a vacuum less than –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.7 psi), and then close both valves.
7) Stop vacuum pump. Disconnect center charging hose from pump inlet. Now, the system is ready for charging refrigerant.



I4RS0A720014-

Checking A/C System for Pressure Leaks

After completing the evacuation, close manifold gauge high pressure valve and low pressure valve and wait 10 minutes. Verify that low pressure gauge reading has not changed.

CAUTION:

If the gauge reading moves closer to "0", there is a leak somewhere. Inspect the tubing connections and make necessary corrections. And then, evacuate system once again and make sure that there are no leaks.

Charge

CAUTION:

- **Because the sight glass is not used for this A/C system, do not perform an additional charge to the A/C system. To charge the proper amount of refrigerant, recover and evacuate the A/C system first. And then, charge the proper amount of refrigerant into the A/C system.**
- **Always charge refrigerant through low pressure side of A/C system after the initial charge is performed from the high pressure side with the engine stopped.**
- **Never charge refrigerant through high pressure side of A/C system with engine running.**
- **Do not charge refrigerant while compressor is hot.**
- **When installing tap valve to refrigerant container to make a hole there through, carefully follow directions given by manufacturer.**
- **A pressure gauge should always be used before and during refrigerant charge.**
- **The refrigerant container should be emptied of refrigerant when discarding it.**
- **The refrigerant container should not be heated up to 40 °C (104 °F) or over.**
- **Refrigerant container should not be reversed in direction during refrigerant charge. Reversing in direction causes liquid refrigerant to enter compressor, causing troubles, such as compression of liquid refrigerant and the like.**

NOTE:

The air conditioning system contains HFC-134a (R-134a).
Described here is a method to charge the air conditioning system with refrigerant from the refrigerant service container.
When charging refrigerant recovered by using the refrigerant and recycling equipment (when recycling refrigerant), follow the procedure described in the equipment manufacturer's instruction manual.

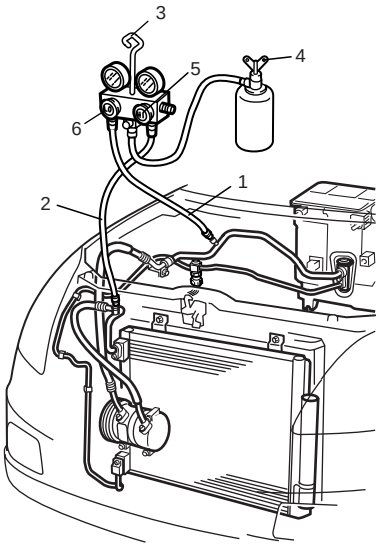
The initial charge of the A/C system is performed through the high pressure side with the engine stopped. And next, this method must be followed by charging from the low pressure side with the engine running.

1) Check if hoses are routed properly after evacuating the system.
2) Connect low charging hose (1) and high charging hose (2) of the manifold gauge set (3) in position. Then, open refrigerant container valve (4) to purge the charging line.
3) Open the high pressure side valve (5) and charge refrigerant to system.
4) After a while, open the low pressure side valve (6) and close the high pressure side valve.

WARNING:

Make sure that high pressure side valve is closed securely.

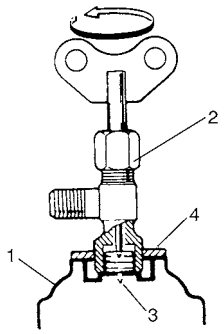
5) Start engine and keep engine speed at 1500 r/min, and then operate A/C system.
6) Charge A/C system with refrigerant in vapor state. At this time, refrigerant container should be held upright.



I4RS0A720015-

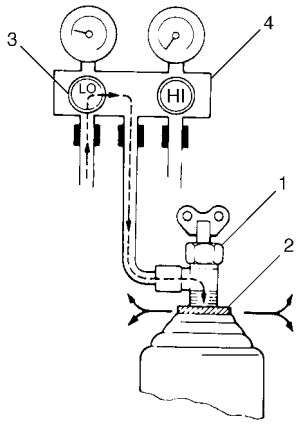
7) When refrigerant container (1) is emptied, use the following procedure to replace it with a new refrigerant container.
   a) Close low pressure valve.

b) Replace empty container with a refrigerant container which has been charged with refrigerant. When using refrigerant container tap valve (2), use the following procedure for replacement.
   i) Retract needle (3) and remove refrigerant container tap valve by loosening its plate nut (4).
   ii) Install the refrigerant container tap valve to a new refrigerant container.



I2RH01720018-

c) Purge any air existing in center charging hose. When using refrigerant container tap valve, use the following procedure to purge air.
   i) Once fully tighten refrigerant container tap valve (1), and then loosen (open) plate nut (2) slightly.
   ii) Open low pressure side valve (3) of manifold gauge set (4) a little.
   iii) As soon as refrigerant comes out with a “hiss” through a clearance between refrigerant container and tap valve, tighten plate nut as well as low pressure side valve.
   iv) Turn handle of tap valve clockwise so that its needle is screwed into the new container to make a hole for refrigerant flow.

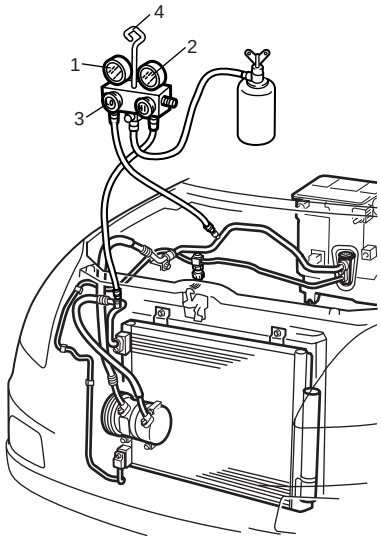


I2RH01720019-

8) After the system has been charged with specified amount (370 ± 20 g) of refrigerant or when low pressure gauge (1) and high pressure gauge (2) have indicated the following specified value, close low pressure side valve (3) on manifold gauge set (4).

Low side and high side pressure example

Gauges should read as follows when ambient temperature is 30 °C (86 °F).	
Pressure on high pressure gauge	**1240 – 1520 kPa 12.4 – 15.2 kg/cm^2 176 – 216 psi**
Pressure on low pressure gauge	**250 – 360 kPa 2.5 – 3.5 kg/cm^2 35.6 – 51 psi**



I4RS0A720016-

Removal of Manifold Gauge Set

WARNING:

High pressure side is under high pressure. Therefore, be careful not to get injured especially on your eyes and skin.

For the A/C system charged with the specified amount of refrigerant, remove manifold gauge set as follows:

1) Close low pressure side valve of manifold gauge set. (The high pressure side valve is closed continuously during the process of charging.)
2) Close refrigerant container valve.
3) Stop engine.
4) Using shop rag, remove charging hoses from service valves. This operation must be performed guickly.
5) Put caps on service valves.

Check A/C System for Refrigerant Leaks
Whenever a refrigerant leak is suspected in the system or any service operation has been performed which may result in malfunction of lines and connections, it is advisable to check for leaks.
Common sense should be used during refrigerant leak test, since the need and extent of any such test will, in general, depend upon the nature of a complaint and the type of a service performed on the system.

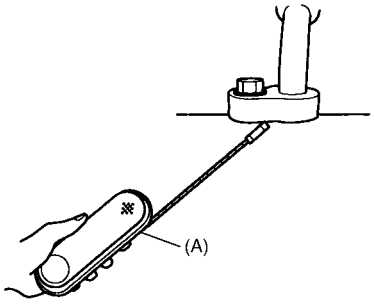
Liquid leak detector

WARNING:

- **To prevent explosions and fires, make sure that there are no flammables in the vicinity.**
- **When the refrigerant exposed to fire, it turns into a poisonous gas (phosgene). Do not inhale this gas.**

There is a number of fittings and places throughout the A/C system where a liquid leak detector solution may be used to pinpoint refrigerant leaks.
By merely applying the solution to the area in question with a swab, such as attached to the cap of a vial, bubbles will form within seconds if there is a leak.
For confined areas, such as sections of the evaporator and condenser, an electronic (refrigerant) leak detector is more practical for determining leaks.

Special tool
(A): 09990-86011



I2RH01720020-

Condenser Assembly On-Vehicle Inspection

S4RS0A7206008

Check the followings.

- Clog of condenser fins
  If any clog is found, condenser fins should be washed with water and should be dried with compressed air.
- Condenser fins for leakage and breakage
  If any defects are found, repair or replace condenser.
- Condenser fittings for leakage.
  If any defects are found, repair or replace condenser.

Condenser Assembly Removal and Installation

S4RS0A7206007

CAUTION:

Do not damage condenser fins. If condenser fin is bent, straighten it by using flat head screwdriver or pair of pliers.

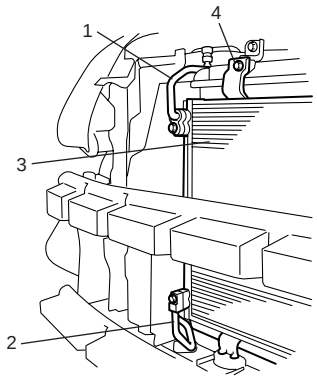
Removal

1) Recover refrigerant from A/C system referring to “Operation Procedure for Refrigerant Charge: ”.

NOTE:

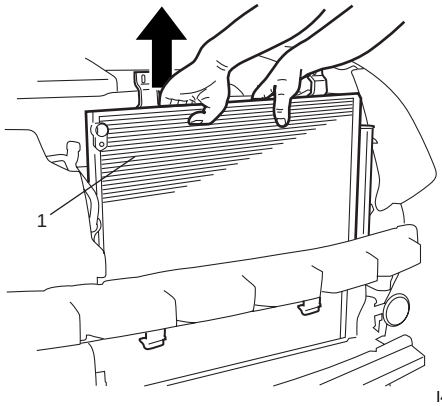
The amount of removed compressor oil must be measured for replenishing compressor oil.

2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect discharge hose (1) and liquid pipe (2) from condenser assembly (3).
4) Remove condenser assembly mounting bolts (4).



I4RS0A720017-

5) Remove condenser assembly (1) as shown.



I4RS0A720018-

Installation
Reverse the removal procedure to install condenser noting the following instructions.

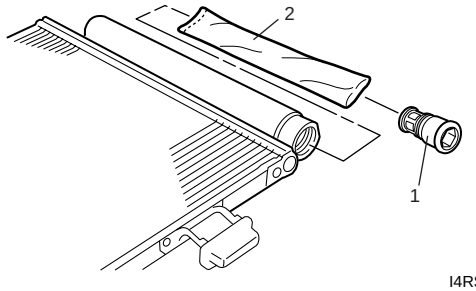
- Replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.

Desiccant Removal and Installation

S4RS0A7206009

Removal

1) Remove condenser assembly referring to “Condenser Assembly Removal and Installation: ”.
2) Remove cap (1) from receiver/dryer tank.
3) Remove desiccant (2) from receiver/dryer tank.



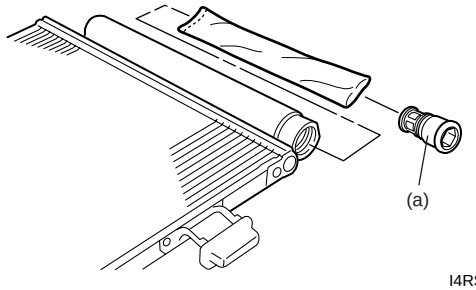
I4RS0A720019-

Installation
Reverse the removal procedure noting the following instructions.

- Replenish specified amount of compressor oil to compressor suction side referring to in “Operation Procedure for Refrigerant Charge: ”.
- Do not remove desiccant from the plastic bag until just before inserting it into the receiver.
- Install the desiccant with its welded part downward.
- Apply compressor oil to cap’s O-ring.
- Tighten cap to the specified torque

  Tightening torque
  Cap (a): 3.0 N·m (0.3 kg-m, 2.5 lb-ft)

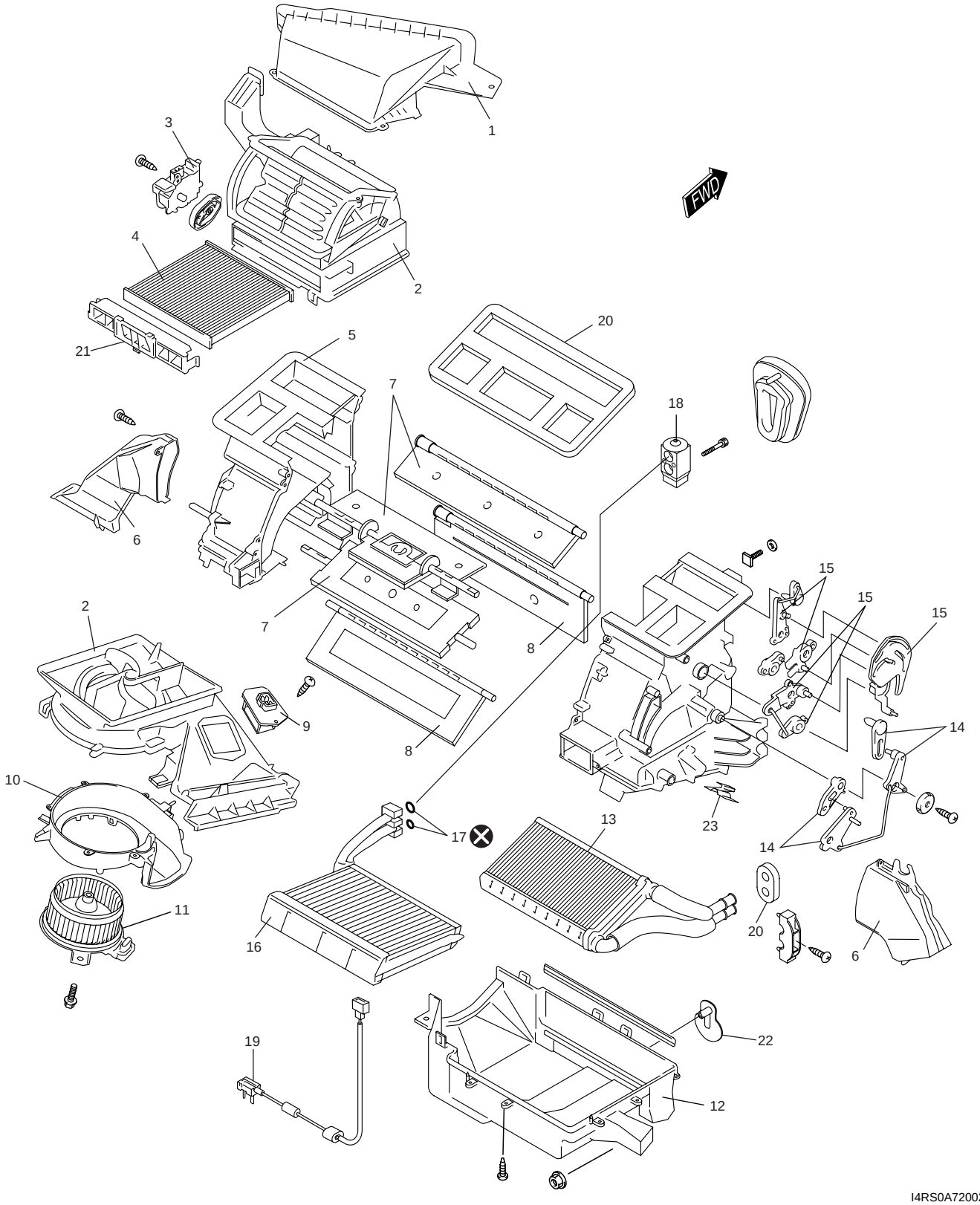
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.



I4RS0A720020-

HVAC Unit Components

S4RS0A7206003



I4RS0A720021-

1. Fresh air inlet duct	7. Airflow control door assembly	13. Heater core	19. Evaporator thermistor (evaporator temperature sensor)
2. Blower upper case	8. Temperature control door assembly	14. Temperature control lever	20. Packing
3. Air intake control actuator	9. Blower motor resistor	15. Airflow control lever	21. Filter cover
4. Air filter	10. Blower lower case	16. Evaporator	22. Drain hose
5. Heater unit upper case	11. Blower motor	17. O-ring	23. Cable lock clamp

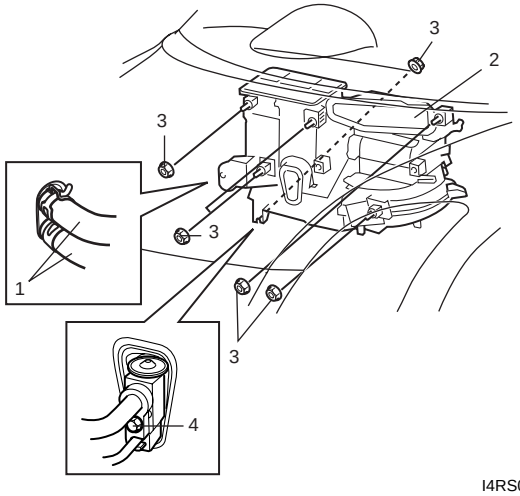
6. Foot duct	12. Heater unit lower case	18. Expansion valve	⊗ : Do not reuse.

HVAC Unit Removal and Installation

S4RS0A7206012

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Recover refrigerant from A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
4) Remove cowl top panel referring to “Cowl Top Components: in Section 9K”.
5) Drain engine coolant, and then disconnect heater hoses (1) from HVAC unit (2).
6) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation: in Section 9C”.
7) Loosen suction hose and liquid pipe bolt (4).
8) Remove nuts (3).
9) Remove HVAC unit from vehicle body.

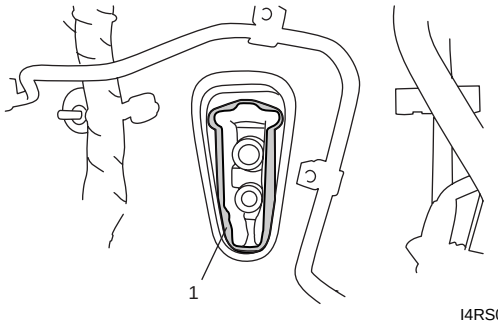


I4RS0A720022-

Installation

Reverse removal procedure noting the following instructions.

- Replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.
- Install the padding (1) to the installation hole uniformly.



I4RS0A720023-

- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.
- Adjust control cables referring to “HVAC Control Unit Removal and Installation: in Section 7A”.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Evaporator Inspection

S4RS0A7206013

Check the followings.

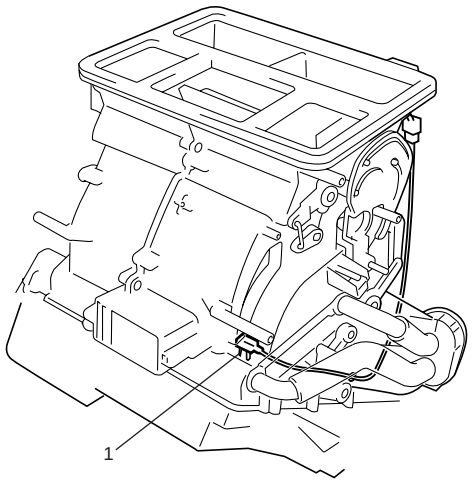
- Clog of A/C evaporator fins.
  If any clogs are found, A/C evaporator fins should be washed with water, and then should be dried with compressed air.
- A/C evaporator fins for leakage and breakage.
  If any defects are found, repair or replace A/C evaporator.
- A/C evaporator fittings for leakage.
  If any defects are found, repair or replace A/C evaporator.

Evaporator Thermistor (Evaporator Temperature Sensor) Removal and Installation

S4RS0A7206033

Removal

1) Disconnect negative (–) cable from battery.
2) Remove HVAC unit from vehicle body referring to “HVAC Unit Removal and Installation: ”.
3) Remove evaporator thermistor (evaporator temperature sensor) (1) from evaporator by disassembling HVAC unit.

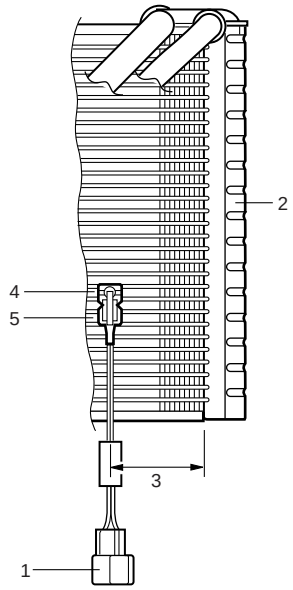


I4RS0A720052-

Installation

Reverse the removal procedure noting the following instruction.

- Install evaporator thermistor (evaporator temperature sensor) (1) onto evaporator (2) as shown.



I4RS0A720053-

3.	50 ± 5 mm (2 ± 0.2 in.)
4.	Sensor part fixed to 10th fin from the bottom
5.	Holding part fixed to 8th fin from the bottom

Evaporator Thermistor (Evaporator Temperature Sensor) Inspection

S4RS0A7206014

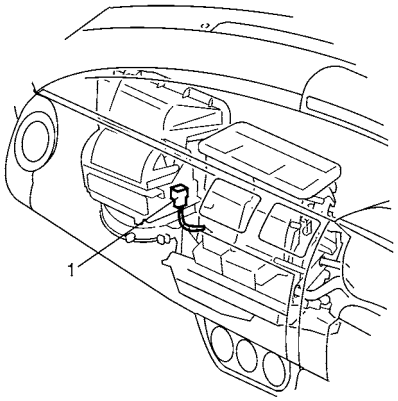
Check resistance between terminals of evaporator thermistor (1).

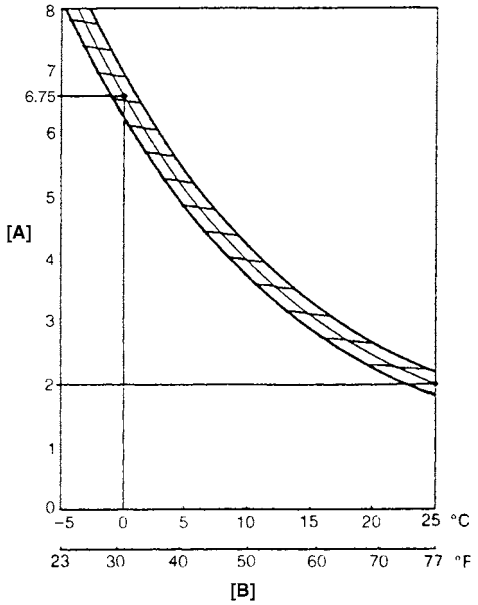
If check results are as not specified, replace evaporator thermistor.

Evaporator themistor resistance

0 °C (32 °F): 6.6 – 6.9 kΩ

25 °C (77 °F): 1.9 – 2.3 kΩ





I4RS0A720027-

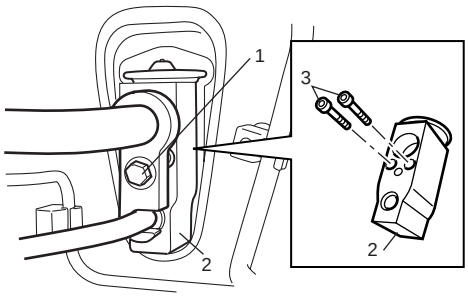
[A]:	Resistance (kΩ)
[B]:	Temperature

Expansion Valve Removal and Installation

S4RS0A7206015

Removal

1) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
2) Loosen a bolt (1) and remove pipes from expansion valve (2).
3) Loosen bolts (3) and remove expansion valve.



I4RS0A720028-

Installation
Reverse removal procedure noting the following instructions.

- Apply compressor oil to O-ring of expansion valve and pipes.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.

Expansion Valve Inspection

S4RS0A7206016

Refer to “A/C System Performance Inspection: ”

A/C Refrigerant Pressure Sensor and Its Circuit Inspection

S4RS0A7206034

1) Disconnect A/C refrigerant pressure sensor connector.
2) Turn ignition switch to ON position.
3) Check if voltage between “RED” wire terminal and “ORN” wire terminal of A/C refrigerant pressure sensor connector is 4.75 V to 5.25 V.
   If not, check A/C refrigerant pressure sensor circuit.
4) Connect A/C refrigerant pressure sensor connector with ignition switch turned OFF.
5) Connect manifold gauge set to the charging valves.
6) Check A/C refrigerant pressure sensor voltage of ECM connector referring to “A/C System Inspection at ECM: ”.
   If voltage is not as specified below, replace A/C refrigerant pressure sensor.

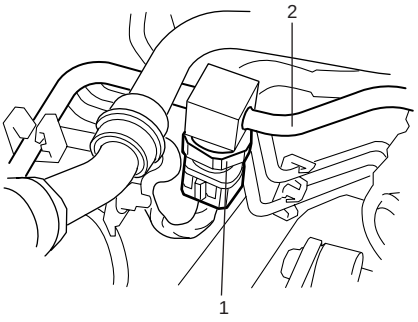
A/C refrigerant pressure sensor voltage specifications (A/C refrigerant pressure measured by manifold gauge)
0.8 MPa (8.0 kg/cm^2, 116 psi): 1.46 – 1.71 V
1.4 MPa (14 kg/cm^2, 203 psi): 2.28 – 2.53 V
1.6 MPa (16 kg/cm^2, 232 psi): 2.55 – 2.80 V
1.8 MPa (18 kg/cm^2, 261 psi): 2.82 – 3.03 V

A/C Refrigerant Pressure Sensor Removal and Installation

S4RS0A7206018

Removal

1) Recover refrigerant from the A/C system with the recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
2) Disconnect negative (–) cable from battery.
3) Disconnect A/C refrigerant pressure sensor connector.
4) Remove A/C refrigerant pressure sensor (1) from liquid pipe (2).

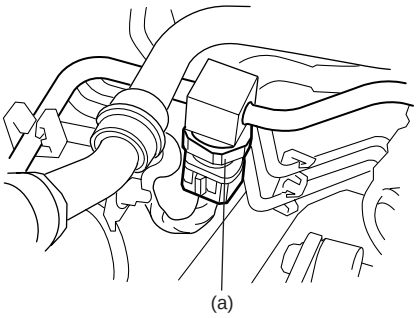


I4RS0A720029-

Installation.
Reverse removal procedure noting the following instructions.

- Apply compressor oil to O-ring of A/C refringerant pressure sensor.
- Tighten A/C refrigerant pressure sensor to specified torque.

  Tightening torque
  A/C refrigerant pressure sensor (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A720031-

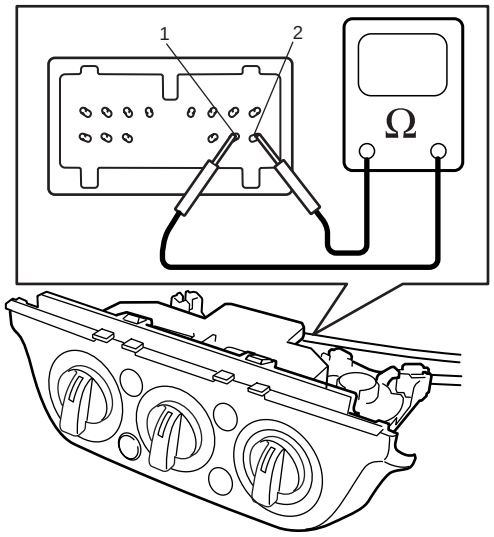
- Evacuate and charge system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.

A/C Switch Inspection

S4RS0A7206035

- Check that there is continuity between terminal (1) and terminal (2) when A/C switch is at ON position.
- Check that there is no continuity between terminal (1) and terminal (2) when A/C switch is at OFF position.

If check result does not meet the above conditions, replace HVAC control unit.

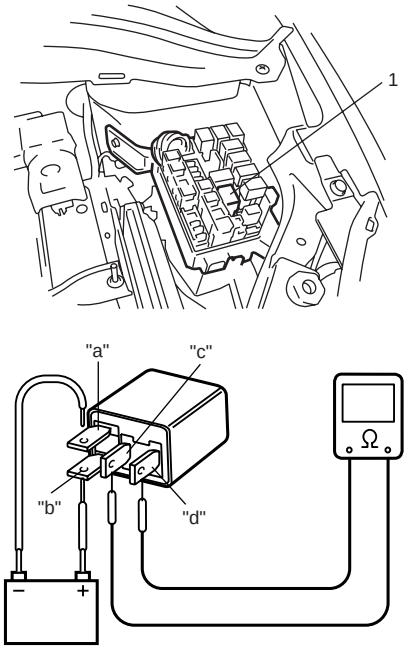


I4RS0A720030-

Compressor Relay Inspection

S4RS0A7206019

1) Disconnect negative (–) cable from battery.
2) Remove compressor relay (1) from main fuse box.
3) Check that there is no continuity between terminal “c” and “d”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “b” of relay and battery negative (–) terminal to terminal “a” of relay, and then check continuity between terminal “c” and “d”. If there is no continuity, replace relay.



I4RS0A720032-

Compressor Drive Belt Inspection and Adjustment

S4RS0A7206021

Inspection

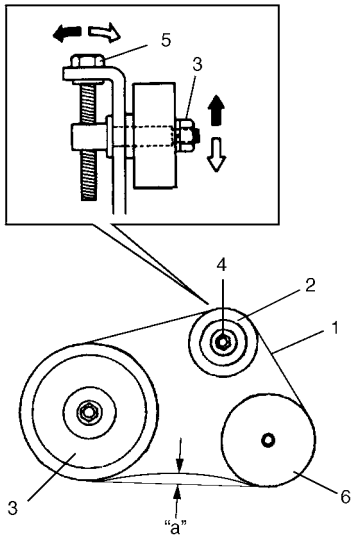
- Check compressor drive belt (1) for wear, crack, deformation and cleanliness. If any defect is found, replace the belt with new one referring to “Compressor Drive Belt Removal and Installation: ”.
- Check compressor drive belt tension by measuring how much it deflects when pushed intermediate point between tension pulley (2) and crankshaft pulley (3) with about 100 N (10 kg) force after rotating crankshaft pulley 360°. If belt tension is out of specification, adjust belt tension referring to “Adjustment”.

Compressor drive belt tension
“a”: 7 – 8mm (0.28 – 0.31 in.)

New compressor drive belt tension
“a”: 6 – 7mm (0.24 – 0.28 in.)

Adjustment

1) Loosen tension pulley nut (4).
2) Adjust belt tension by tighten or loosen tension pulley adjusting bolt (5).
3) Tighten tension pulley nut.
4) Rotate the crankshaft pulley 360°, and then recheck belt tension.



I4RS0A720033-

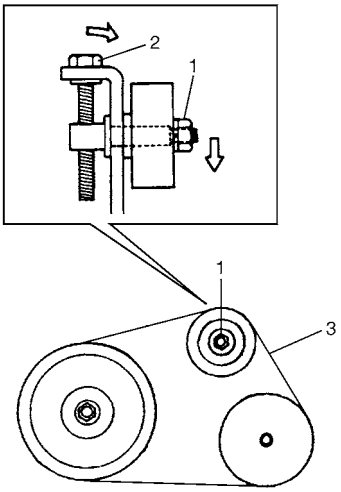
6. Magnet clutch pulley

Compressor Drive Belt Removal and Installation

S4RS0A7206036

Removal

1) Loosen tension pulley nut (1).
2) Loosen belt tension by loosening tension pulley adjusting bolt (2).
3) Remove compressor drive belt (3).



I4RS0A720034-

Installation

Reverse removal procedure noting the following instruction.

- Adjust belt tension referring to “Compressor Drive Belt Inspection and Adjustment: ”.

Compressor Assembly Removal and Installation

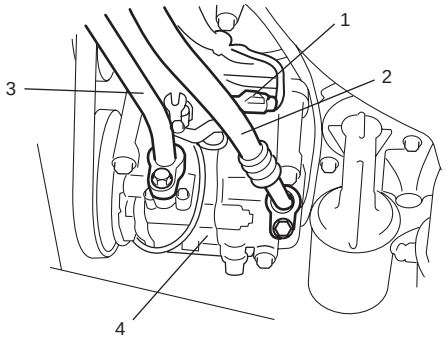
S4RS0A7206037

Removal

1) Run engine at idle speed with A/C ON for 10 minutes.
2) Stop the engine.
3) Disconnect negative (-) cable from battery.
4) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
5) Remove compressor drive belt referring to “Compressor Drive Belt Removal and Installation: ”.
6) Remove right side engine under cover.
7) Disconnect magnet clutch lead wire coupler (1).
8) Disconnect discharge hose (2) and suction hose (3) from compressor (4).

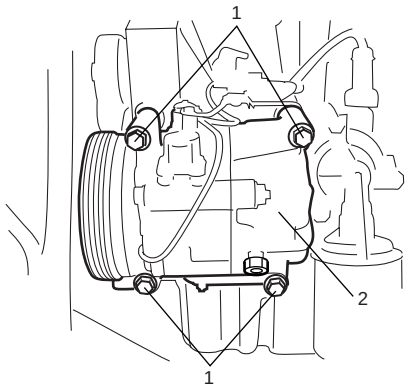
NOTE:

Cap open fittings immediately to keep moisture out of the system.



I4RS0A720035-

9) Remove compressor mounting bolts (1), and then remove compressor (2) from its bracket.



I4RS0A720036-

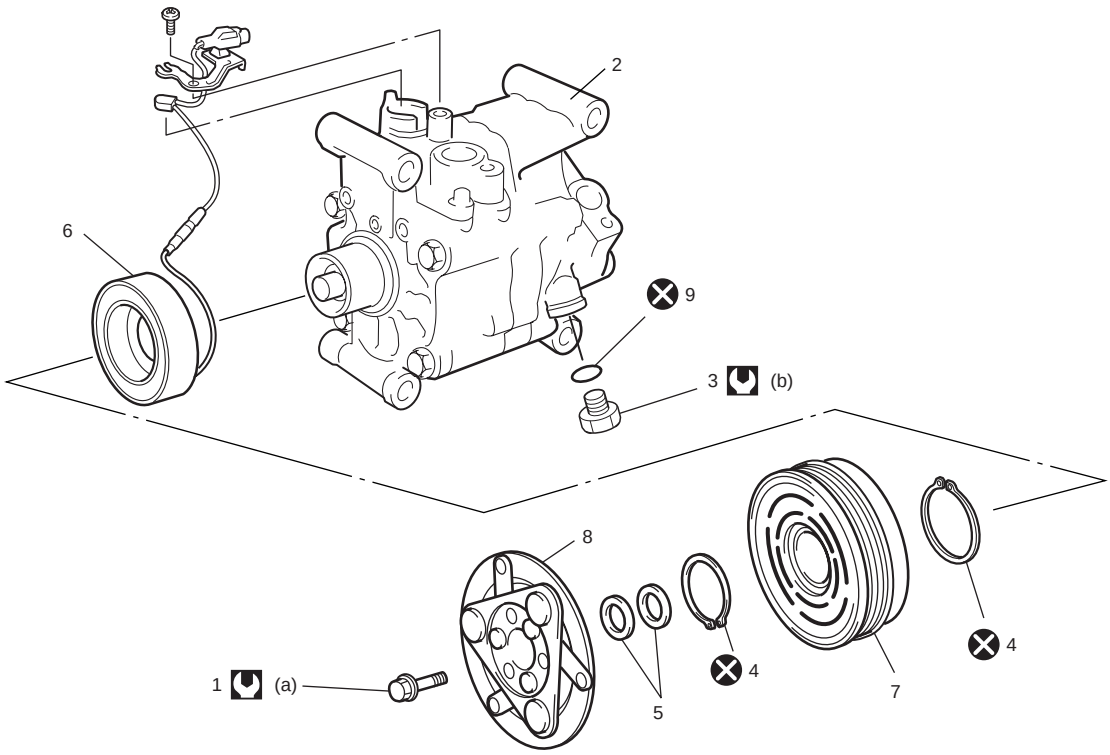
Installation

Reverse removal procedure noting the following instructions.

- If compressor is replaced, pour new compressor oil referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.
- Evacuate and charge system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.
- Adjust drive belt tension referring to “Compressor Drive Belt Inspection and Adjustment: ”.

Compressor Assembly Components

S4RS0A7206024



I4RS0A720037-

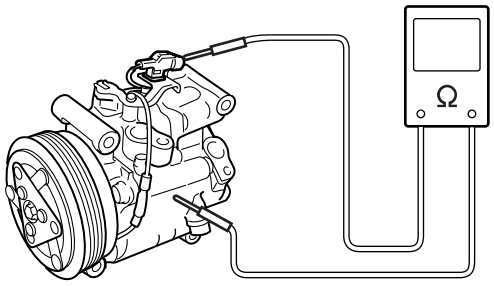
1. Armature plate bolt	4. Circlip	7. Magnet clutch pulley	: Do not reuse.
2. Compressor	5. Shim	8. Armature plate	(a) : 15 N·m (1.5 kg-m, 11.0 lb-ft)
3. Relief valve	6. Magnet clutch coil and thermal switch	9. O-ring	(b) : 8 N·m (0.8 kg-m, 6.0 lb-ft)

Magnet Clutch Inspection

S4RS0A7206023

- Check armature plate and magnet clutch pulley for wear and oil soak respectively.
- Check magnet clutch pulley bearing for noise, wear and grease leakage.
- Measure magnet clutch coil for resistance at 20 °C (68 °F). If the measured resistance does out of specification, replace magnet clutch assembly.

Magnet clutch coil resistance
Standard: 3.5 – 4.0 Ω



I4RS0A720038-

Magnet Clutch Removal and Installation

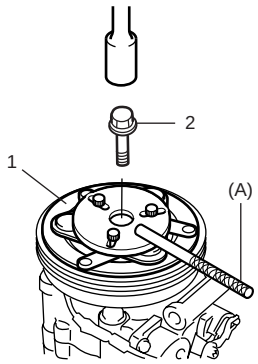
S4RS0A7206025

Removal

1) Remove compressor from vehicle referring to “Compressor Assembly Removal and Installation: ”.
2) Fix armature plate (1) with special tool and remove armature plate bolt (2).

Special tool
(A): 09991–06310

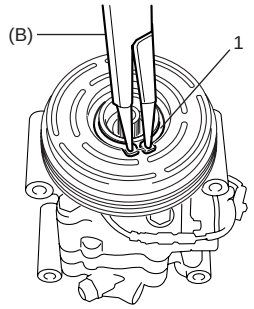
3) Remove armature plate (1).



I4RS0A720039-

4) Remove shims from shaft.
5) Remove circlip (1) using special tool.

Special tool
(B): 09900–06107

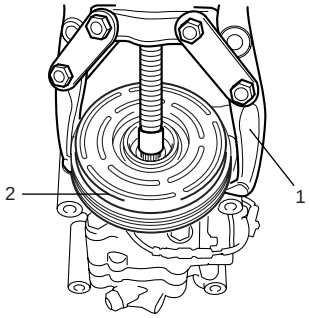


I4RS0A720040-

6) Remove magnet clutch pulley (2).

NOTE:

- **If it is difficult to remove magnet clutch pulley by hand, use puller (1).**
- **Do not damage magnet clutch pulley when using puller.**

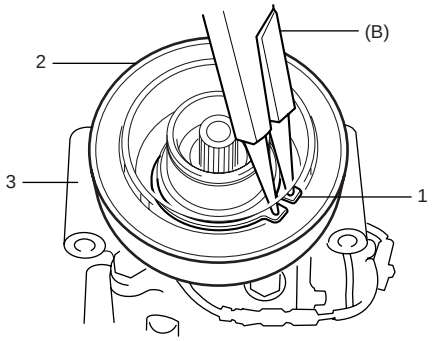


I4RS0A720041-

7) Remove magnet clutch lead wire clamp.
8) Remove circlip (1) by using special tool.

Special tool
(B): 09900–06107

9) Remove magnet clutch coil (2) from compressor (3).

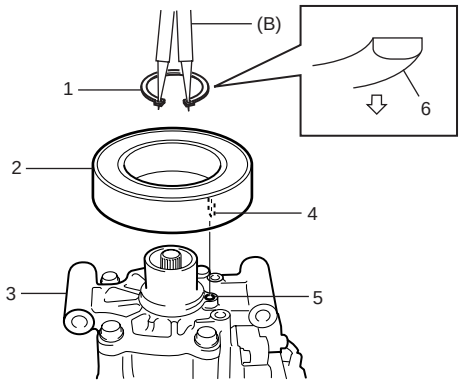


I4RS0A720042-

Installation

1) Install magnet clutch coil (2) fitting protrusion (4) of magnet clutch coil onto hole (5) of compressor (3).
2) Install new circlip (1) directing chamfer side (6) downward.

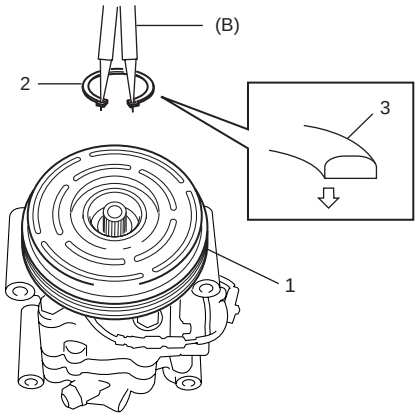
Special tool
(B): 09900-06107



I4RS0A720043-

3) Apply silicon to contact face of thermal switch.
4) Install magnet clutch lead wire clamp.
5) Install magnet clutch pulley (1).
6) Install new circlip (2) directing chamfer side (3) upward.

Special tool
(B): 09900–06107

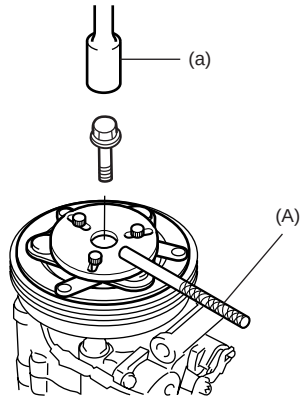


I4RS0A720044-

7) Tighten armature plate bolt to specified torque.

Tightening torque
Armature plate bolt (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

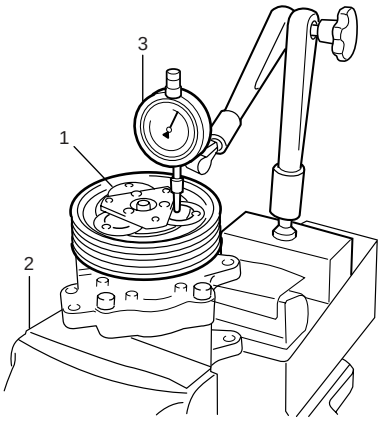
Special tool
(A): 09991–06310



I4RS0A720045-

8) Adjust clearance between magnet clutch plate (1) and magnet clutch pulley by putting shim(s) on compressor shaft. To measure the clearance, perform the following steps.
   a) Put compressor in a vise (2).
   b) Set dial gauge (3) on magnet clutch plate, and then adjust its pointer at 0.
   c) Connect battery positive terminal (+) to magnet clutch coil lead wire.
   d) Connect battery negative terminal (–) to compressor body assembly. (At this point, magnet clutch plate and magnet clutch pulley are kept in contact.)
   e) Disconnect battery negative terminal (–) to compressor body assembly. (At this point, magnet clutch plate and magnet clutch pulley are not in contact.)
   f) Read stroke of magnet clutch plate from dial gauge by performing step d) and e) repeatedly. (Stroke of magnet clutch plate is clearance between magnet clutch plate and magnet clutch pulley.)

Standard clearance between magnet clutch plate and magnet clutch plate:
0.3 – 0.5 mm (0.012 – 0.020 in.)



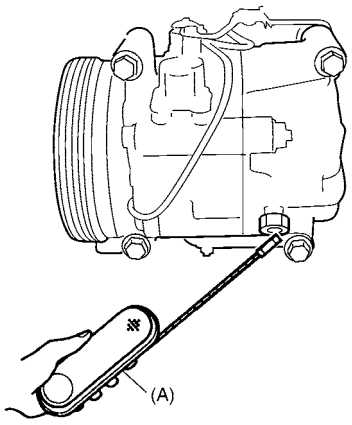
I4RS0A720046-

Relief Valve Inspection

S4RS0A7206031

By using special tool, check if there is refrigerant leakage. If there is refrigerant leakage, replace the relief valve.

Special tool
(A): 09990–86011



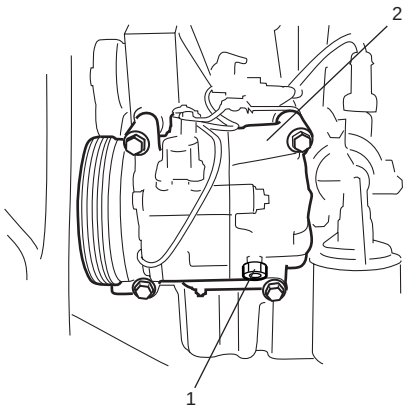
I4RS0A720047-

Relief Valve Removal and Installation

S4RS0A7206038

Removal

1) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
2) Remove relief valve (1) from compressor (2).

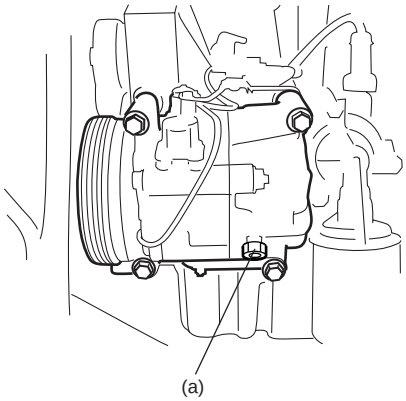


I4RS0A720048-

Installation
Reverse removal procedure noting the following instructions.

- Use new O-ring.
- Apply compressor oil to O-ring.
- Tighten relive valve to the specified torque.

Tightening torque
Relief valve (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)



I4RS0A720049-

- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.

Specifications

Tightening Torque Specifications

S4RS0A7207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Cap	3.0	0.3	2.5	☞
A/C refrigerant pressure sensor	11	1.1	8.0	☞
Armature plate bolt	15	1.5	11.0	☞
Relief valve	8	0.8	6.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Compressor Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A7208001

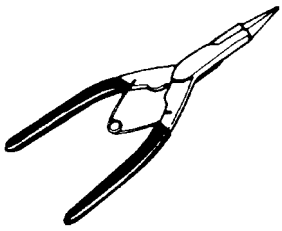
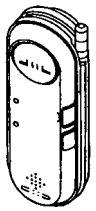
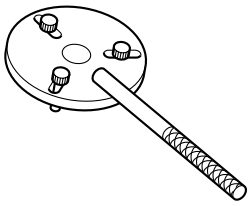
Material	SUZUKI recommended product or Specification		Note
Compressor oil	Compressor oil (MATSUSHITADENKI) - Domestic	P/No.: 99000–99015–00A	☞

NOTE:

Required service material is also described in the following.
“Precautions on Servicing A/C System: ”

Special Tool

S4RS0A7208002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ / ☞ / ☞		09990–86011 Gas leak detector ☞ / ☞	
09991–06310 Armature plate holder ☞ / ☞			

Section 8

Restraint

CONTENTS

Precautions 8-1
Precautions 8-1
Precautions on Restraint 8-1

Seat Belts 8A-1
Precautions 8A-1
Precautions on Service and Diagnosis of Seat Belt 8A-1
General Description 8A-1
Seat Belt Construction 8A-1
Diagnostic Information and Procedures 8A-2
Repair and Inspection Required after Accident 8A-2
Repair Instructions 8A-3
Front Seat Belt Components 8A-3
Front Seat Belt Removal and Installation 8A-3
Front Seat Belt Inspection 8A-4
Rear Seat Belt Components 8A-6
Rear Seat Belt Removal and Installation 8A-7
Rear Seat Belt Inspection 8A-7
Specifications 8A-7
Tightening Torque Specifications 8A-7

Air Bag System 8B-1
Precautions 8B-1
Precautions on Service and Diagnosis of Air Bag System 8B-1
Precautions on Handling and Storage of Air Bag System Components 8B-1
Precautions on Disposal of Air Bag and Seat Belt Pretensioner 8B-5
General Description 8B-5
Air Bag System Construction 8B-5
Air Bag System Input / Output Table 8B-6
Schematic and Routing Diagram 8B-7
Air Bag System Wiring Circuit Diagram 8B-7
Component Location 8B-9
Air Bag System Components, Wiring and Connectors Location 8B-9
Diagnostic Information and Procedures 8B-10
Air Bag Diagnostic System Check 8B-10
Air Bag Diagnostic System Check Flow 8B-10
DTC Table 8B-11
DTC Check 8B-12
DTC Clearance 8B-12
Scan Tool Data 8B-13
"AIR BAG" Warning Lamp Comes ON Steady 8B-13
"AIR BAG" Warning Lamp Does Not Come ON 8B-15
"AIR BAG" Warning Lamp Flashes 8B-17
DTC B1013: SDM fault 8B-18
DTC B1014: "AIR BAG" Warning Lamp Circuit Failure 8B-18
DTC B1016: Power Source Voltage High 8B-19
DTC B1017: Power Source Voltage Low 8B-21
DTC B1021: Front Air Bag Module Deployed 8B-23
DTC B1024 / B1025: Side-Air Bag (Driver / Passenger) Deployed 8B-23
DTC B1026: Pretensioner Activated 8B-24
DTC B1027: Reusable Number Exceeded 8B-25
DTC B1031: Driver Air Bag Initiator Circuit Resistance High 8B-25
DTC B1032: Driver Air Bag Initiator Circuit Resistance Low 8B-30
DTC B1033: Driver Air Bag Initiator Circuit Short to Ground 8B-35
DTC B1034: Driver Air Bag Initiator Circuit Short to Power Circuit 8B-40
DTC B1041: Passenger Air Bag Initiator Circuit Resistance High 8B-45
DTC B1042: Passenger Air Bag Initiator Circuit Resistance Low 8B-49
DTC B1043: Passenger Air Bag Initiator Circuit Short to Ground 8B-53
DTC B1044: Passenger Air Bag Initiator Circuit Short to Power Circuit 8B-57
DTC B1051 / B1055: Driver / Passenger Pretensioner Initiator Circuit Resistance High 8B-61
DTC B1052 / B1056: Driver / Passenger Pretensioner Initiator Circuit Resistance Low 8B-64
DTC B1053 / B1057: Driver / Passenger Pretensioner Initiator Circuit Short to Ground 8B-67
DTC B1054 / B1058: Driver / Passenger Pretensioner Initiator Circuit Short to Power Circuit 8B-69
DTC B1061 / B1065: Driver / Passenger Side-Air Bag Initiator Circuit Resistance High 8B-71
DTC B1062 / B1066: Driver / Passenger Side-Air Bag Initiator Circuit Resistance Low 8B-75
DTC B1063 / B1067: Driver / Passenger Side-Air Bag Initiator Circuit Short to Ground 8B-79

DTC B1064 / B1068: Driver / Passenger Side-Air Bag Initiator Circuit Short to Power Circuit 8B-82
DTC B1071: Forward-Sensor Performance Problem 8B-85
DTC B1072: Forward-Sensor Communication Error 8B-85
DTC B1073: Forward-Sensor Circuit Short to Ground 8B-85
DTC B1074: Forward-Sensor Circuit Short to Power Circuit or Open 8B-87
DTC B1081 / B1091: Driver / Passenger Side-Sensor Performance Problem 8B-89
DTC B1082 / B1092: Driver / Passenger Side-Sensor Communication Error 8B-89
DTC B1083 / B1093: Driver / Passenger Side-Sensor Circuit Short to Ground 8B-89
DTC B1084 / B1094: Driver / Passenger Side-Sensor Circuit Short to Power Circuit or Open 8B-91
DTC B1085 / B1095: Wrong Side-Sensor (Driver Side / Passenger) ID 8B-93
DTC B1361 / B1365: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance High 8B-93
DTC B1362 / B1366: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance Low 8B-95
DTC B1363 / B1367: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Ground 8B-97
DTC B1364 / B1368: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Power Circuit 8B-99
Inspection of Intermittent and Poor Connections 8B-101
Repair and Inspection Required after Accident 8B-102
Repair Instructions 8B-105
Disabling Air Bag System 8B-105
Enabling Air Bag System 8B-105
SDM Removal and Installation 8B-106
SDM Inspection 8B-107
Driver Air Bag (Inflator) Module Removal and Installation 8B-107
Driver Air Bag (Inflator) Module Inspection 8B-108
Passenger Air Bag (Inflator) Module Removal and Installation 8B-109
Passenger Air Bag (Inflator) Module Inspection 8B-110
Side-Air Bag (Inflator) Module Removal and Installation 8B-111
Side-Air Bag (Inflator) Inspection 8B-112
Side Curtain-Air Bag (Inflator) Module Removal and Installation 8B-113
Side Curtain-Air Bag (Inflator) Module Inspection 8B-114
Forward-Sensor Removal and Installation 8B-114
Forward-Sensor Inspection 8B-115
Side-Sensor Removal and Installation 8B-115
Side-Sensor Inspection 8B-116
Passenger Air Bag (Inflator) Module Repair Harness Installation 8B-117
Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal 8B-118
Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal 8B-128
Specifications 8B-129
Tightening Torque Specifications 8B-129
Special Tools and Equipment 8B-129
Use of Special Tools 8B-129
Recommended Service Material 8B-130
Special Tool 8B-131

Precautions

Precautions

Precautions on Restraint

S4RS0A8000001

Air Bag System Service Warning
Refer to “Air Bag System Service Warning: in Section 00”.

Fastener Caution
Refer to “Fastener Caution: in Section 00”.

Precautions on Service and Diagnosis of Seat Belt
Refer to “Precautions on Service and Diagnosis of Seat Belt: in Section 8A”.

Precautions on Service and Diagnosis of Air Bag System
Refer to “Precautions on Service and Diagnosis of Air Bag System: in Section 8B”.

Precautions on Handling and Storage of Air Bag Components
Refer to “Precautions on Handling and Storage of Air Bag System Components: in Section 8B”.

Precautions on Disposal of Air Bag and Seat Belt Pretensioner
Refer to “Precautions on Disposal of Air Bag and Seat Belt Pretensioner: in Section 8B”.

Seat Belts

Precautions

Precautions on Service and Diagnosis of Seat Belt

S4RS0A8100001

WARNING:

If replacing seat belt is necessary, replace buckle and seat belt assembly together as a set. This is for the reason of ensuring locking of tongue plate with buckle. If these parts are replaced individually, such a locking condition may become unreliable. For this reason, SUZUKI will supply only the spare buckle and seat belt assembly in a set part.

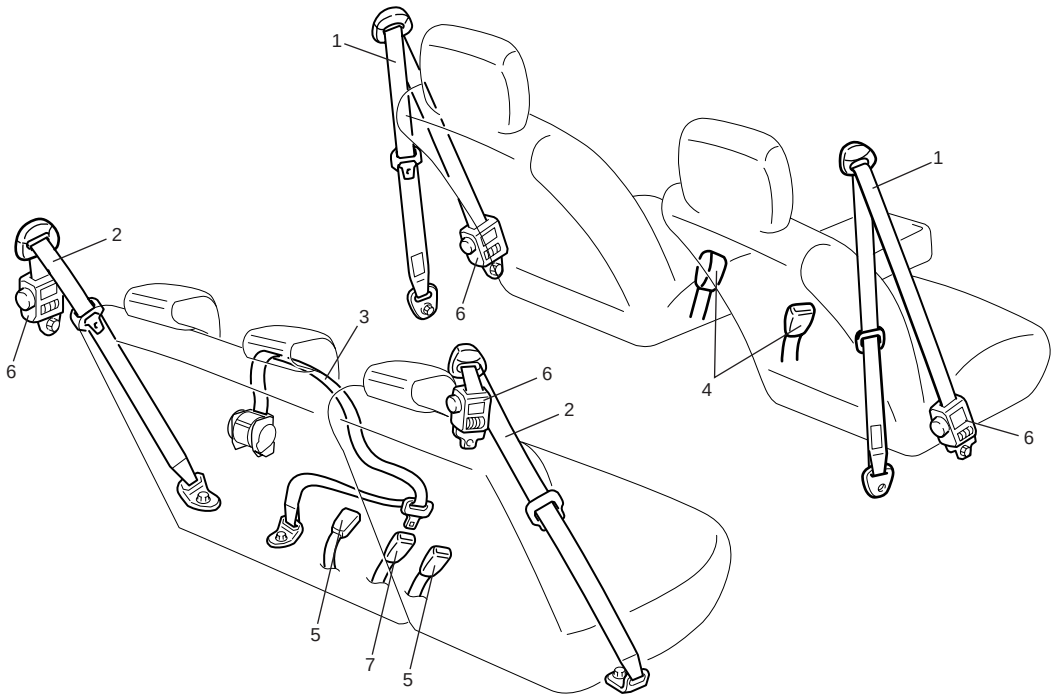
Before servicing or replacing seat belts, refer to the following precautionary items.

- Seat belts should be normal relative to strap retractor and buckle portions.
- Keep sharp edges and damaging objects away from belts.
- Avoid bending or damaging any portion of belt buckle or latch plate.
- Do not bleach or dye belt webbing. (Use only mild soap and lukewarm water to clean it.)
- When installing a seat belt anchor bolt, it should be tightened by hand at first to prevent cross-threading and then to specified torque.
- Do not attempt any repairs on retractor mechanisms or retractor covers. Replace defective assemblies with new replacement parts.
- Keep belts dry and clean at all times.
- If there exist any parts in question, replace such parts.
- Replace belts whose webbing is cut or otherwise damaged.
- Do not put anything into trim panel opening which seat belt webbing passes through.

General Description

Seat Belt Construction

S4RS0A8101001



I4RS0A810001-

1. Front seat belt assembly (with ELR and pretensioner)	4. Buckle for front seat belt assembly	7. Buckle for rear center seat belt
2. Rear seat belt assembly (with A-ELR)	5. Buckle for rear seat belt assembly	
3. Rear center seat belt (with A-ELR)	6. Retractor assembly	

Seat Belt with ELR
The seat belt with emergency locking retractor (ELR) is designed so that it locks immediately (to prevent the webbing from being pulled out of the retractor any further) when any of the following items is detected as exceeding each set value;

- Speed at which the webbing is pulled out of the retractor.
- Acceleration or deceleration of the vehicle speed.
- Inclination.

Seat Belt with A-ELR
The automatic and emergency locking retractor (A-ELR) works as an Emergency Locking Retractor (ELR) till its webbing is pulled all the way out and then on as an Automatic Locking Retractor (ALR) till it is retracted fully.
ALR: Automatically locks when the webbing is pulled out from the retractor and allowed to retract even a little. Then the webbing can not be pulled out any further, unless it is wound all the way back into the retractor, which releases the lock and allows the webbing to be pulled out.

Seat Belt with ELR and Pretensioner
The seat belt with ELR and a pretensioner has a pretensioner mechanism which operates in linkage with the air bag in addition to the described ELR.
The pretensioner is incorporated in retractor assembly and controlled by SDM as one of air bag system components. It will be activated at the same time as the driver and passenger air bag module when an impact at the front of vehicle exceeds the specified value.
When servicing seat belt (retractor assembly) with pretensioner, be sure to observe all WARNINGS and CAUTIONS and “Precautions on Service and Diagnosis of Air Bag System: in Section 8B”.

CAUTION:

Do not reuse the seat belt pretensioner (retractor assembly) that has activated. Replace it with a new seat belt assembly and buckle together as a set. For checking procedure of its activation, refer to “Repair and Inspection Required after Accident: in Section 8B”.

Diagnostic Information and Procedures

Repair and Inspection Required after Accident

S4RS0A8104001

After an accident, whether the seat belt pretensioner has been activated or not, be sure to perform checks and repairs described on “Repair and Inspection Required after Accident: in Section 8B”.

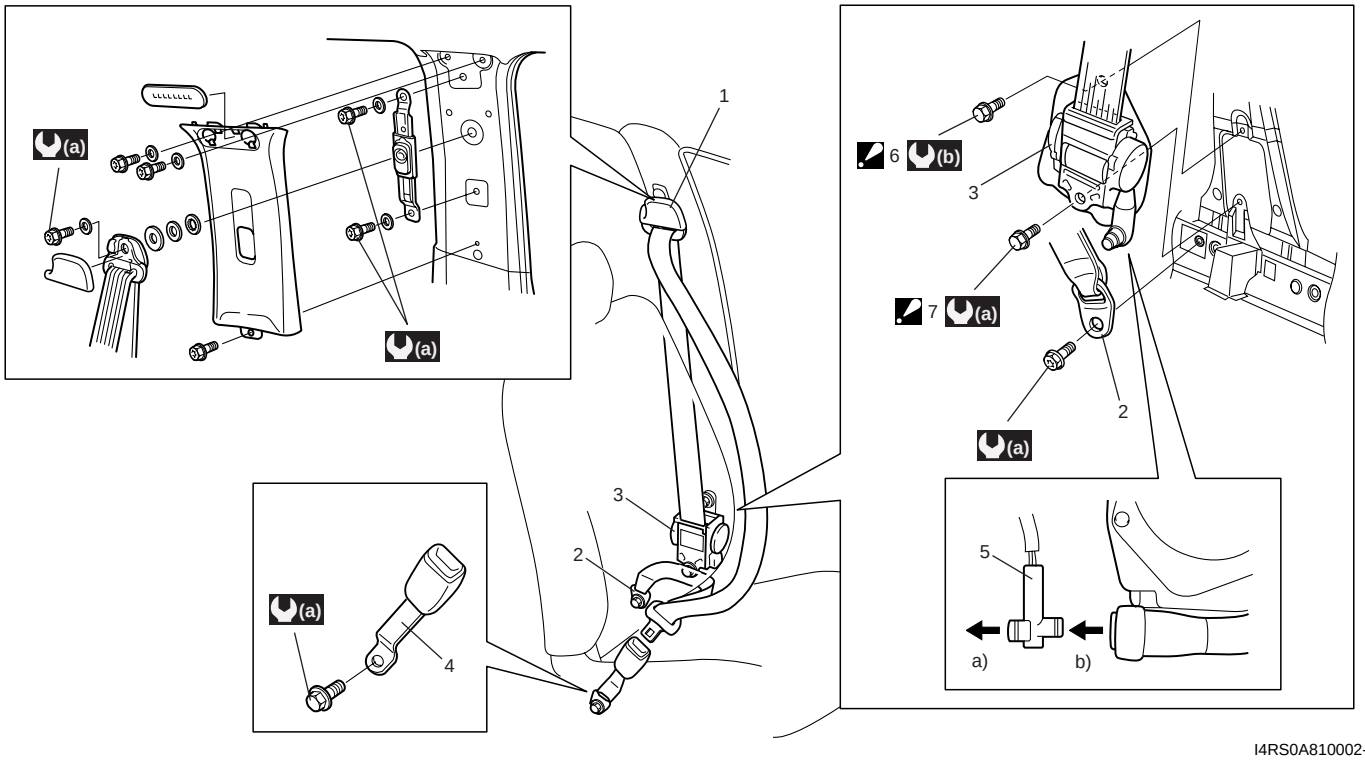
Repair Instructions

Front Seat Belt Components

S4RS0A8106001

WARNING:

- **Never attempt to disassemble or repair the seat belt pretensioner (retractor assembly). If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Seat Belt: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner when necessary.**



I4RS0A810002-

1. Upper anchor	4. Buckle	7. Retractor assembly lower mounting bolt : After tightening lower bolt, tighten upper bolt.
2. Lower anchor	5. Yellow connector (for seat belt pretensioner)	(a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
3. Retractor assembly	6. Retractor assembly upper mounting bolt : After tightening lower bolt, tighten upper bolt.	(b) : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

Front Seat Belt Removal and Installation

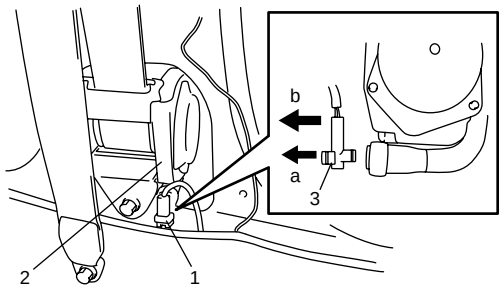
S4RS0A8106002

WARNING:

- **Never attempt to disassemble or repair the seat belt pretensioner (retractor assembly). If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Seat Belt: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner when necessary.**

Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system. Refer to "Disabling Air Bag System: in Section 8B".
3) Remove center pillar lower trim.
4) Disconnect Yellow connector (1) from seat belt pretensioner (2).
   a) Release locking of lock button (3).
   b) After unlocked, disconnect to connector.



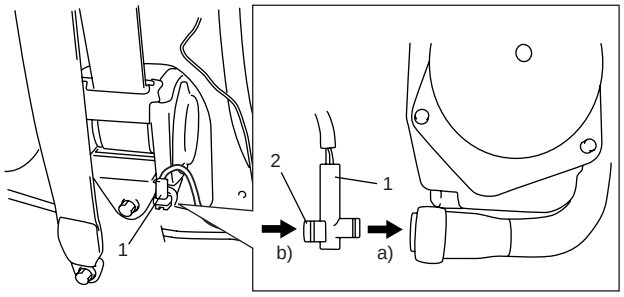
I2RH01810003-

5) Remove front seat belts from the vehicle.

Installation

Install in reverse order of removal, noting the following.

- Seat belt anchor bolts should have an unified fine thread (7/16-20 UNF). Under no circumstances should any different sized or metric screw threads be used.
- Connect Yellow connector (1) to seat belt pretensioner securely.
  a. Connect connector.
  b. Lock connector with lock slider (2).



I5RH01810002-

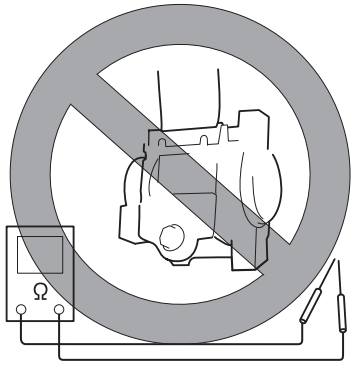
- Enable air bag system. Refer to “Enabling Air Bag System: in Section 8B”.

Front Seat Belt Inspection

S4RS0A8106003

WARNING:

- **Never attempt to disassemble or repair the seat belt pretensioner (retractor assembly). If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read “Precautions on Service and Diagnosis of Seat Belt: ”, before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner when necessary.**
- **Never measure resistance of pretensioner or disassemble it. Otherwise, personal injury may result.**



I2RH01810004-

CAUTION:

If seat belt pretensioner (retractor assembly) was dropped from a height of 30 cm (1 ft) or more, it should be replaced.

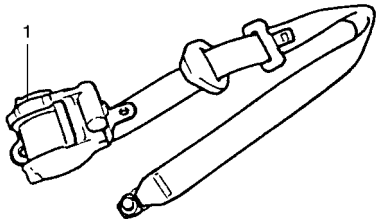
Seat belts and attaching parts can affect the vital components and systems of a vehicle.
Therefore, they should be inspected carefully and replaced with genuine parts only.

Seat Belt

- The seat belt webbing or strap should be free from damage.

Retractor Assembly (with Seat Belt Pretensioner)

1) Let the seat belt retract fully to confirm its easy retraction.
   - The retractor assembly should lock webbing when pulled quickly.
   - The front seat belt retractor assembly (1) should pass the inspection and should lock webbing even when tilted (approx. 15°) toward the fore and aft or right and left directions.
2) Check retractor assembly (1) with seat belt pretensioner appearance visually for following symptoms and if any one of them is applicable, replace it with a new one as an assembly.
   - Pretensioner has activated.
   - There is a crack in seat belt pretensioner (retractor assembly).
   - Seat belt pretensioner (retractor assembly) is damaged or a strong impact (e.g., dropping) was applied to it.



I2RH01810005-

Anchor Bolt

- Anchor bolts should be torqued to specification.

Belt Latch

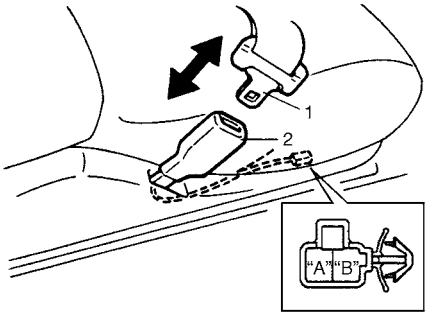
- It should be secure when latched.

Seat Belt Switch

Check driver side seat belt switch for continuity by using ohmmeter.

Seat belt switch specification

Without inserted buckle tongue to buckle catch:
Terminal "A" and "B": Continuity
With inserted buckle tongue to buckle catch:
Terminal "A" and "B": No continuity



I4RS0B810001-

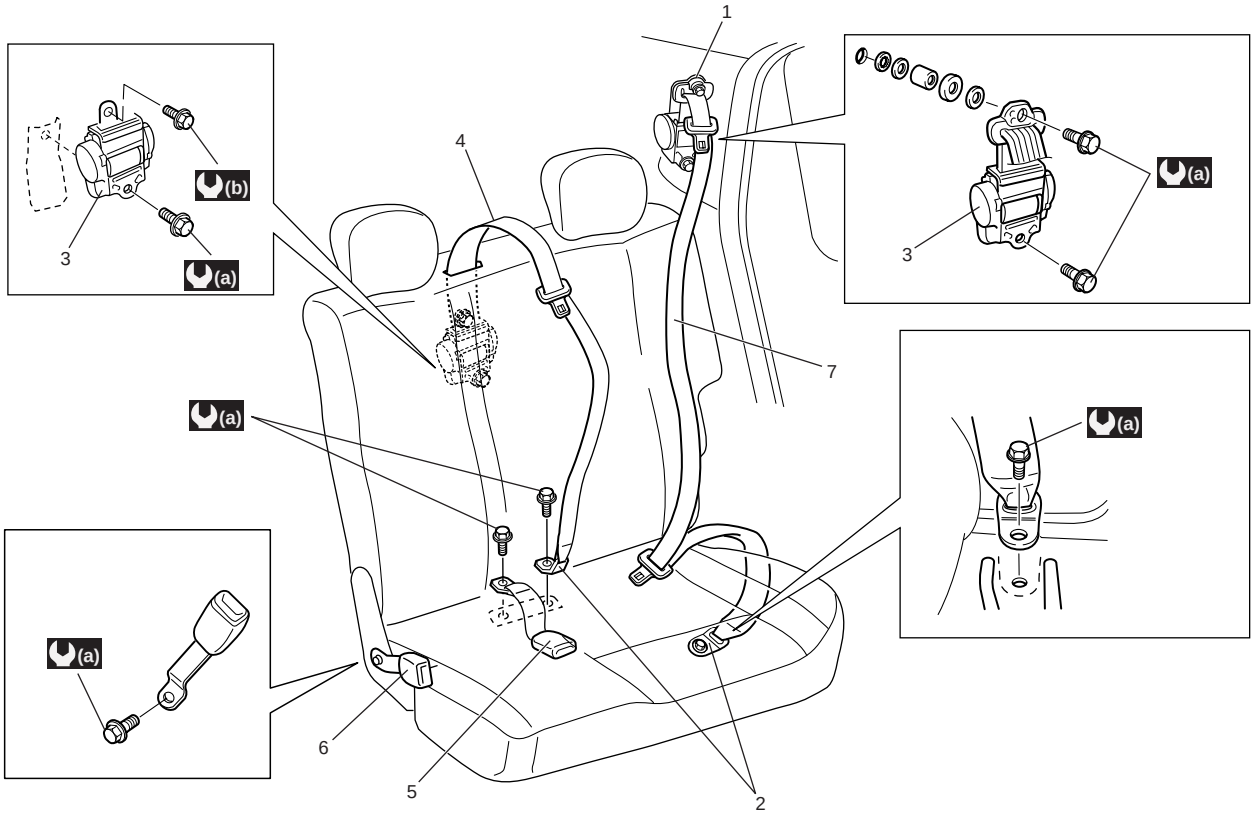
1.	Buckle tongue
2.	Buckle catch

Rear Seat Belt Components

S4RS0A8106006

WARNING:

Be sure to read “Precautions on Service and Diagnosis of Seat Belt: ” before starting to work and observe every precaution during work.



I4RS0A810003-

1. Upper anchor	4. Rear center seat belt	7. Rear seat belt
2. Lower anchor	5. Buckle for rear seat belt	(a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
3. Retractor assembly	6. Buckle for rear center seat belt	(b) : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

Rear Seat Belt Removal and Installation

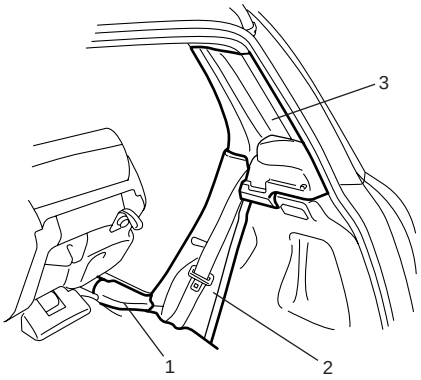
S4RS0A8106004

WARNING:

Be sure to read “Precautions on Service and Diagnosis of Seat Belt: ” before starting to work and observe every precaution during work.

Removal

1) Fold rear seats referring to “Folding Rear Seats” in Owners Manual.
2) Remove rear side sill scuff (1), quarter lower trim (2) and quarter upper trim (3).



I4RS0A810004-

3) Remove rear seat belt referring to “Rear Seat Belt Components: ”.

Installation

Reverse removal procedure for installation noting the following.

- Seat belt anchor bolts should have an unified fine thread (7/16-20 UNF). Under no circumstances should any different sized or metric screw threads be used.

Rear Seat Belt Inspection

S4RS0A8106005

WARNING:

Be sure to read “Precautions on Service and Diagnosis of Seat Belt: ” before starting to work and observe every precaution during work.

- Check the rear seat belt in the same way as “Front Seat Belt Inspection: ”.
- As to seat belts with A-ELR, check them as follows.
  – With vehicle at stop, pull seat belt all the way out, let it retract a little and try to pull it. It should not be pulled out, that is, it should be locked where retracted.
  – Let seat belt retract to its original state. Next, pull it half way out, let it retract a little and try to pull it again. It should be pulled out smoothly, that is it should not be locked at this time.

Specifications

Tightening Torque Specifications

S4RS0A8107001

NOTE:

The specified tightening torque is also described in the following.
“Front Seat Belt Components: ”
“Rear Seat Belt Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Air Bag System

Precautions

Precautions on Service and Diagnosis of Air Bag System

S4RS0A8200001

WARNING:

- **If the air bag system and another vehicle system both need repair, SUZUKI recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.**
- **Do not modify the steering wheel, dashboard, both front seat or any other on or around air bag system components. Modifications can adversely affect air bag system performance and lead to injury.**
- **Be sure to follow the procedures described in this section. Failure to follow procedures could result in possible air bag system activation, personal injury or unneeded air bag system repairs.**

- WARNING / CAUTION labels are attached on each part of air bag system components (SDM, air bag (inflator) modules and seat belt pretensioners). Be sure to follow the instructions.
- Many of service procedures require disconnection of “A/BAG” fuse and air bag (inflator) module(s) (driver, passenger, side of both sides and curtain of both sides) from initiator circuit to avoid an accidental deployment.
- Do not apply power to the air bag system unless all components are connected or a diagnostic flow requests it, as this will set a DTC.
- The “Air Bag Diagnostic System Check: ” must be the starting point of any air bag diagnostics. The “Air Bag Diagnostic System Check: ” will verify proper “AIR BAG” warning lamp operation and will lead you to the correct flow to diagnose any air bag malfunctions. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacements.
- Never use air bag component parts from another vehicle.
- If the vehicle will be exposed to temperatures over 93 °C (200 °F) (for example, during a paint baking process), remove the air bag system components beforehand to avoid component damage or unintended system activation.
- When handling the air bag (inflator) modules (driver, passenger, side of both sides and curtain of both sides), seat belt pretensioners (driver and passenger), SDM, forward-sensor or side-sensor, be careful not to drop it or apply an impact to it. If an excessive impact was applied (e.g., SDM, forward-sensor and side-sensor are dropped, air bag (inflator) module is dropped from a height of 90 cm (3 ft) or more, seat belt pretensioner (retractor assembly) is dropped from a height of 30 cm (1 ft) or more), never attempt disassembly or repair but replace it with a new one.
- When using electric welding, be sure to disconnect air bag (inflator) module connectors (driver, passenger, side of both sides and curtain of both sides) and seat belt pretensioner connectors (driver and passenger) respectively.
- When applying paint around the air bag system related parts, use care so that the harness or connector will not be exposed to the paint mist.
- Never expose air bag system component parts directly to hot air (drying or baking the vehicle after painting) or flames.

WARNING:

When performing service on or around air bag system components or air bag wiring, follow the procedures listed in “Disabling Air Bag System: ” to temporarily disable the air bag system.
Failure to follow procedures could result in possible air bag system activation, personal injury or unneeded air bag system repairs.

Precautions on Handling and Storage of Air Bag System Components

S4RS0A8200002

SDM

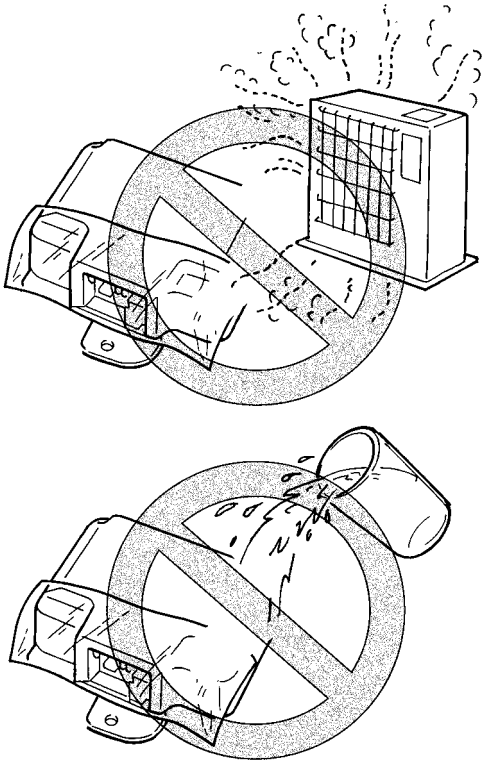
WARNING:

Never power up air bag system when SDM is not rigidly attached to the vehicle. Otherwise, personal injury may result.

CAUTION:

After detecting one time of such collision as to meet deployment conditions, SDM must not be used. Refer to “Air Bag Diagnostic System Check: ” when checking SDM.

- Never attempt disassembly of SDM.
- When storing SDM, select a place where neither high temperature nor high humidity is anticipated and oil, water and dust are kept off.



I5RH01820001-

- If SDM has been dropped, replace it with a new one.
- If SDM installation part of floor was damaged, repair that part completely before reinstallation.
- All SDM and mounting bracket fasteners must be carefully torqued and the arrow must be pointed toward the front of the vehicle to ensure proper operation of the air bag system.

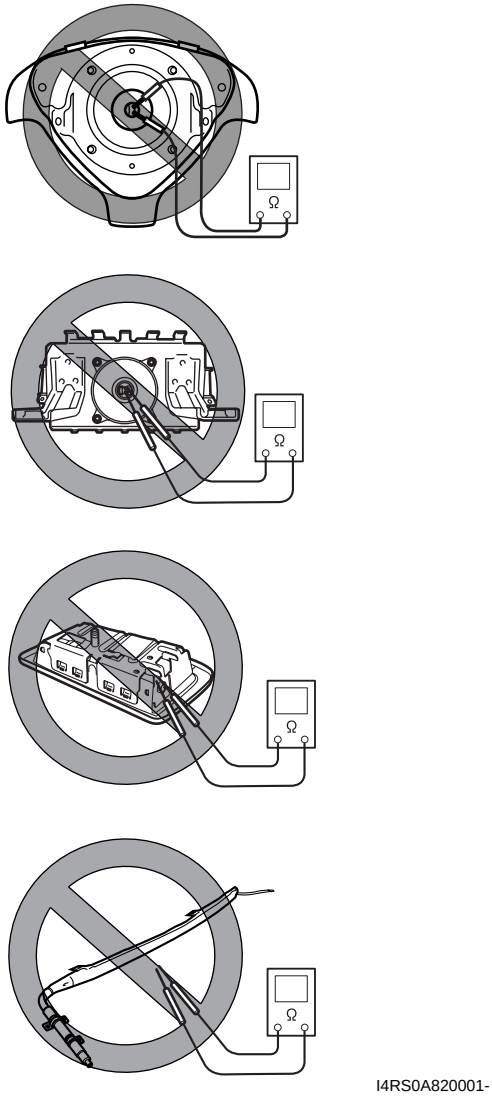
Live (Undeployed) Air Bag (Inflator) Modules

Special care is necessary when handling and storing a live (undeployed) air bag (inflator) modules.

The rapid gas generation produced during deployment of the air bag could cause the air bag (inflator) module, or an object in front of the air bag (inflator) module, to be thrown through the air in the unlikely event of an accidental deployment.

WARNING:

Never attempt to measure the resistance of the air bag (inflator) modules (driver, passenger and side of both sides and curtain of both sides). It is very dangerous as the electric current from the tester may deploy the air bag.



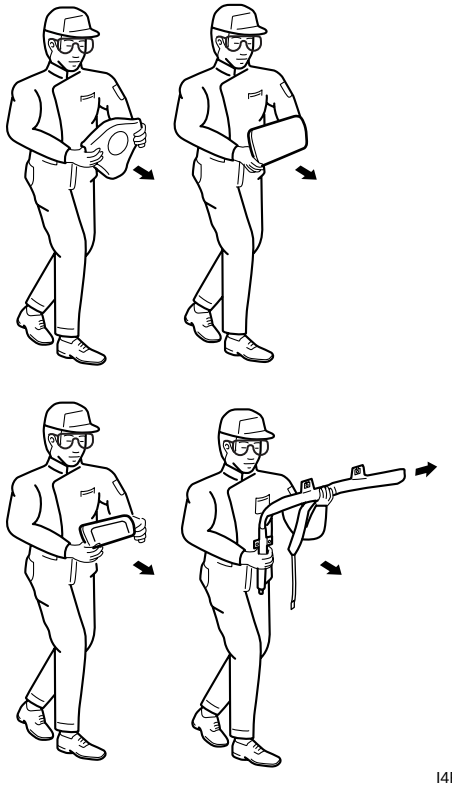
I4RS0A820001-

- Never attempt disassembly of the air bag (inflator) modules.
- If any abnormality is found, be sure to replace it with new one as an assembly.
- When an abnormality is noted as existing in the live (undeployed) air bag (inflator) module, be sure to deploy it before discarding it.
- When grease, cleaning agent, oil, water, etc., got on the air bag (inflator) modules (driver, passenger, side of both sides and curtain of both sides), wipe it off immediately with a dry cloth.
- If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced with a new one as an assembly.

WARNING:

- **For handling and storage of a live air bag (inflator) module, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. Never carry the air bag (inflator) module by the wires or connector on the underside of the module.**

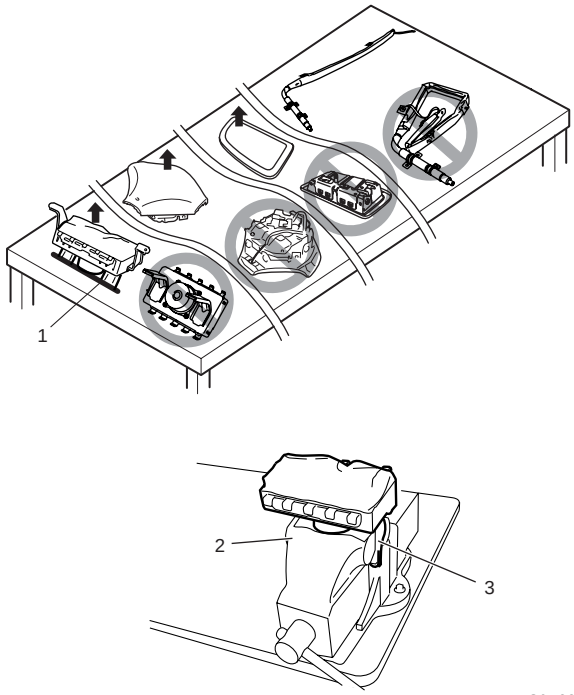
Otherwise, personal injury may result.



I4RS0A820002-

WARNING:

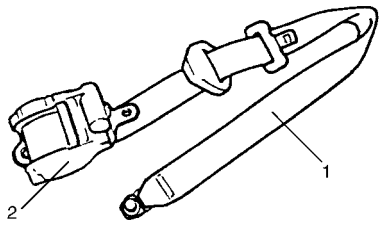
When placing a live air bag (inflator) module on bench or other surface, always face the bag up, away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit (1) or use the workbench vise (2) to hold it securely at its lower mounting bracket (3).
It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules.
This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.
Otherwise, personal injury may result.



I4RS0A820003-

Live (Inactivated) Seat Belt Pretensioner

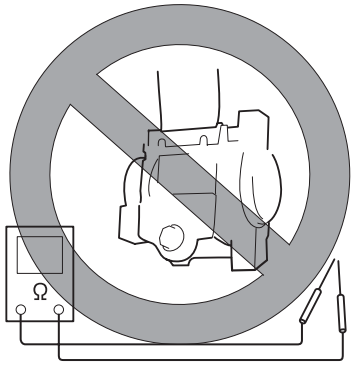
Special care is necessary when handling and storing a live (inactivated) seat belt pretensioners.
Also, when the seat belt pretensioners activate, gas is generated and the seat belt (1) is retracted into the retractor assembly (2) quickly.
Note, therefore, that if they activate accidentally, the seat belt pretensioners and other object(s) around them may be thrown through the air.



I3JA01820043-

WARNING:

Never attempt to measure the resistance of the seat belt pretensioners. It is very dangerous as the electric current from the tester may activate pretensioner.



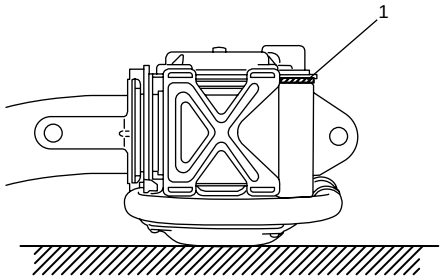
I2RH01820047-

- Never attempt to disassemble the seat belt pretensioners (retractor assembly).
- If any abnormality is found, be sure to replace it with new one as an assembly.
- When an abnormality is noted as existing in the live (inactivated) seat belt pretensioner, be sure to activate it before discarding it.
- When grease, cleaning agent oil, water, etc., got on the seat belt pretensioners (retractor assembly), wipe it off immediately with a dry cloth.
- If seat belt pretensioner was dropped from a height of 30 cm (1 ft) or more, it should be replaced with a new one as an assembly.

WARNING:

- **For handling and storage of a live seat belt pretensioner, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Never carry the seat belt pretensioner by webbing.**
- **When placing a live seat belt pretensioner on the workbench or other surface, be sure not to lay it with its exhaust hole (1) provided side facing down. It is also prohibited to put something on its face with an exhaust hole (1) or to put a seat belt pretensioner on top of another.**

Otherwise, personal injury may result.



I2RH01820048-

Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner

WARNING:

- **The air bag (inflator) module and seat belt pretensioner immediately after deployment/activation is very hot. Wait for at least 30 minutes to cool it off before proceeding the work.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module and to activate seat belt pretensioner.**
- **After an air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and by-products of the chemical reaction. As with many service procedures, gloves and safety glasses should be worn.**
- **Wash your hands with mild soap and water after completing the work.**

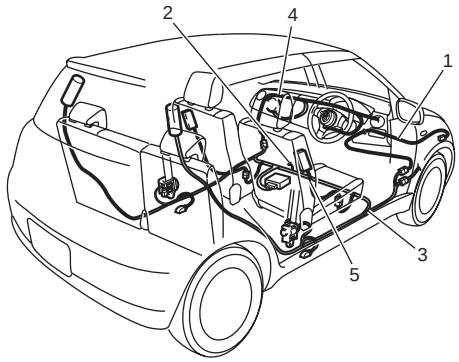
Refer to the procedure described under “Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal: ” for disposal.

Air Bag Wire Harness and Connector

Air bag wire harness is included in main harness (1), instrument panel harness (4), floor harness (3) and seat harness (5). Air bag wire harness can be identified easily as the part of connector side wire harness is covered with a yellow protection tube. Be very careful when handling it.

- When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.
- When installing it, be careful so that the air bag wire harness is not caught or does not interfere with other parts.

- Make sure air bag system grounding point (2) is clean and ground is securely fastened for optimum metal-to-metal contact. Poor grounding can cause intermittent problems that are difficult to diagnose.



I4RS0A820004-

Precautions on Disposal of Air Bag and Seat Belt Pretensioner

S4RS0A8200003

Do not dispose of the live (undeployed) air bag (inflator) modules and the live (inactivated) seat belt pretensioners.
When disposal is necessary, be sure to deploy / activate the air bag and seat belt pretensioner according to deployment / activation procedure described in “Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal: ”.

WARNING:

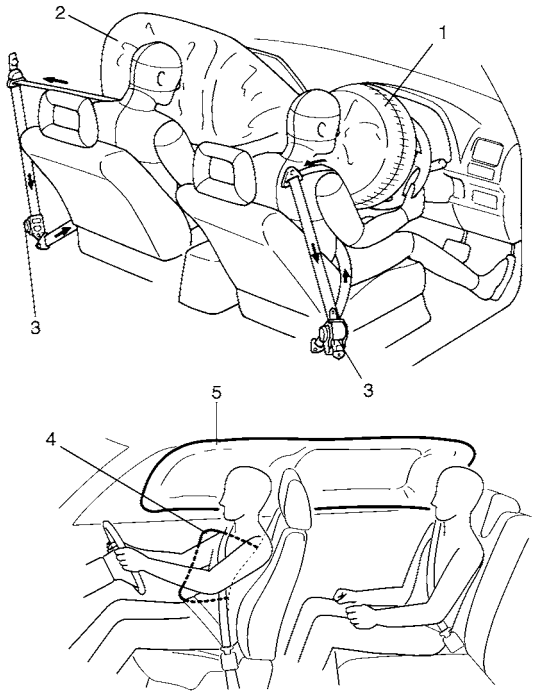
Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which could cause personal injury. Undeployed air bag (inflator) module and inactivated seat belt pretensioner must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module and inactivated seat belt pretensioner contain substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

General Description

Air Bag System Construction

S4RS0A8201001

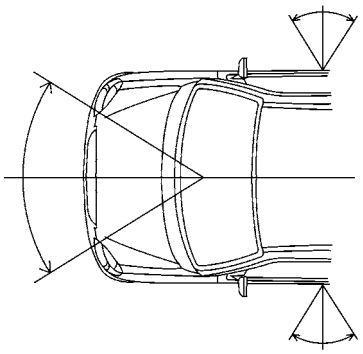
With the air bag system which includes front air bags, side curtain-air bag and side-air bags for both the driver’s and passenger’s sides as well as the seat belt pretensioners, the sag of the seat belt is taken up (for seat belt with pretensioner), the driver air bag (inflator) module is deployed from the center of the steering column and the passenger air bag (inflator) module from the top of the instrument panel in front of the front passenger seat in occurrence of a front collision with an impact larger than a certain set value to supplement protection offered by the driver and front passenger seat belts.
Side-air bag (inflator) module is deployed from the side of the seat back in occurrence of a sideward collision with an impact larger than a certain set value.
Side curtain-air bag (inflator) module is deployed from the roof side in occurrence of a sideward collision with an impact larger than a certain set value.



I4RS0A820102-

1. Driver air bag	4. Side-air bag
2. Passenger air bag	5. Side curtain-air bag
3. Seat belt pretensioner	

The air bag system is designed to activate only in severe frontal and sideward collisions. It is not designed to activate in rear impacts, rollovers, or minor frontal and sideward collisions, since it would offer no protection in those types of accidents.



I2RH0B820007-

Air Bag System Input / Output Table

S4RS0A8201002

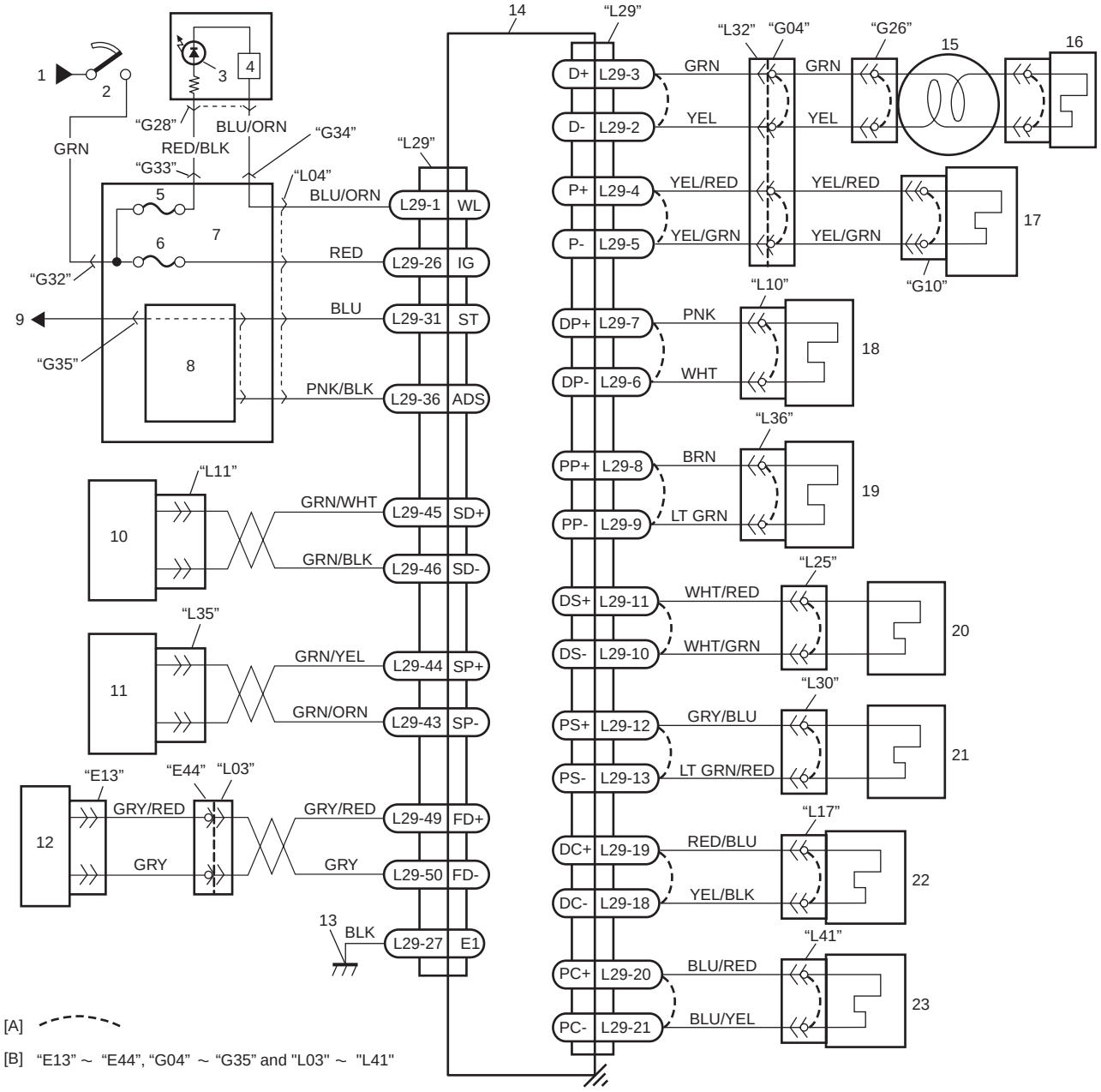
INPUT \ OUTPUT		Driver air bag, Passenger air bag, Seat belt with pretensioner (LH) and Seat belt with pretensioner (RH)	Driver side-air bag and Driver side curtain-air bag	Passenger side-air bag and Passenger side curtain-air bag
Signal from sensor	Sensor in SDM and forward-sensor	○	—	—
	Driver side-sensor	—	○	—
	Passenger side-sensor	—	—	○

I4RS0A820005-

Schematic and Routing Diagram

Air Bag System Wiring Circuit Diagram

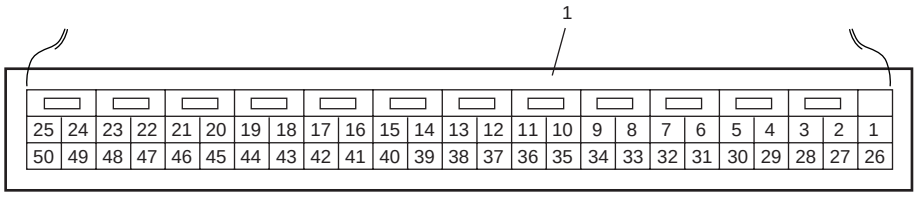
S4RS0A8202001



I4RS0A820006-

[A]: Shorting bar	8. BCM	17. Passenger air bag (inflator) module
[B]: Connector	9. To data link connector (DLC)	18. Driver seat belt pretensioner
1. To battery	10. Driver side-sensor (if equipped)	19. Passenger seat belt pretensioner
2. Ignition switch	11. Passenger side-sensor (if equipped)	20. Driver side-air bag (inflator) module (if equipped)
3. "AIR BAG" warning lamp	12. Forward-sensor	21. Passenger side-air bag (inflator) module (if equipped)
4. Lamp driver	13. Ground for air bag system	22. Driver side curtain-air bag (inflator) module (if equipped)
5. "IG SIG" fuse	14. SDM	23. Passenger side curtain-air bag (inflator) module (if equipped)
6. "A/BAG" fuse	15. Contact coil	
7. Junction block assembly	16. Driver air bag (inflator) module	

Terminal arrangement of SDM (viewed from harness side)



I5RH01820003-

1. SDM Connector “L29”

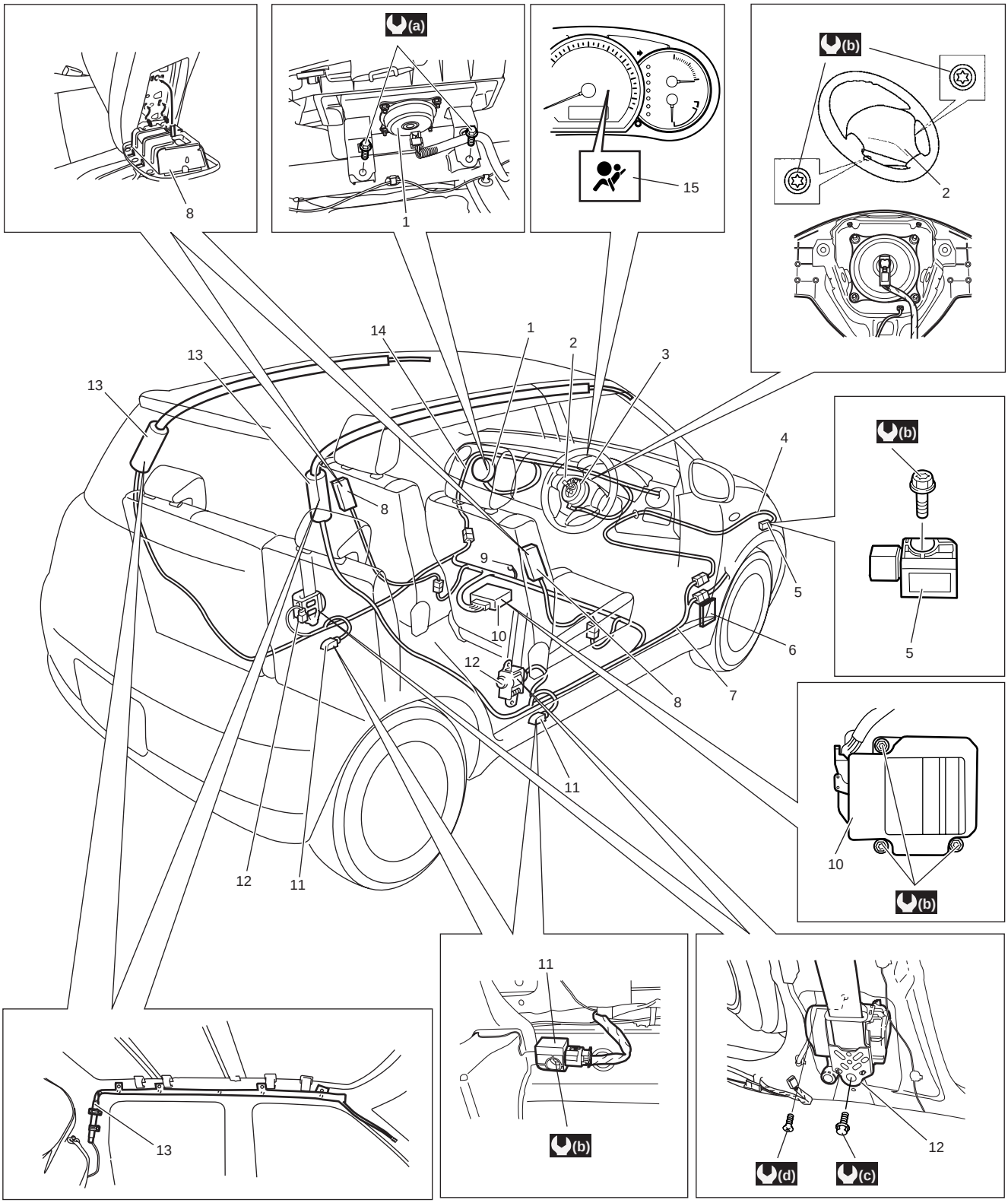
Connector “L29” (SDM connector)

Terminal	Terminal symbol	Circuit	Terminal	Terminal symbol	Circuit
L29-1	WL	“AIR BAG” warning lamp	L29-26	IG	Ignition switch (power source)
L29-2	D1–	Driver air bag (–)	L29-27	E1	Ground
L29-3	D1+	Driver air bag (+)	L29-28	—	—
L29-4	P1+	Passenger air bag (+)	L29-29	—	—
L29-5	P1–	Passenger air bag (–)	L29-30	—	—
L29-6	DP–	Driver seat belt pretensioner (–)	L29-31	ST	DLC
L29-7	DP+	Driver seat belt pretensioner (+)	L29-32	—	—
L29-8	PP+	Passenger seat belt pretensioner (+)	L29-33	—	—
L29-9	PP–	Passenger seat belt pretensioner (–)	L29-34	—	—
L29-10	DS–	Driver side-air bag (–) (If equipped)	L29-35	—	—
L29-11	DS+	Driver side-air bag (+) (If equipped)	L29-36	ADS	Air bag deployed signal for BCM
L29-12	PS+	Passenger side-air bag (+) (If equipped)	L29-37	—	—
L29-13	PS–	Passenger side-air bag (–) (If equipped)	L29-38	—	—
L29-14	—	—	L29-39	—	—
L29-15	—	—	L29-40	—	—
L29-16	—	—	L29-41	—	—
L29-17	—	—	L29-42	—	—
L29-18	DS–	Driver side curtain-air bag (–)	L29-43	SP–	Passenger side-sensor (–)
L29-19	DS+	Driver side curtain-air bag (+)	L29-44	SP+	Passenger side-sensor (+)
L29-20	PS+	Passenger side curtain-air bag (+)	L29-45	SD+	Driver side-sensor (+)
L29-21	PS–	Passenger side curtain-air bag (–)	L29-46	SD–	Driver side-sensor (–)
L29-22	—	—	L29-47	—	—
L29-23	—	—	L29-48	—	—
L29-24	—	—	L29-49	FD+	Forward-sensor (+)
L29-25	—	—	L29-50	FD–	Forward-sensor (–)

Component Location

Air Bag System Components, Wiring and Connectors Location

S4RS0A8203001



I4RS0A820007-

1. Passenger air bag (inflator) module	8. Side-air bag (inflator) module (if equipped)	15. “AIR BAG” warning lamp
2. Driver air bag (inflator) module	9. Ground for air bag system	(a) : 23 N·m (2.3 kg-m, 16.5 lb-ft)
3. Contact coil assembly	10. SDM	(b) : 9 N·m (0.9 kg-m, 6.5 lb-ft)
4. Air bag harness in main harness	11. side-sensor (if equipped)	(c) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
5. Forward-sensor	12. Seat belt pretensioner	(d) : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)
6. “A/BAG” fuse in junction block assembly (including BCM)	13. Side curtain-air bag (inflator) module (if equipped)	
7. Air bag harness in floor harness	14. Air bag harness in instrument panel harness	

Diagnostic Information and Procedures

Air Bag Diagnostic System Check

S4RS0A8204001

WARNING:

To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified in this manual. Do not use a non-powered probe type tester.
Instructions in this manual must be followed carefully, otherwise personal injury may result.

CAUTION:

The order in which DTCs are diagnosed is very important. Failure to diagnose the DTCs in the order specified may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.

The diagnostic procedures used are designed to find and repair air bag system malfunctions.

To get the best results, it is important to use the diagnostic flow and follow the sequence in the following.

1) Perform the “Air Bag Diagnostic System Check Flow: ”.
(The “Air Bag Diagnostic System Check Flow: ” must be the starting point of any air bag system diagnosis. The “Air Bag Diagnostic System Check Flow: ” checks for proper “AIR BAG” warning lamp operation through “AIR BAG” warning lamp and whether air bag DTCs exist.)
2) Refer to the proper diagnostic flow as directed by the “Air Bag Diagnostic System Check Flow: ”.
(The “Air Bag Diagnostic System Check Flow: ” will lead you to the correct flow to diagnose any air bag system malfunctions. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.)
3) Repeat the “Air Bag Diagnostic System Check Flow: ” after any repair or diagnostic procedures have been performed.
(Performing the “Air Bag Diagnostic System Check Flow: ” after all repair or diagnostic procedures will ensure that the repair has been made correctly and that no other malfunctions exist.)

Air Bag Diagnostic System Check Flow

S4RS0A8204087

Flow test description
Step 1: Check that “AIR BAG” warning lamp lights.
Step 2: Check that “AIR BAG” warning lamp lights.
Step 3: Check that “AIR BAG” warning lamp flashes 6 times after ignition switch is turned ON.
Step 4: Check that history codes are in SDM memory.
Step 5: Check that current code is in SDM memory.

Step	Action	Yes	No
1	1) Make sure that battery voltage is about 11 V or higher. 2) Note “AIR BAG” warning lamp as ignition switch is turned ON. *Does “AIR BAG” warning lamp come ON when ignition switch is turned ON?*	Go to Step 2.	Proceed to ““AIR BAG” Warning Lamp Does Not Come ON: ”.
2	*Does “AIR BAG” warning lamp come ON steady?*	Proceed to ““AIR BAG” Warning Lamp Comes ON Steady: ”.	Go to Step 3.
3	*Does “AIR BAG” warning lamp turn OFF, after flashing 6 times?*	“AIR BAG” warning lamp circuit is in good condition. Go to Step 4.	“AIR BAG” warning lamp circuit is in good condition. Go to Step 5.

Step	Action	Yes	No
4	1) Check DTC using SUZUKI scan tool referring to “DTC Check: ”. *Is “NO CODES” displayed on SUZUKI scan tool?*	Air bag system is in good condition.	An intermittent trouble has occurred at some place. Check the connector harness, etc. related to the sensed DTC. Refer to “Inspection of Intermittent and Poor Connections: ”. Then clear DTC (referring to “DTC Clearance: ”.) and repeat this flow.
5	Check DTC using SUZUKI scan tool, referring to “DTC Check: ”. *Is “NO CODES” displayed on SUZUKI scan tool?*	Substitute a known-good SDM and recheck.	Check and repair according to flow corresponding to that DTC.

DTC Table

S4RS0A8204004

SDM DTC

DTC	Diagnosis		
—	Normal		—
☞ B1013	SDM	SDM fault	Diagnose trouble according to diagnostic flow corresponding to each code No.
☞ B1014		“AIR BAG” warning lamp circuit failure	
☞ B1016	Power source voltage	Too high	
☞ B1017		Too low	
☞ B1021	SDM	Front air bag module exploded	
☞ B1024		Driver side-air bag module exploded	
☞ B1025		Passenger side-air bag module exploded	
☞ B1026		Pretensioner activated	
☞ B1027		Reusable number exceeded	
☞ B1031	Driver air bag circuit	Resistance high	
☞ B1032		Resistance low	
☞ B1033		Short to ground	
☞ B1034		Short to power circuit	

DTC	Diagnosis	
☞ B1041	Passenger air bag circuit	Resistance high
☞ B1042		Resistance low
☞ B1043		Short to ground
☞ B1044		Short to power circuit
☞ B1051	Driver pretensioner circuit	Resistance high
☞ B1052		Resistance low
☞ B1053		Short to ground
☞ B1054		Short to power circuit
☞ B1055	Passenger pretensioner circuit	Resistance high
☞ B1056		Resistance low
☞ B1057		Short to ground
☞ B1058		Short to power circuit
☞ B1061	Driver side-air bag	Resistance high
☞ B1062		Resistance low
☞ B1063		Short to ground
☞ B1064		Short to power circuit
☞ B1065	Passenger side-air bag	Resistance high
☞ B1066		Resistance low
☞ B1067		Short to ground
☞ B1068		Short to power circuit
☞ B1071	Forward-sensor circuit	Performance problem
☞ B1072		Communication error
☞ B1073		Short to ground
☞ B1074		Short to power circuit or open

DTC	Diagnosis		
☞ B1081	Driver side-sensor	Performance problem	
☞ B1082		Communication error	
☞ B1083		Short to ground	
☞ B1084		Short to power circuit or open	
☞ B1085		Wrong assembly	
☞ B1091	Passenger side-sensor	Performance problem	
☞ B1092		Communication error	
☞ B1093		Short to ground	
☞ B1094		Short to power circuit or open	
☞ B1095		Wrong assembly	
☞ B1361	Driver side curtain-air bag circuit	Resistance high	
☞ B1362		Resistance low	
☞ B1363		Short to ground	
☞ B1364		Short to power circuit	
☞ B1365	Passenger side curtain-air bag circuit	Resistance high	
☞ B1366		Resistance low	
☞ B1367		Short to ground	
☞ B1368		Short to power circuit	

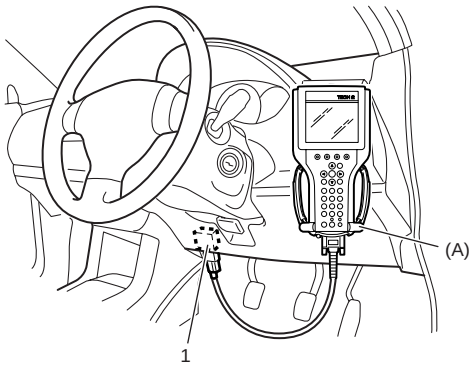
DTC Check

S4RS0A8204005

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) located on underside of instrument panel at driver's seat side.

   Special tool
   (A): SUZUKI scan tool

3) Turn ignition switch to ON position.
4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to SUZUKI scan tool operator's manual for further details.
   If communication between scan tool and SDM is not possible, check if scan tool is communicable by connecting it to SDM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC) (1).



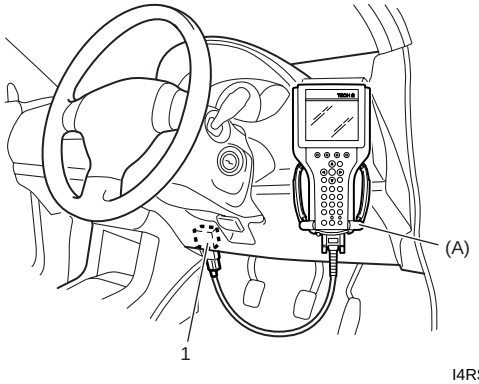
I4RS0A820008-

DTC Clearance

S4RS0A8204006

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) in the same manner as when making this connection for DTC check.

   Special tool
   (A): SUZUKI scan tool



I4RS0A820008-

3) Turn ignition switch to ON position.
4) Erase DTC according to instructions displayed on SUZUKI scan tool. Refer to SUZUKI scan tool operator's manual for further details.
5) After completing the clearance, perform "DTC Check: " and confirm that normal DTC (NO CODES) is displayed and not malfunction DTC.
6) Turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

NOTE:

If DTC B1013, DTC B1021 or DTC B1027 is stored in SDM, it is not possible to clear DTC.

Scan Tool Data

S4RS0A8204068

Data list of SDM

Scan Tool Data	Normal Condition / Reference Value
Battery voltage	10 – 14 V
Back up volt	27.0 – 33.0 V
System ID	4ch or 8ch
Driv A/B Ini Res	2.1 – 3.8 ohm
Pass A/B Ini Res	1.8 – 2.8 ohm
Driv Preten Ini Res	1.8 – 2.9 ohm
Pass Preten Ini Res	1.8 – 2.9 ohm
Driv Sidebag Ini Res	1.8 – 2.6 ohm
Pass Sidebag Ini Res	1.8 – 2.6 ohm
Driv curtain Ini Res	1.8 – 2.8 ohm
Pass curtain Ini Res	1.8 – 2.8 ohm

Scan Tool Data Definition

Back Up Volt (V): This parameter indicates the capacity of the backup condenser installed to maintain the ignition current (as much as possible) even when the power supply to SDM that ignites the inflator is shut off.

Battery Voltage (V): Battery voltage is an analog input signal read by SDM.

System ID (4ch/8ch): This parameter indicates the number of initiator circuits.

Driv A/B Ini Res (Driver air bag initiator resistance) (ohm): This parameter indicates the resistance of the driver air bag initiator circuit.

Pass A/B Ini Res (Passenger air bag initiator resistance) (ohm): This parameter indicates the resistance of the passenger air bag initiator circuit.

Driv Preten Ini Res (Driver pretensioner initiator resistance) (ohm): This parameter indicates the resistance of the driver seat belt pretensioner initiator circuit.

Pass Preten Ini Res (Passenger pretensioner initiator resistance) (ohm): This parameter indicates the resistance of the passenger seat belt pretensioner initiator circuit.

Driv Sidebag Ini Res (Driver side-air bag initiator resistance) (ohm): This parameter indicates the resistance of the driver side-air bag initiator circuit.

Pass Sidebag Ini Res (Passenger side-air bag initiator resistance) (ohm): This parameter indicates the resistance of the Passenger side-air bag initiator circuit.

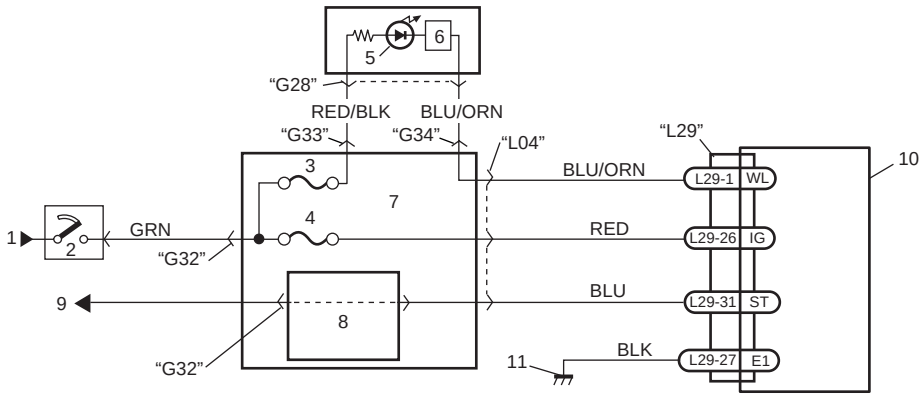
Driv curtain Ini Res (Driver side curtain-air bag initiator resistance) (ohm): This parameter indicates the resistance of the driver side curtain-air bag initiator circuit.

Pass curtain Ini Res (Passenger side curtain-air bag initiator resistance) (ohm): This parameter indicates the resistance of the passenger side curtain-air bag initiator circuit.

"AIR BAG" Warning Lamp Comes ON Steady

S4RS0A8204007

Wiring Diagram



I4RS0A820009-

1. From main fuse	5. "AIR BAG" warning lamp in combination meter	9. To DLC
2. Ignition switch	6. Lamp driver	10. SDM
3. "IG SIG" fuse	7. Junction block assembly	11. Ground for air bag system
4. "AIR BAG" fuse	8. BCM	

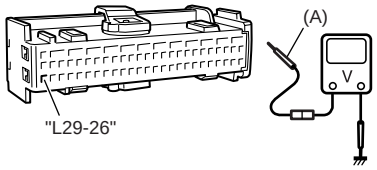
CAUTION:

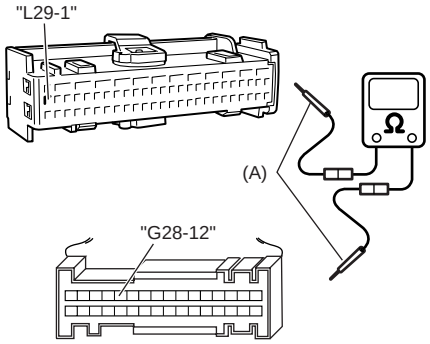
- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

Flow Test Description

Step 1: Check for “AIR BAG” fuse blown.
Step 2, 3: Check for loose connection between junction block assembly connector and junction block assembly.
Step 4: Check for loose connection between SDM connector and SDM.
Step 5: Check for SDM power supply circuit.
Step 6: Check for short circuit between “AIR BAG” warning lamp circuit and ground.

Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. 2) Remove and inspect “AIR BAG” fuse. *Is fuse good?*	Go to Step 2.	“RED” wire short to ground. After repair, replace “AIR BAG” fuse.
2	1) Check for loose connection of junction block assembly connector “L04”. *Is it connected securely?*	Go to Step 3.	Correct connector “L04” securely.
3	1) Check for loose connection of junction block assembly connector “G34”. *Is it connected securely?*	Go to Step 4.	Correct connector “G34” securely.
4	1) Check for loose connection of SDM connector “L29”. *Is it connected securely?*	Go to Step 5.	Correct connector “L29” securely.
5	1) Disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminal “L29-26”. 3) If OK, then check voltage between “L29-26” terminal of SDM connector and body ground with ignition switch ON. **Special tool** **(A): 09932-76010**  I4RS0A820100- *Is it 8 V or more?*	Go to Step 6.	“RED” wire (between “AIR BAG” fuse and SDM connector) open or “GRN” wire (between ignition switch and “AIR BAG” fuse) open or short to ground.

Step	Action	Yes	No
6	1) Disconnect combination meter connector “G28” referring to “Combination Meter Removal and Installation: in Section 9C”. 2) Check proper connection to combination meter at “BLU/ORN” terminal for “AIR BAG” warning lamp and to SDM at terminal “L29-1”. 3) If OK, then check resistance between “BLU/ORN” wire terminal of combination meter connector “G28” and “L29-1” terminal of SDM connector. **Special tool** **(A): 09932-76010**  *Is resistance 1 Ω or less?*	Substitute a known-good SDM and recheck. If “AIR BAG” warning lamp remain lighting, replace combination meter.	“BLU/ORN” wire (between combination meter and SDM connector) open or short to ground.

NOTE:

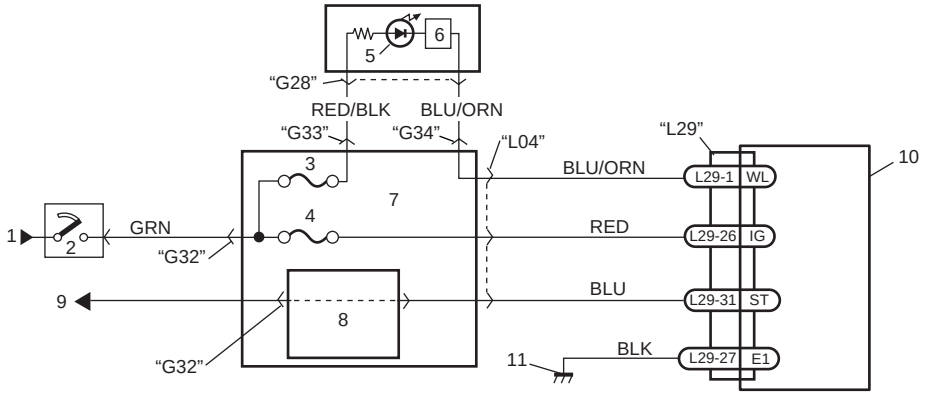
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

“AIR BAG” Warning Lamp Does Not Come ON

S4RS0A8204008

Wiring Diagram



1. From main fuse	5. “AIR BAG” warning lamp in combination meter	9. To DLC
2. Ignition switch	6. Lamp driver	10. SDM
3. “IG SIG” fuse	7. Junction block assembly	11. Ground for air bag system
4. “AIR BAG” fuse	8. BCM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

Flow Test Description
Step 1: Check combination meter power feed circuit.
Step 2: Check "AIR BAG" warning lamp circuit.

Troubleshooting

Step	Action	Yes	No
1	1) Set parking brake. 2) Note combination meter when ignition switch is turned ON. *Does the "BRAKE" indicator (warning lamp) come ON?*	Go to Step 2.	Check and correct the following possible cause. • Open circuit in "GRN" or "RED/BLK" wire. • Short circuit between "GRN" or "RED/BLK" and ground. • "METER" fuse blown.
2	1) Disconnect SDM connector "L29". 2) Note combination meter when ignition switch is turned ON. *Does the "AIR BAG" warning lamp come ON?*	Substitute a known-good SDM and recheck.	"BLU/ORN" circuit shorted to power circuit. If OK, replace combination meter.

NOTE:

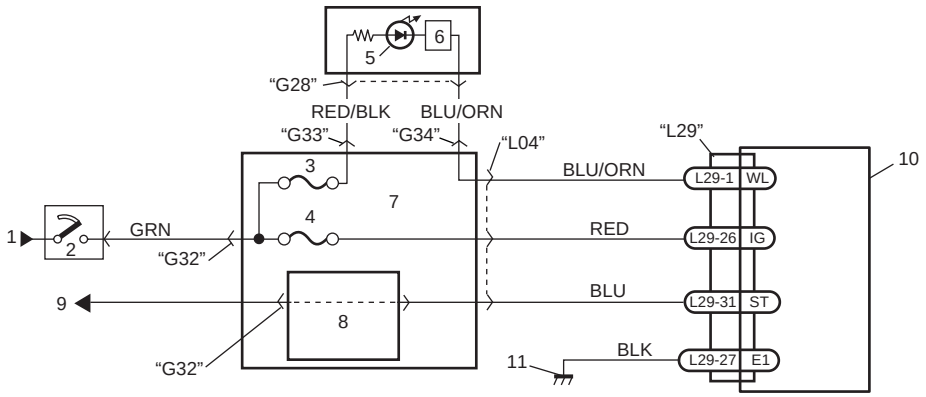
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

“AIR BAG” Warning Lamp Flashes

S4RS0A8204009

Wiring Diagram



I4RS0A820009-

1. From main fuse	5. “AIR BAG” warning lamp in combination meter	9. To DLC
2. Ignition switch	6. Lamp driver	10. SDM
3. “IG SIG” fuse	7. Junction block assembly	11. Ground for air bag system
4. “AIR BAG” fuse	8. BCM	

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

Flow Test Description

Check for short circuit between diagnosis switch circuit and ground.

Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check “L29-34” terminal of SDM. *Is it shorted to ground terminal or harness?*	Clean up terminal.	Substitute a know-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1013: SDM fault

S4RS0A8204030

DTC Will Set when
An internal SDM fault is detected by SDM.

NOTE:

DTC B1013 can never be cleared once it has been set.

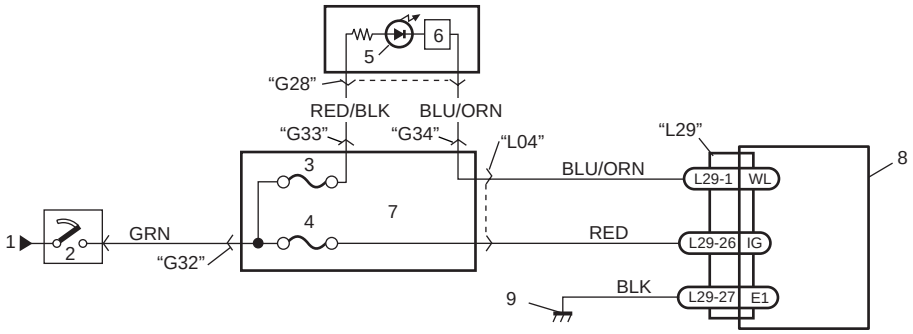
DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace SDM.
3) Repeat “Air Bag Diagnostic System Check: ”.

DTC B1014: “AIR BAG” Warning Lamp Circuit Failure

S4RS0A8204029

Wiring Diagram



I4RS0A820010-

1. From main fuse	4. “A/BAG” fuse	7. Junction block assembly
2. Ignition switch	5. “AIR BAG” warning lamp in combination meter	8. SDM
3. “IG SIG” fuse	6. Lamp driver	9. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The voltage at the “AIR BAG” warning lamp circuit terminal “L29-1” does not match the commanded state of the warning lamp driver for specified time.

Flow Test Description
Step 1: This test rechecks “AIR BAG” warning lamp operation.
Step 2: This test rechecks whether an abnormality is in SDM.

DTC Troubleshooting

Step	Action	Yes	No
1	1) This DTC is set when there is a trouble in “AIR BAG” warning lamp circuit. Failure to properly perform “Air Bag Diagnostic System Check” may also result in misdiagnosis. Therefore, check “AIR BAG” warning lamp circuit again according to “Air Bag Diagnostic System Check: ”. *Is “AIR BAG” warning lamp circuit in good condition?*	Go to Step 2.	Repair “AIR BAG” warning lamp circuit.
2	1) Clear DTC referring to “DTC Clearance: ”. 2) Check DTC referring to “DTC Check: ”. *Is DTC B1014 set?*	Substitute a known-good SDM and recheck.	Recheck air bag system referring to “Air Bag Diagnostic System Check: ”.

NOTE:

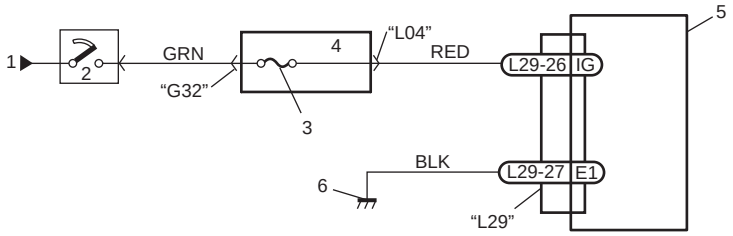
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1016: Power Source Voltage High

S4RS0A8204020

Wiring Diagram



I4RS0A820011-

1. From main fuse	3. “A/BAG” fuse	5. SDM
2. Ignition switch	4. Junction block assembly	6. Ground for air bag system

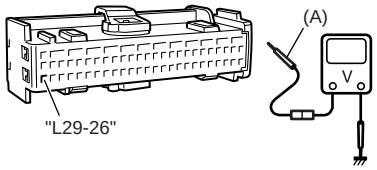
CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The power source voltage to SDM is above an approx. 21 V for specified time.

Flow Test Description
Step 1: Check if voltage applied to SDM is within normal range.
Step 2: Check if DTC B1016 still exists.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect SDM connector. 2) Check proper connection to SDM at "L29-26" terminal. 3) If OK, turn ignition switch ON and then check voltage between "L29-26" terminal on SDM connector and body ground. **Special tool** **(A): 09932-76010**  I4RS0A820100- *Is voltage 14 V or less?*	Go to Step 2.	Check charging system and repair as necessary referring to "Generator Test (Overcharged Battery Check): in Section 1J".
2	1) With ignition switch OFF, reconnect SDM connector. *With ignition switch ON, is DTC B1016 indicated?*	Substitute a known-good SDM and recheck.	Intermittent trouble. Check for intermittent trouble referring to "Inspection of Intermittent and Poor Connections: " If OK, substitute a known-good SDM and recheck.

NOTE:

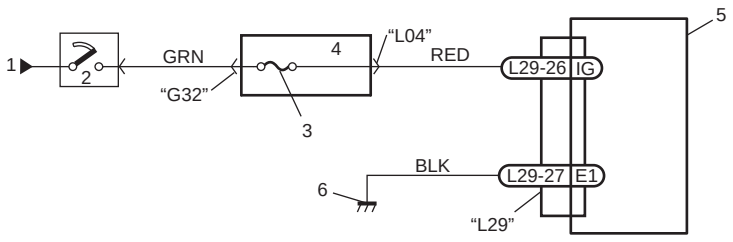
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1017: Power Source Voltage Low

S4RS0A8204021

Wiring Diagram



I4RS0A820011-

1. From main fuse	3. "A/BAG" fuse	5. SDM
2. Ignition switch	4. Junction block assembly	6. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when

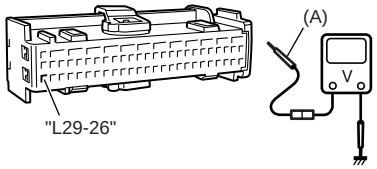
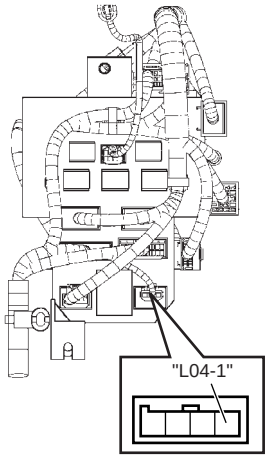
The power source voltage is below an approx. 8 V for specified time.

Flow Test Description

Step 1: Check if voltage on battery is within normal range.
Step 2: Check if voltage applied to SDM is within normal range.
Step 3: Check if voltage applied to "L04" connector is within normal range.
Step 4: Check if DTC B1017 still exists.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Measure voltage on battery. *Is voltage 11 V or more?*	Go to Step 2.	Check charging system and repair as necessary referring to "Generator Test (Undercharged Battery Check): in Section 1J".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector. 2) Check proper connection to SDM at “L29-26” terminal. 3) If OK, turn ignition switch ON and then check voltage between “L29-26” terminal on SDM connector and body ground. **Special tool** **(A): 09932-76010**  I4RS0A820100- *Is voltage 8 V or more?*	Go to Step 4.	Go to step 3.
3	1) With ignition switch OFF, disconnect on connector “L04” junction block assembly. 2) Check proper connection at “L04-1” terminal. 3) If OK, turn ignition switch ON and then check voltage between “L04-1” terminal and body ground.  I4RS0A820012- *Is voltage 8 V or more?*	Go to Step 4.	Check circuit from battery to “L04” connector and charging system.
4	1) With ignition switch OFF, reconnect SDM connector. *With ignition switch ON, does DTC B1017 exist?*	Substitute a known-good SDM and recheck.	Check charging system and repair as necessary referring to “Generator Test (Undercharged Battery Check): in Section 1J”.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1021: Front Air Bag Module Deployed

S4RS0A8204028

DTC Will Set when

The SDM detects a frontal crash of sufficient force to warrant activation of the air bag system. (SDM outputs a deployment command.)

Flow Test Description

Step 1: Check that DTC B1021 has been set although air bag has not been deployed.
Step 2: Check that DTC has been set due to failure of SDM.

NOTE:

Before executing items in this flow, be sure to perform "Air Bag Diagnostic System Check: ".

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. *Has air bag deployed?*	Replace components and perform inspections as directed in "Repair and Inspection Required after Accident: ".	Go to Step 2.
2	1) Inspect front of vehicle and undercarriage for signs of impact. *Are there signs of impact?*	Replace components and perform inspections as directed in "Repair and Inspection Required after Accident: ".	Substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**
- **Clear DTCs of BCM referring to "DTC Clearance: in Section 10B"**

DTC B1024 / B1025: Side-Air Bag (Driver / Passenger) Deployed

S4RS0A8204069

DTC Will Set when

The SDM detects a sideward crash (driver or passenger side) of sufficient force to warrant activation of the side-air bag system (driver or passenger). (SDM outputs a deployment command.)

Flow Test Description

Step 1: Check that DTC B1024 or B1025 has been set although side-air bag has not been deployed.
Step 2: Check that DTC has been set due to failure of SDM.

NOTE:

Before executing items in this flow, be sure to perform "Air Bag Diagnostic System Check: ".

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. *Has air bag deployed?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident: ”.	Go to Step 2.
2	1) Inspect front of vehicle and undercarriage for signs of impact. *Are there signs of impact?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident: ”.	Substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**
- **Clear DTCs of BCM referring to “DTC Clearance: in Section 10B”**

DTC B1026: Pretensioner Activated

S4RS0A8204070

DTC Will Set when

The SDM detects a frontal crash of sufficient force to warrant activation of the pretensioner. (SDM outputs a deployment command.)

Flow Test Description

Step 1: Check that DTC B1026 has been set although pretensioner has not been activated.
Step 2: Check that DTC has been set due to failure of SDM.

NOTE:

Before executing items in this flow, be sure to perform “Air Bag Diagnostic System Check: ”.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. *Has pretensioner activated?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident: ”.	Go to Step 2.
2	1) Inspect front of vehicle and undercarriage for signs of impact. *Are there signs of impact?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident: ”.	Substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**
- **Clear DTCs of BCM referring to “DTC Clearance: in Section 10B”**

DTC B1027: Reusable Number Exceeded

S4RS0A8204071

DTC Will Set when

The SDM has not been replaced though the side-air bag developed several times in the past.

NOTE:

DTC B1027 can never be cleared once it has been set.

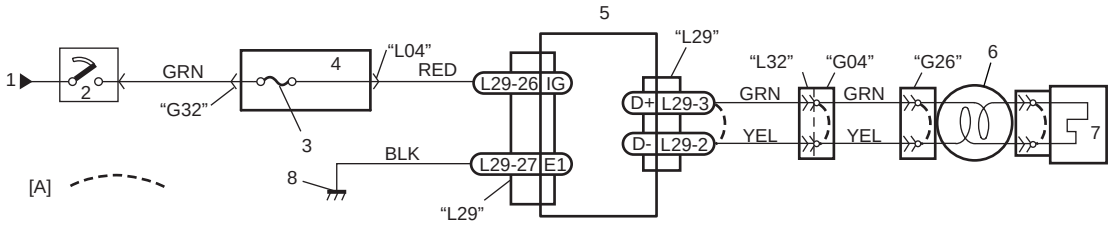
DTC Trouble shooting

1) Turn ignition switch OFF.
2) Replace SDM.
3) Repeat “Air Bag Diagnostic System Check: ”.

DTC B1031: Driver Air Bag Initiator Circuit Resistance High

S4RS0A8204052

Wiring Diagram



I4RS0A820013-

[A]: Shorting bar	3. “A/BAG” fuse	6. Contact coil assembly
1. From main fuse	4. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

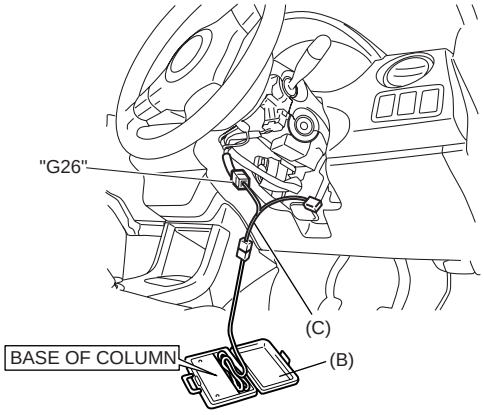
DTC Will Set when

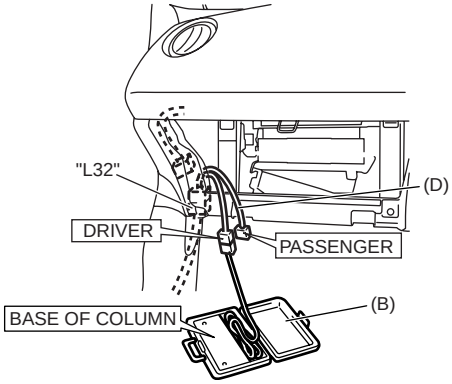
The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is above a specified value for specified time.

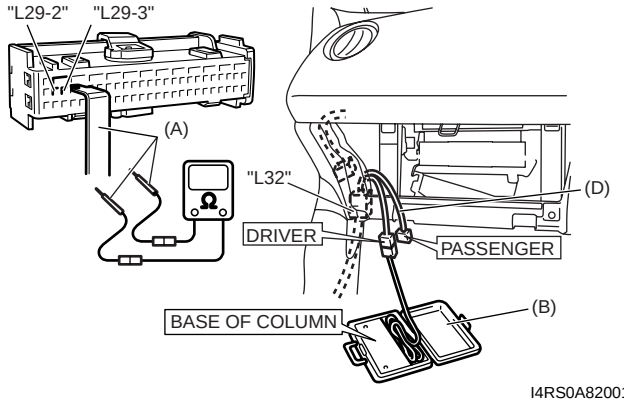
Flow Test Description

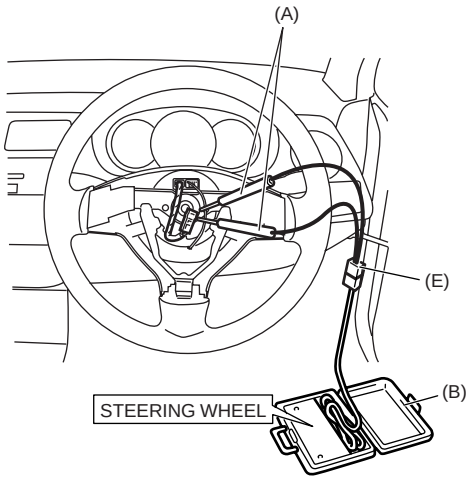
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit. (in instrument panel and floor harness)
Step 3: Check driver air bag (inflator) module initiator circuit. (in floor harness)
Step 4: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0A820014- 4) Check SDM DTC. *With ignition switch ON, is DTC B1031 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0A820015- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1031 indicated?*	Go to Step 3.	High resistance or open wire in “GRN” or “YEL” circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-2” and “L29-3”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-2” and “L29-3” terminals with connected special tools (B) and (D). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–77320**  *Is resistance 3.85 Ω or less?*	Substitute a known-good SDM and recheck.	High resistance or open wire in “GRN” or “YEL” circuit in floor harness.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from “G26” connector and then reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering wheel referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”. 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module connector. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0A820017- 5) Check SDM DTC. *With ignition switch ON, is DTC B1031 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to “Contact Coil Cable Assembly Removal and Installation: in Section 6B”.	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

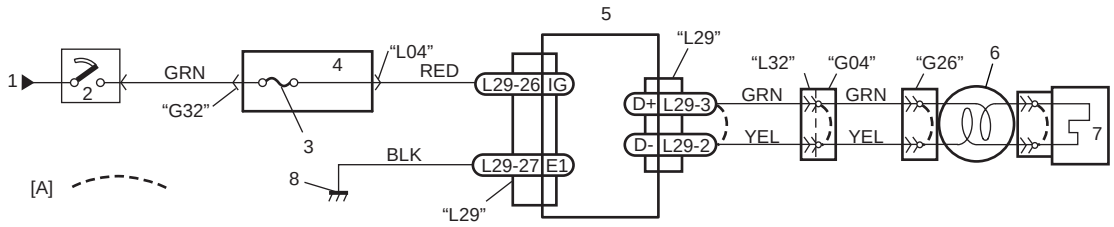
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1032: Driver Air Bag Initiator Circuit Resistance Low

S4RS0A8204017

Wiring Diagram



I4RS0A820013-

[A]: Shorting bar	3. "A/BAG" fuse	6. Contact coil assembly
1. From main fuse	5. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

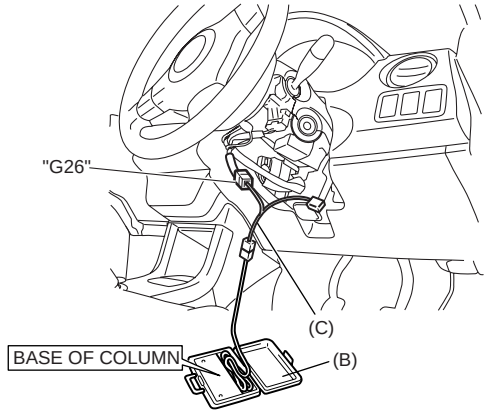
DTC Will Set when

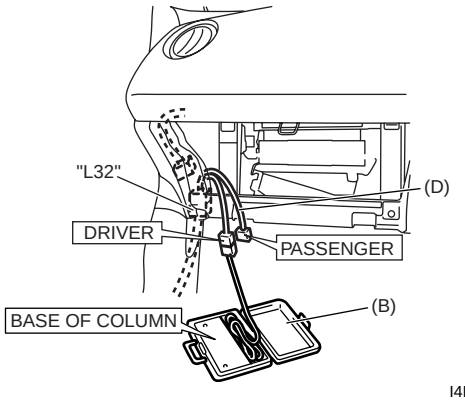
The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is below a specified value for specified time.

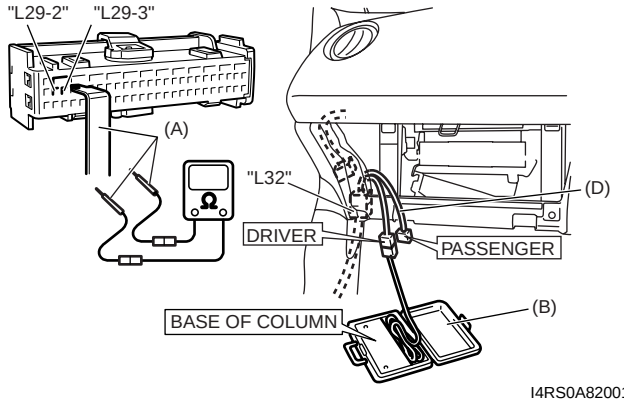
Flow Test Description

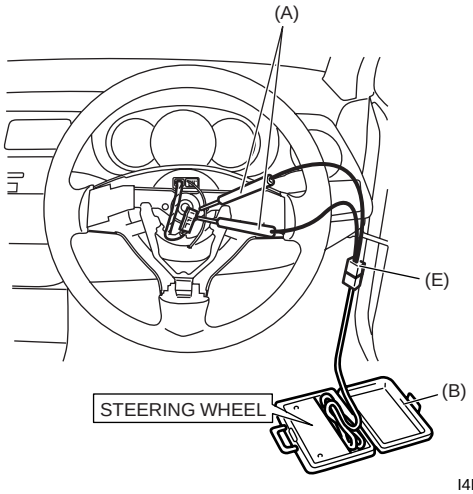
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit. (in instrument panel and floor harness)
Step 3: Check driver air bag (inflator) module initiator circuit. (in floor harness)
Step 4: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0A820014- 4) Check SDM DTC. *With ignition switch ON, is DTC B1032 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0A820015- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1032 indicated?*	Go to Step 3.	“GRN” circuit shorted to “YEL” circuit, “GRN” circuit or “YEL” circuit shorted to other circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-2” and “L29-3”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-2” and “L29-3” terminals with connected special tool (B) and (D). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–77320**  I4RS0A820016- *Is resistance 2.1 Ω or more?*	Substitute a known-good SDM and recheck.	“GRN” circuit shorted to “YEL” circuit, “GRN” circuit or “YEL” circuit shorted to other circuit in floor harness.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from “G26” connector and reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering column referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”. 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module connector. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0A820017- 5) Check SDM DTC. *With ignition switch ON, is DTC B1032 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to “Contact Coil Cable Assembly Removal and Installation: in Section 6B”.	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

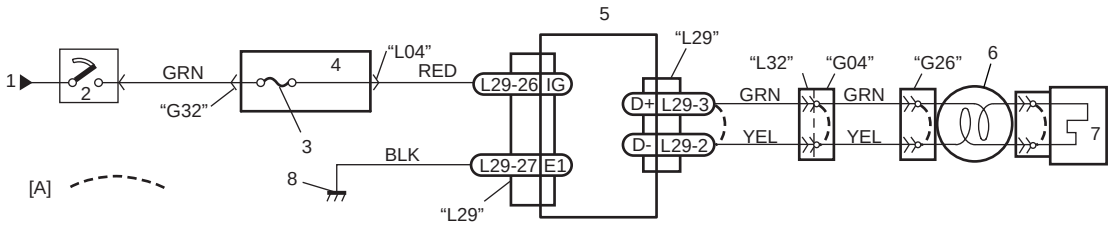
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1033: Driver Air Bag Initiator Circuit Short to Ground

S4RS0A8204018

Wiring Diagram



I4RS0A820013-

[A]: Shorting bar	3. "A/BAG" fuse	6. Contact coil assembly
1. From main fuse	4. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

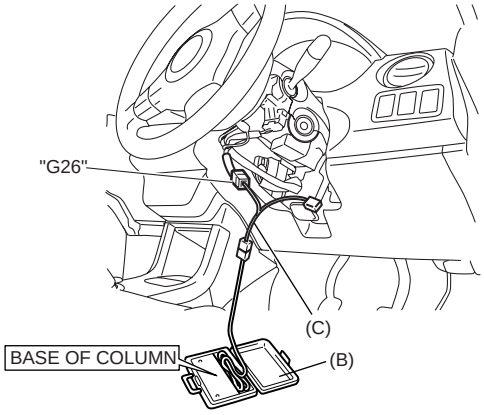
DTC Will Set when

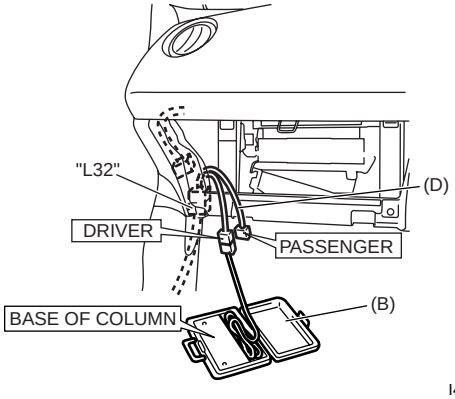
The voltage measured at driver air bag initiator circuit is below a specified value for specified time.

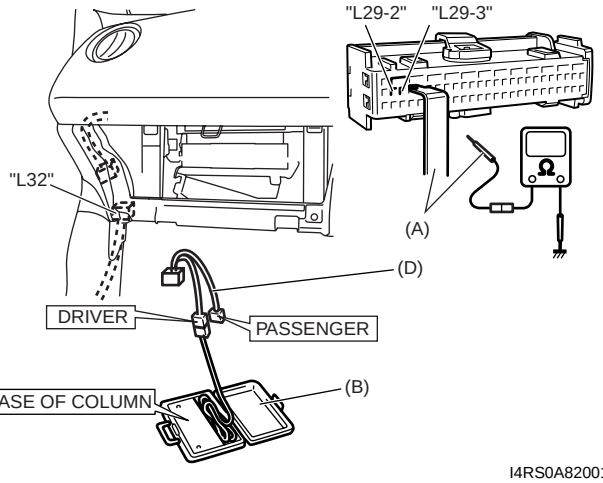
Flow Test Description

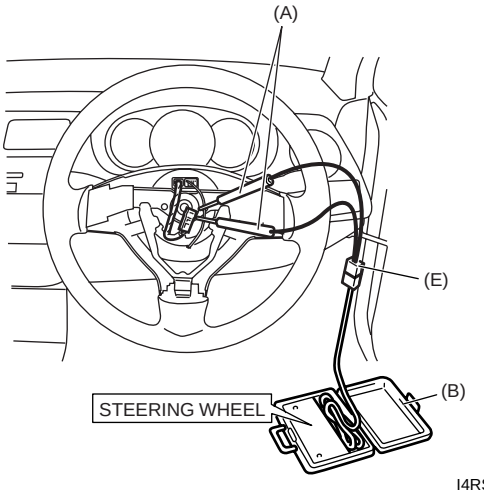
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit. (in instrument panel and floor harness)
Step 3: Check driver air bag (inflator) module initiator circuit. (in floor harness)
Step 4: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0A820014- 4) Check SDM DTC. *With ignition switch ON, is DTC B1033 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0A820015- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1033 indicated?*	Go to Step 3.	“GRN” circuit or “YEL” circuit shorted to ground in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (D) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release Shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-2” terminal and body ground and between “L29-3” terminal and body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–78340**  *Are resistances infinity?*	Substitute a known-good SDM and recheck.	“GRN” circuit or “YEL” circuit shorted to ground in floor harness.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from "G26" connector and reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering column referring to "Driver Air Bag (Inflator) Module Removal and Installation: ". 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module connector. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0A820017- 5) Check SDM DTC. *With ignition switch ON, is DTC B1033 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to "Contact Coil Cable Assembly Removal and Installation: in Section 6B".	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation: ".

NOTE:

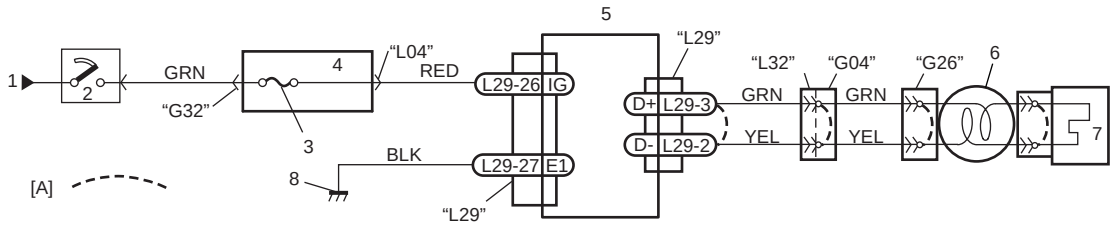
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1034: Driver Air Bag Initiator Circuit Short to Power Circuit

S4RS0A8204019

Wiring Diagram



I4RS0A820013-

[A]: Shorting bar	3. "A/BAG" fuse	6. Contact coil assembly
1. From main fuse	4. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

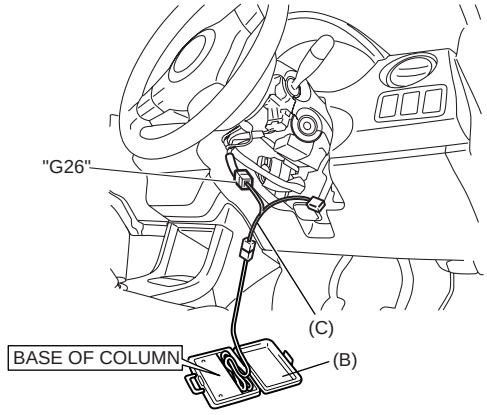
CAUTION:

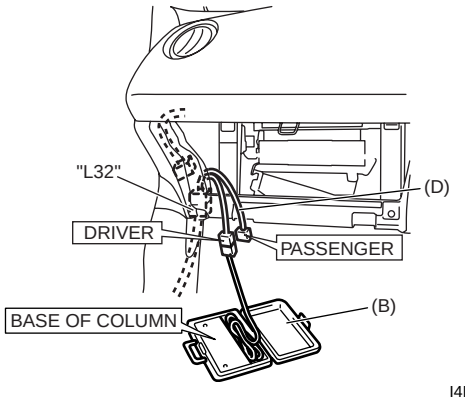
- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

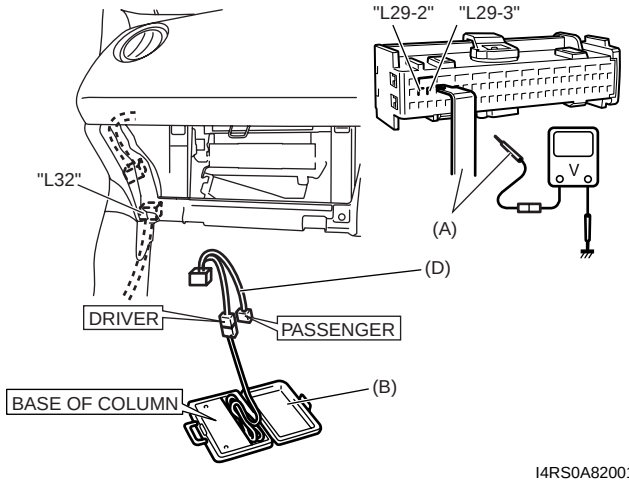
DTC Will Set when
The voltage measured at driver air bag initiator circuit is above a specified value for specified time.

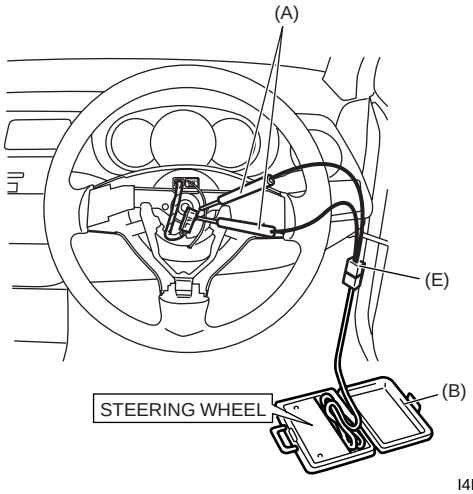
Flow Test Description
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit.
Step 3: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0A820014- 4) Check SDM DTC. *With ignition switch ON, is DTC B1034 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0A820015- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1034 indicated?*	Go to Step 3.	“GRN” circuit or “YEL” circuit shorted to power supply circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (D) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release Shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage from “L29-2” terminal to body ground and between “L29-3” terminal to body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–77320**  I4RS0A820019- *With ignition switch ON, is each measured value 1 V or less?*	Substitute a known-good SDM and recheck.	“GRN” circuit or “YEL” circuit shorted to power supply circuit.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from “G26” connector and reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering column referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”. 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0A820017- 5) Check SDM DTC. *With ignition switch ON, is DTC B1034 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to “Contact Coil Cable Assembly Removal and Installation: in Section 6B”.	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

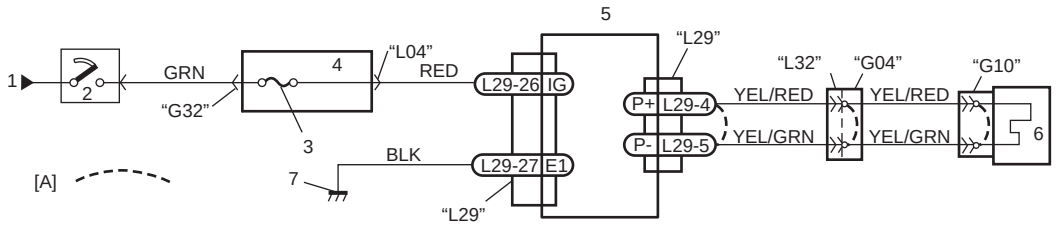
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1041: Passenger Air Bag Initiator Circuit Resistance High

S4RS0A8204012

Wiring Diagram



I4RS0A820020-

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

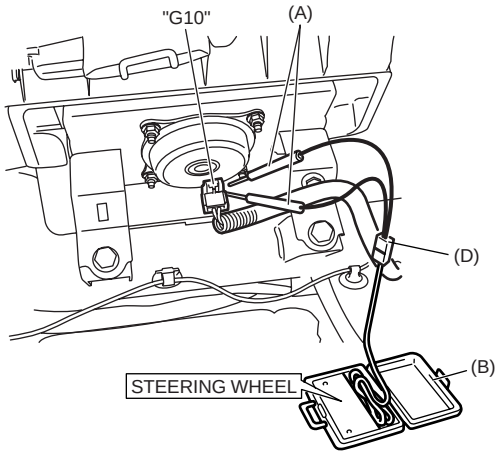
DTC Will Set when

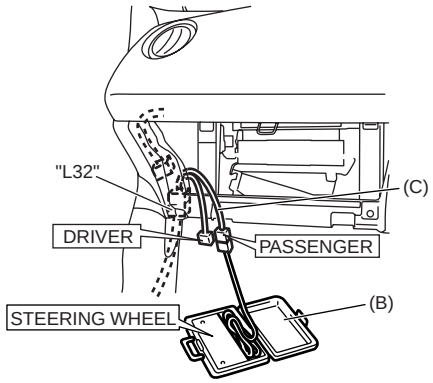
The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is above a specified value for specified time.

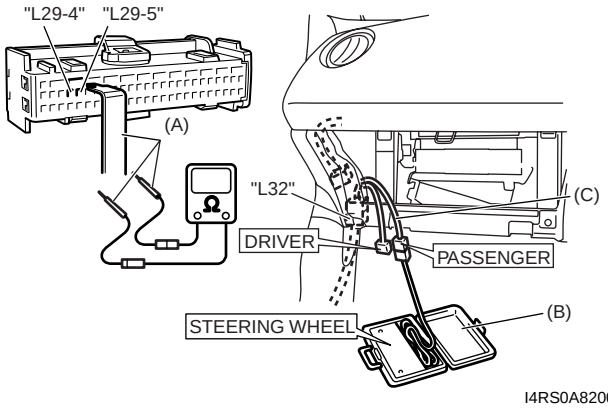
Flow Test Description

Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in “G10” connector. 3) If OK, then connect special tools (A), (B) and (D) to “G10” connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0A820021- 4) Check SDM DTC. *With ignition switch ON, is DTC B1041 indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820022- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1041 indicated?*	Go to Step 3.	High resistance or open wire “YEL/RED” or “YEL/GRN” circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-4” and “L29-5”. 3) If OK, release shorting bar in SDM connector inserting release too (1) included in special tool (A). 4) Measure resistance between “L29-4” and “L29-5” terminals with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  *Is resistance 2.82 Ω or less?*	Substitute a known-good SDM and recheck.	High resistance or open wire in “YEL/RED” or “YEL/GRN” circuit in floor harness.

NOTE:

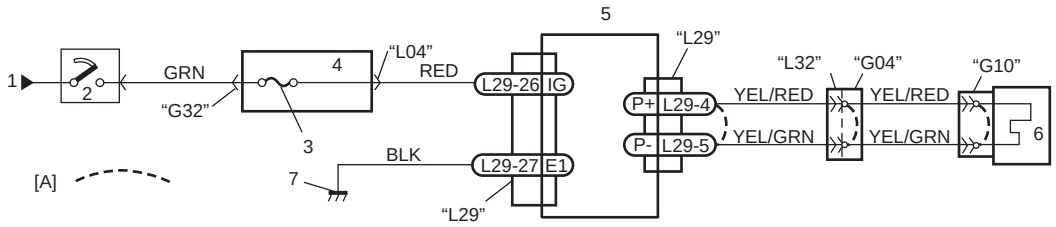
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1042: Passenger Air Bag Initiator Circuit Resistance Low

S4RS0A8204013

Wiring Diagram



I4RS0A820020-

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

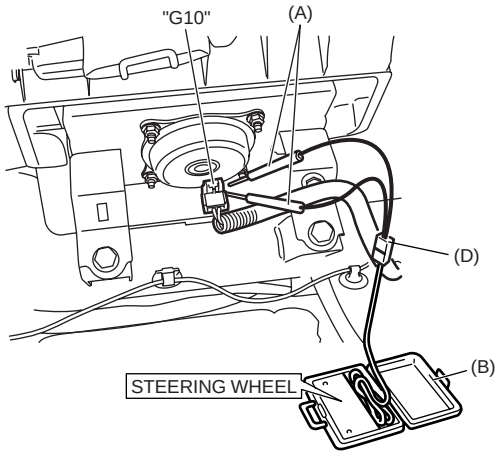
DTC Will Set when

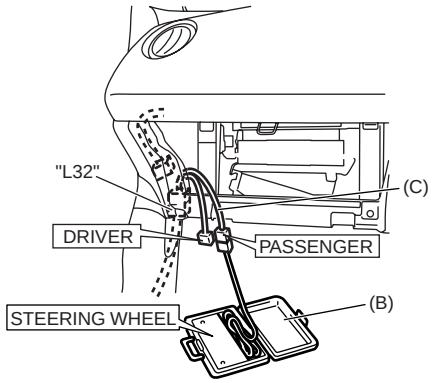
The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is below a specified value for specified time.

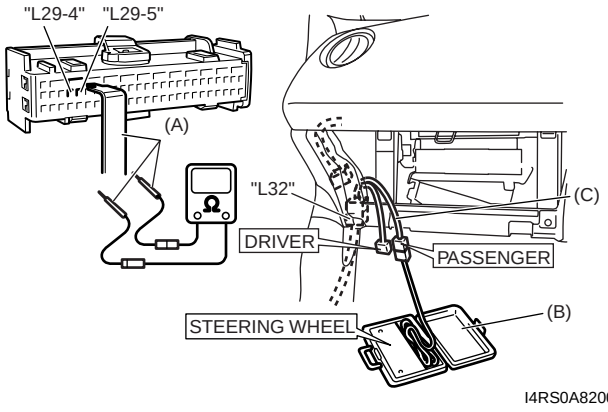
Flow Test Description

Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in “G10” connector. 3) If OK, then connect special tools (A), (B) and (D) to “G10” connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0A820021- 4) Check SDM DTC. *With ignition switch ON, is DTC B1042 indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820022- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1042 indicated?*	Go to Step 3.	“YEL/RED” circuit shorted to “YEL/GRN” circuit, “YEL/RED” circuit or “YEL/GRN” circuit shorted to other circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-4” and “L29-5”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-4” and “L29-5” terminals with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	“YEL/RED” circuit shorted to “YEL/GRN” circuit, “YEL/RED” circuit or “YEL/GRN” circuit shorted to other circuit in floor harness.

NOTE:

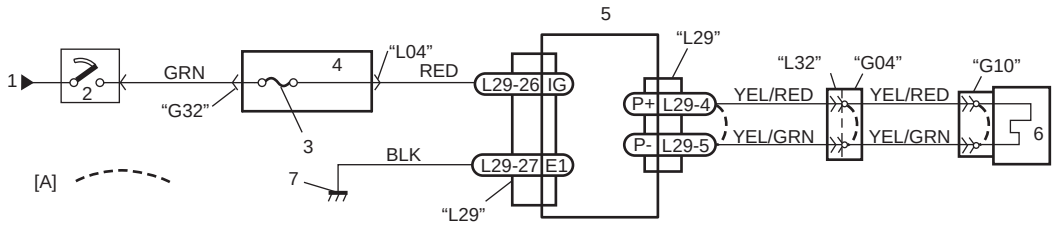
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1043: Passenger Air Bag Initiator Circuit Short to Ground

S4RS0A8204014

Wiring Diagram



I4RS0A820020-

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

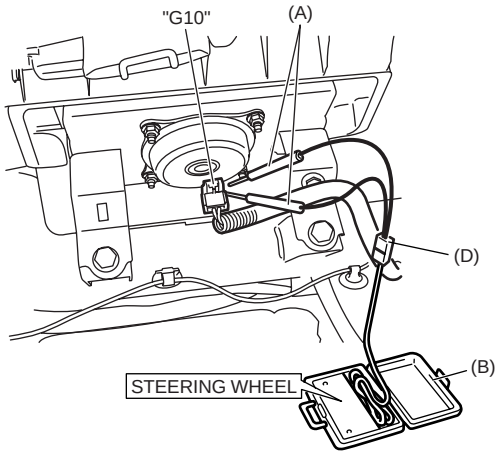
DTC Will Set when

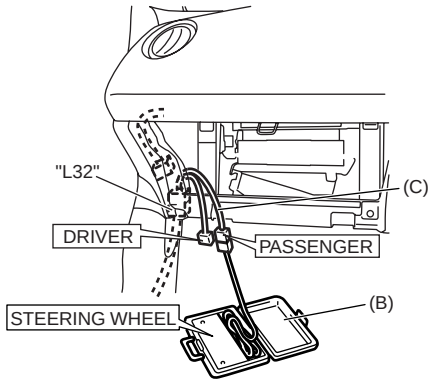
The voltage measured at passenger air bag (initiator) circuit is below a specified value for specified time.

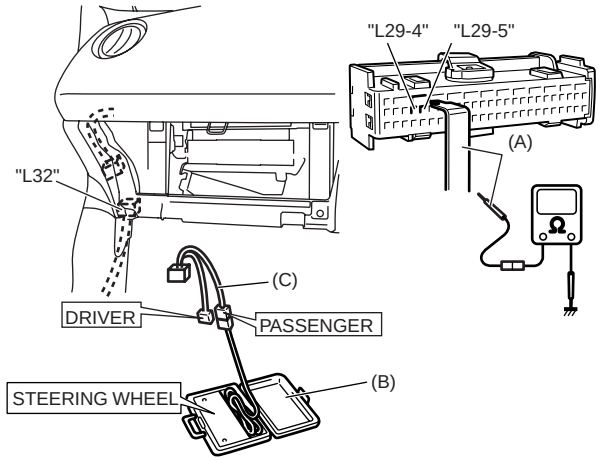
Flow Test Description

Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in “G10” connector. 3) If OK, then connect special tools (A), (B) and (D) to “G10” connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0A820021- 4) Check SDM DTC. *With ignition switch ON, is DTC B1043 indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820022- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1043 indicated?*	Go to Step 3.	“YEL/RED” or “YEL/GRN” circuit shorted to ground in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-4” terminal and body ground and between “L29-5” terminal and body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  *Is resistance infinity?*	Substitute a known-good SDM and recheck.	“YEL/RED” or “YEL/GRN” circuit shorted to ground in floor harness.

NOTE:

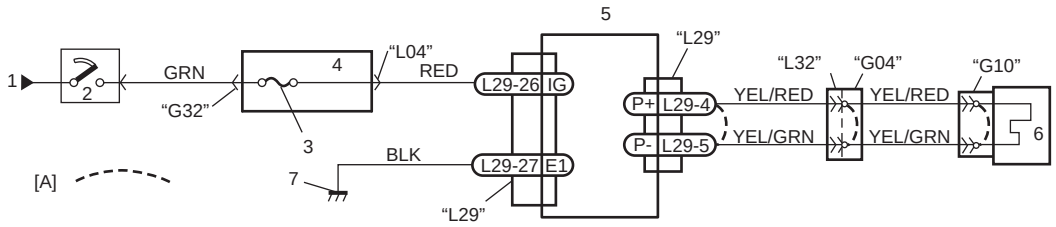
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1044: Passenger Air Bag Initiator Circuit Short to Power Circuit

S4RS0A8204015

Wiring Diagram



I4RS0A820020-

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

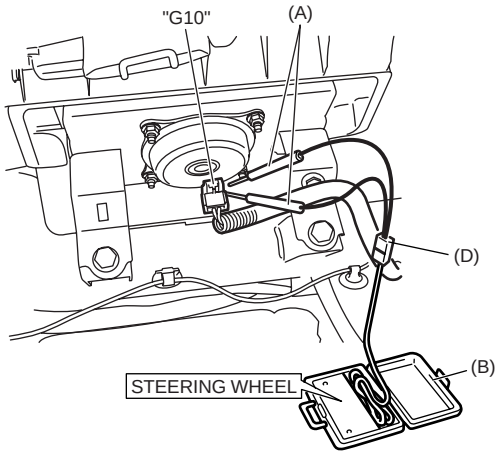
DTC Will Set when

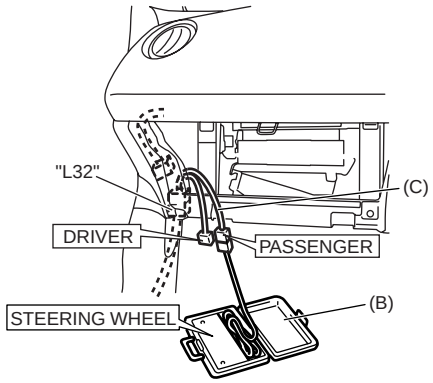
The voltage measured at passenger air bag (initiator) circuit is above a specified value for specified time.

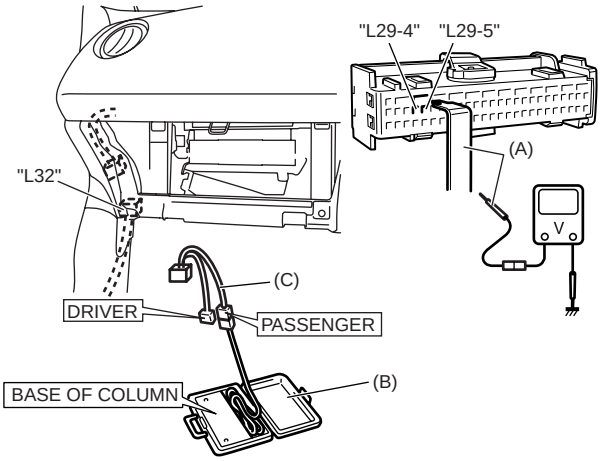
Flow Test Description

Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in “G10” connector. 3) If OK, then connect special tools (A), (B) and (D) to “G10” connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0A820021- 4) Check SDM DTC. *With ignition switch ON, is DTC B1044 indicated?*	Go to Step 3.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820022- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1044 indicated?*	Go to Step 3.	“YEL/RED” or “YEL/GRN” circuit shorted to power supply circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage from “L29-4” terminal to body ground and from “L29-5” terminal to body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820025- *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	“YEL/RED” or “YEL/GRN” circuit shorted to power supply circuit in floor harness.

NOTE:

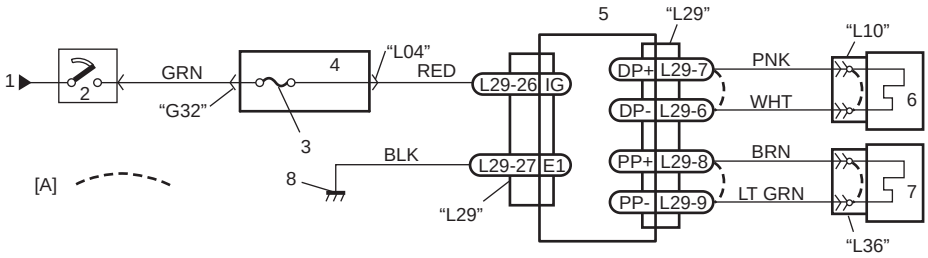
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1051 / B1055: Driver / Passenger Pretensioner Initiator Circuit Resistance High

S4RS0A8204024

Wiring Diagram



I4RS0A820026-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

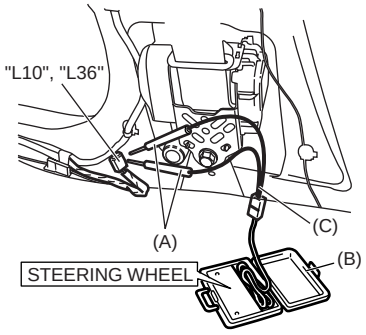
DTC Will Set when

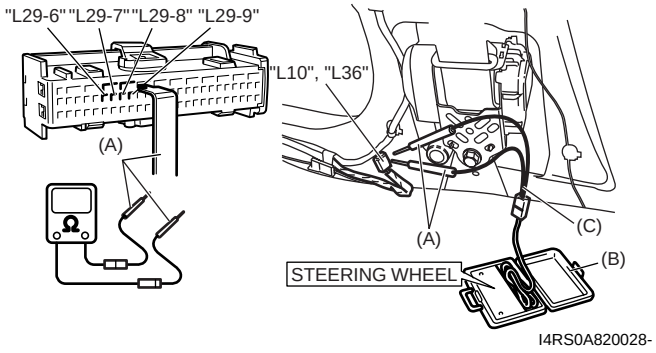
The resistance of driver or passenger seat belt pretensioner initiator circuit is above a specified value for specified time.

Flow Test Description

Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector “L10” or “L36” (1). 2) Check proper connection to seat belt pretensioner at terminals in “L10” or “L36” connector. 3) If OK, then connect special tools (A), (B) and (C) to “L10” or “L36” connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027- 4) Check SDM DTC. *With ignition switch ON, is DTC B1051 or B1055 still indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace seat belt pretensioner referring to “Front Seat Belt Removal and Installation: in Section 8A”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “29”. 2) Check proper connection to SDM at terminals in “L29-6” and “L29-7” (for DTC B1051) or “L29-8” and “L29-9” (for DTC B1055). 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-6” and “L29-7” terminals (for DTC B1051) or “L29-8” and “L29-9” terminals (for DTC B1055) with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78310**  *Is resistance 2.91 Ω or less?*	Substitute a known-good SDM and recheck.	DTC B1051: High resistance or open wire in “PNK” or “WHT” circuit. DTC B1055: High resistance or open wire in “BRN” or “LT GRN” circuit.

NOTE:

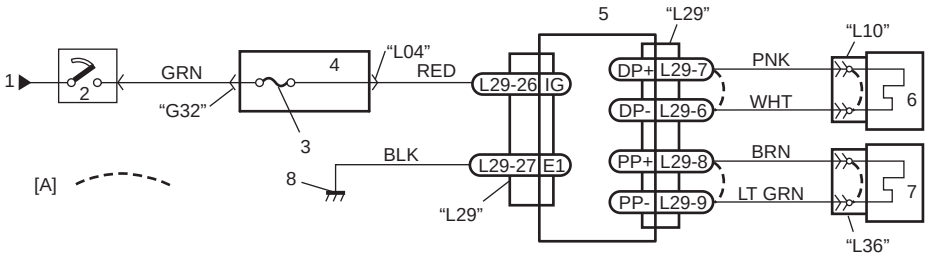
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1052 / B1056: Driver / Passenger Pretensioner Initiator Circuit Resistance Low

S4RS0A8204025

Wiring Diagram



I4RS0A820026-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

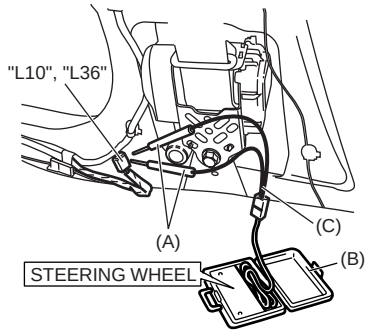
DTC Will Set when

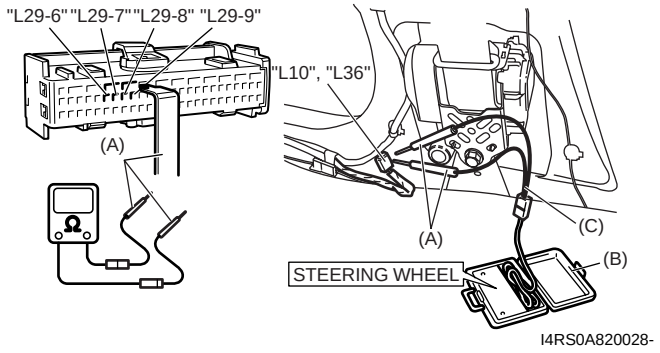
The resistance of driver or passenger seat belt pretensioner initiator circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector “L10” or “L36” (1). 2) Check proper connection to seat belt pretensioner at terminals in “L10” or “L36” connector. 3) If OK, then connect special tools (A), (B) and (C) to “L10” or “L36” connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027- 4) Check SDM DTC. *With ignition switch ON, is DTC B1052 or B1056 still indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace seat belt pretensioner referring to “Front Seat Belt Removal and Installation: in Section 8A”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “29”. 2) Check proper connection to SDM at terminals in “L29-6” and “L29-7” (for DTC B1052) or “L29-8” and “L29-9” (for DTC B1056). 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) If OK, then measure resistance between “L29-6” and “L29-7” terminals (for DTC B1052) or “L29-8” and “L29-9” terminals (for DTC B1056) with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78310**  *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	DTC B1052: “PNK” circuit shorted to “WHT” circuit, “PNK” circuit or “WHT” circuit shorted to other circuit. DTC B1056: “BRN” circuit shorted to “LT GRN” circuit, “BRN” circuit or “LT GRN” circuit shorted to other circuit.

NOTE:

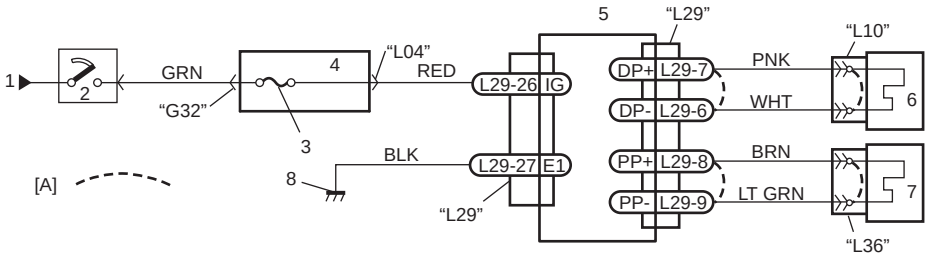
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1053 / B1057: Driver / Passenger Pretensioner Initiator Circuit Short to Ground

S4RS0A8204026

Wiring Diagram



I4RS0A820026-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

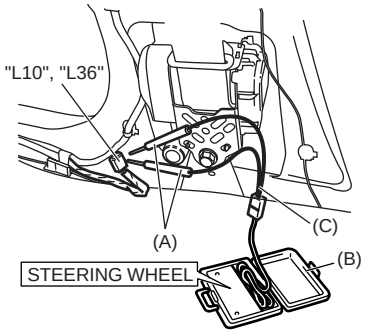
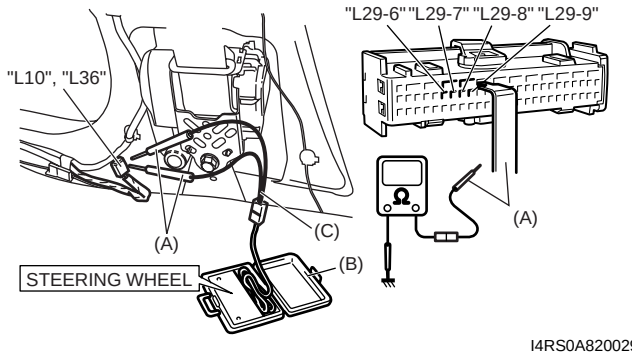
DTC Will Set when

The voltage measured at driver or passenger seat belt pretensioner initiator circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector “L10” or “L36” (1). 2) Check proper connection to seat belt pretensioner at terminals in “L10” or “L36” connector. 3) If OK, then connect special tools (A), (B) and (C) to “L10” or “L36” connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027- 4) Check SDM DTC. *With ignition switch ON, is DTC B1053 or B1057 still indicated?*	Go to Step 2.	Ignition switch OFF. Replace seat belt pretensioner referring to “Front Seat Belt Removal and Installation: in Section 8A”.
2	1) With ignition switch OFF, disconnect special tools (A), (B) and (C) and SDM connector. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-6” and body ground, and between “L29-7” and body ground (for DTC B1053) or between “L29-8” and body ground, and between “L29-9” and body ground (for DTC B1057). **Special tool** **(A): 09932-76010**  I4RS0A820029- *Is resistance infinity?*	Substitute a known-good SDM and recheck.	DTC B1053: “PNK” circuit or “WHT” circuit shorted to ground. DTC B1057: “BRN” circuit or “LT GRN” circuit shorted to ground.

NOTE:

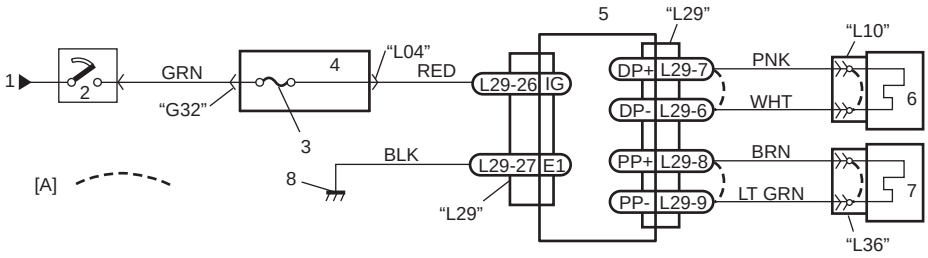
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1054 / B1058: Driver / Passenger Pretensioner Initiator Circuit Short to Power Circuit

S4RS0A8204027

Wiring Diagram



I4RS0A820026-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

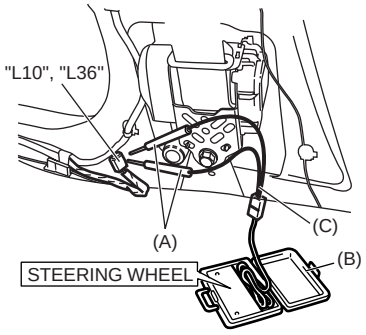
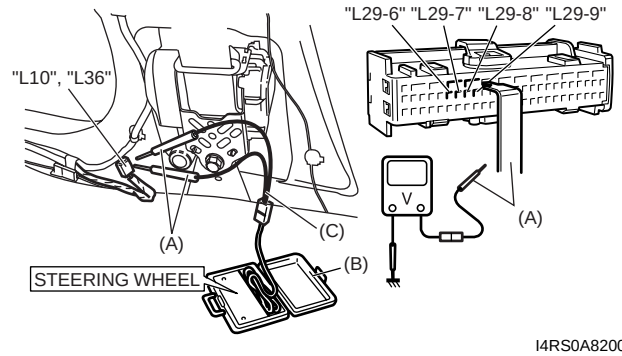
DTC Will Set when

The voltage measured at driver or passenger seat belt pretensioner initiator circuit is above a specified value for specified time.

Flow Test Description

Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector “L10” and “L36” (1). 2) Check proper connection to seat belt pretensioner at terminals in “L10” or “L36” connector. 3) If OK, then connect special tools (A), (B) and (C) to “L10” or “L36” connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027- 4) Check SDM DTC. *With ignition switch ON, is DTC B1054 or B1058 still indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace seat belt pretensioner referring to “Front Seat Belt Removal and Installation: in Section 8A”.
2	1) With ignition switch OFF, disconnect special tools (A), (B) and (C) and SDM connector. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage between “L29-6” and body ground, and between “L29-7” and body ground (for DTC B1054) or between “L29-8” and body ground, and between “L29-9” and body ground (for DTC B1058). **Special tool** **(A): 09932-76010**  I4RS0A820030- *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	DTC B1054: “PNK” circuit or “WHT” circuit shorted to power supply circuit. DTC B1058: “BRN” circuit or “LT GRN” circuit shorted to power supply circuit.

NOTE:

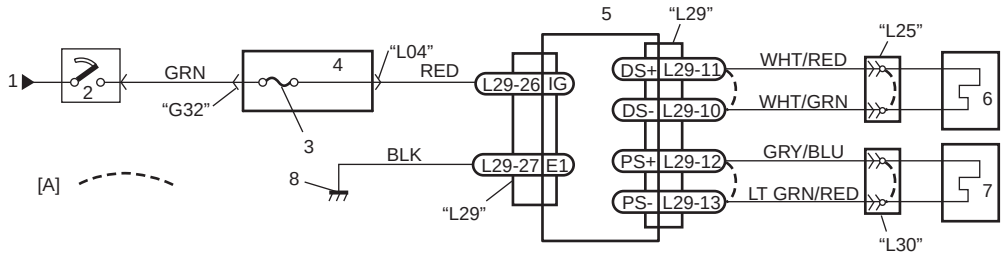
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1061 / B1065: Driver / Passenger Side-Air Bag Initiator Circuit Resistance High

S4RS0A8204072

Wiring Diagram



I4RS0A820031-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

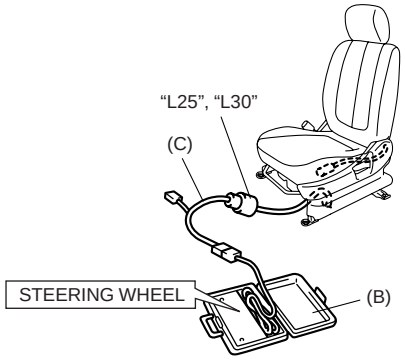
DTC Will Set when

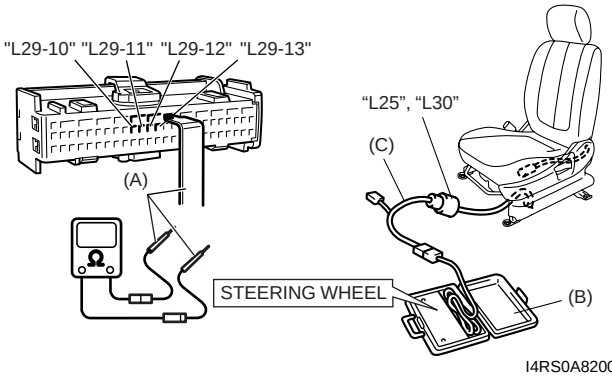
The combined resistance of the side-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is above a specified value for specified time.

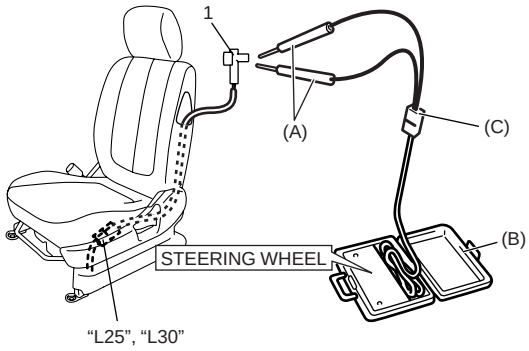
Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in “L25” or “L30” connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1). **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032- 4) Check SDM DTC. *With ignition switch ON, is DTC B1061 or B1065 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-10” and “L29-11” or “L29-12” and “L29-13”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-10” and “L29-11” terminals (for DTC B1061) or “L29-12” and “L29-13” terminals (for DTC B1065) with connected special tool (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  *Is resistance 2.62 Ω or less?*	Substitute a known-good SDM and recheck.	DTC B1061: Repair high resistance or open in “WHT/RED” or “WHT/GRN” wire circuit in floor harness. DTC B1065: Repair high resistance or open in “GRY/BLU” or “LT GRN/RED” wire circuit in floor harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034- 5) Check SDM DTC. *With ignition switch ON, is DTC B1061 or B1065 still indicated?*	DTC B1061: Repair high resistance or open in “WHT/RED” or “WHT/GRN” wire circuit in seat harness. DTC B1065: Repair high resistance or open in “GRY/BLU” or “LT GRN/RED” wire circuit in seat harness.	Replace side-air bag (inflator) module referring to “Side-Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

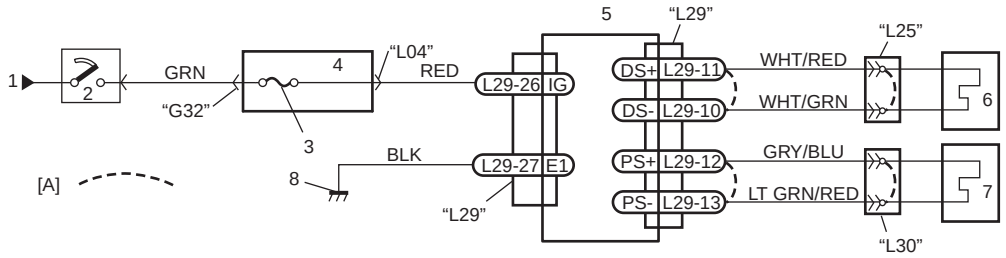
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1062 / B1066: Driver / Passenger Side-Air Bag Initiator Circuit Resistance Low

S4RS0A8204073

Wiring Diagram



I4RS0A820031-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

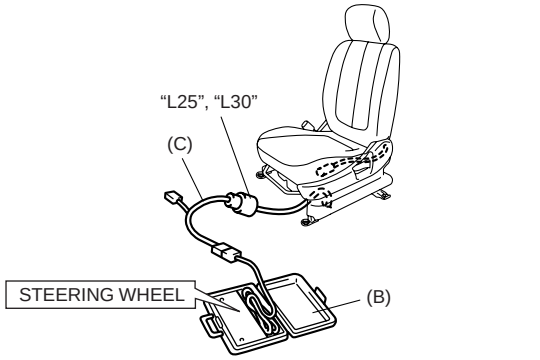
DTC Will Set when

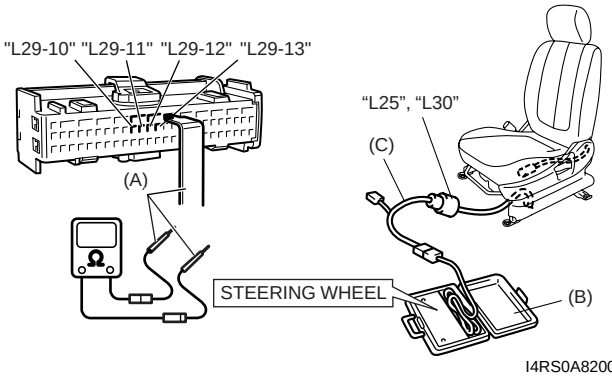
The combined resistance of the side-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is below a specified value for specified time.

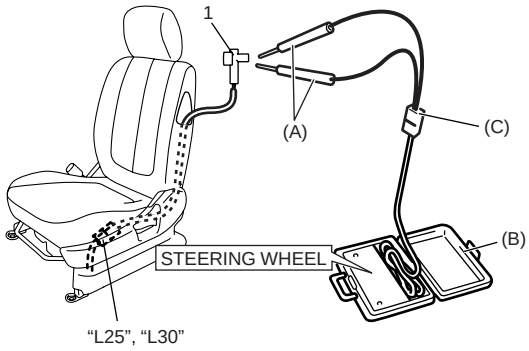
Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in “L25” or “L30” connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1. **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032- 4) Check SDM DTC. *With ignition switch ON, is DTC B1062 or B1066 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-10” and “L29-11” or “L29-12” and “L29-13”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-10” and “L29-11” terminals (for DTC B1062) or “L29-12” and “L29-13” terminals (for DTC B1066) with connected special tools (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820033- *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	DTC B1062: Repair short from “WHT/RED” wire circuit to “WHT/GRN” wire circuit or from “WHT/RED” or “WHT/GRN” wire circuit to other wire circuit in floor harness. DTC B1066: Repair short from “GRY/BLU” wire circuit to “LT GRN/RED” wire circuit or from “GRY/BLU” or “LT GRN/RED” wire circuit to other wire circuit in floor harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034- 5) Check SDM DTC. *With ignition switch ON, is DTC B1062 or B1066 still indicated?*	DTC B1062: Repair short from “WHT/RED” wire circuit to “WHT/GRN” wire circuit in seat harness or from “WHT/RED” or “WHT/GRN” wire circuit to other wire circuit. DTC B1066: Repair short from “GRY/BLU” wire circuit to “LT GRN/RED” wire circuit in seat harness or from “GRY/BLU” or “LT GRN/RED” wire circuit to other wire circuit.	Replace side-air bag (inflator) module referring to “Side-Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

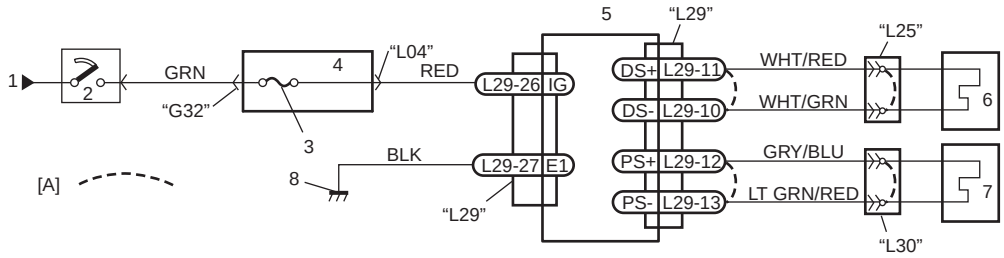
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1063 / B1067: Driver / Passenger Side-Air Bag Initiator Circuit Short to Ground

S4RS0A8204074

Wiring Diagram



I4RS0A820031-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

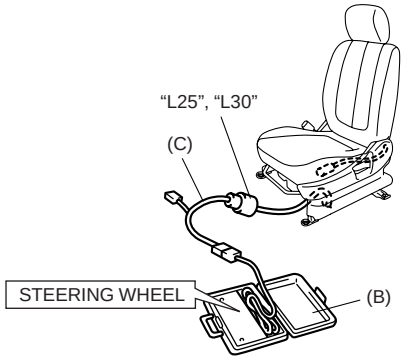
DTC Will Set when

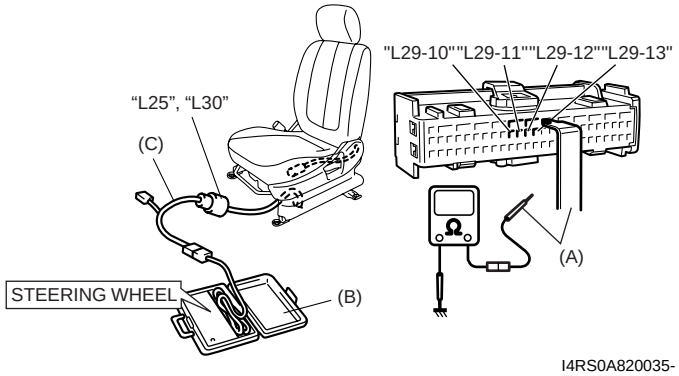
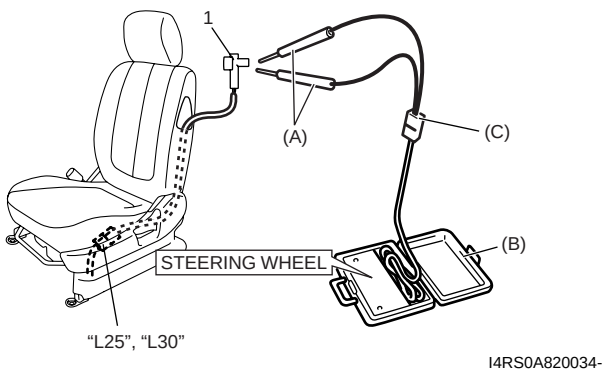
The voltage measured at side-air bag (driver or passenger) initiator circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in “L25” or “L30” connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1. **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032- 4) Check SDM DTC. *With ignition switch ON, is DTC B1063 or B1067 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect special tools and SDM connector “L29”. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-10” and body ground, and between “L29-11” and body ground (for DTC B1063) or “L29-12” and body ground, and between “L29-13” and body ground (for DTC B1067) with connected special tools (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  *Is resistance infinity?*	Substitute a known-good SDM and recheck.	DTC B1063: Repair short from “WHT/RED” or “WHT/GRN” wire circuit to ground in floor harness. DTC B1067: Repair short from “GRY/BLU” or “LT GRN/RED” wire circuit to ground in floor harness.
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  5) Check SDM DTC. *With ignition switch ON, is DTC B1063 or B1067 still indicated?*	DTC B1063: Repair short from “WHT/RED” or “WHT/GRN” wire circuit to ground in seat harness. DTC B1067: Repair short from “GRY/BLU” or “LT GRN/RED” wire circuit to ground in seat harness.	Replace side-air bag (inflator) module referring to “Side-Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

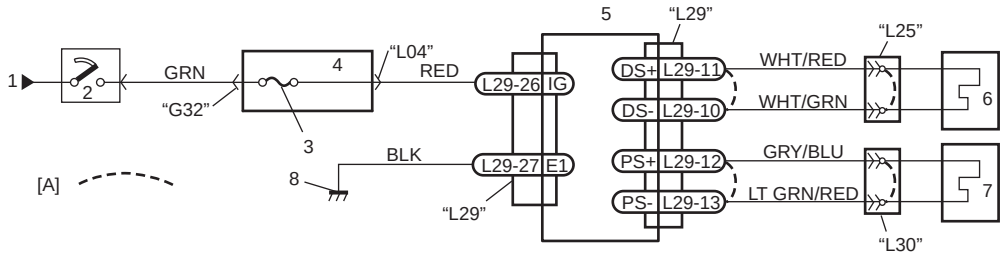
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1064 / B1068: Driver / Passenger Side-Air Bag Initiator Circuit Short to Power Circuit

S4RS0A8204075

Wiring Diagram



I4RS0A820031-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

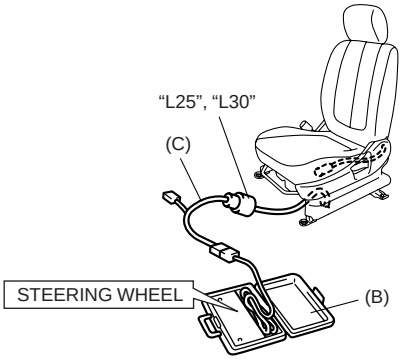
DTC Will Set when

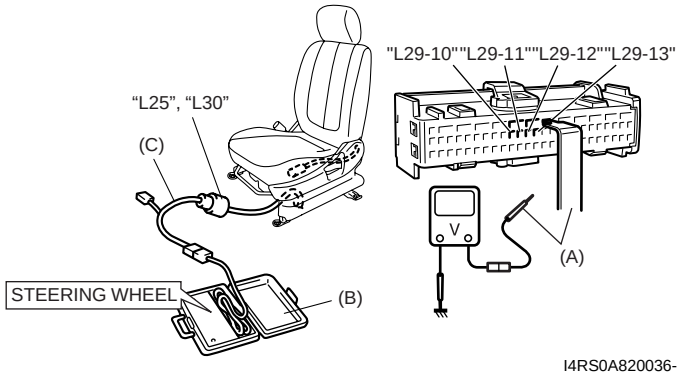
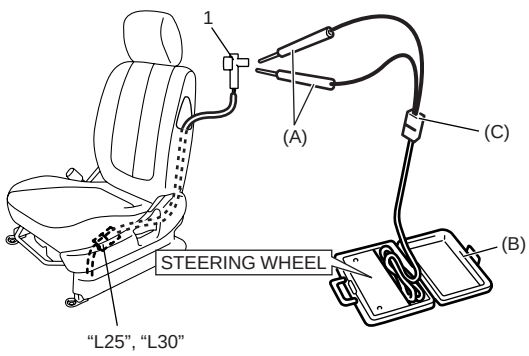
The voltage measured at side-air bag (driver or passenger) initiator circuit is above a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in “L25” or “L30” connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1. **Special tool** **(B): 09932–75010** **(C): 09932–78340**  4) Check SDM DTC. *With ignition switch ON, is DTC B1064 or B1068 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect special tools (B), (C) and SDM connector “L29”. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage between “L29-10” and body ground, and between “L29-11” and ground (for DTC B1064) or “L29-12” and body ground, and between “L29-13” and body ground (for DTC B1068) with connected special tools (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820036- *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	DTC B1064: Repair short from “WHT/RED” or “WHT/GRN” wire circuit to power circuit in floor harness. DTC B1068: Repair short from “GRY/BLU” or “LT GRN/RED” wire circuit to power circuit in floor harness.
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034- 5) Check SDM DTC. *With ignition switch ON, is DTC B1064 or B1068 still indicated?*	DTC B1064: Repair short from “WHT/RED” or “WHT/GRN” wire circuit to power circuit in seat harness. DTC B1068: Repair short from “GRY/BLU” or “LT GRN/RED” wire circuit to power circuit in seat harness.	Replace side-air bag (inflator) module referring to“Side-Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1071: Forward-Sensor Performance Problem

S4RS0A8204022

DTC Will Set when

SDM receives internal fault signal or wrong ID (Part No.) signal from forward-sensor.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace forward-sensor referring to "Forward-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

DTC B1072: Forward-Sensor Communication Error

S4RS0A8204045

DTC Will Set when

Forward-sensor abnormal signal is detected by SDM.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace forward-sensor referring to "Forward-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

NOTE:

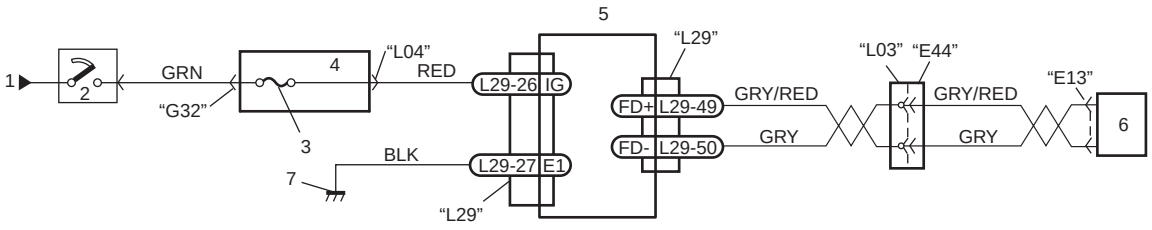
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1073: Forward-Sensor Circuit Short to Ground

S4RS0A8204076

Wiring Diagram



I4RS0A820037-

1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	
3. "A/BAG" fuse	6. Forward-sensor	

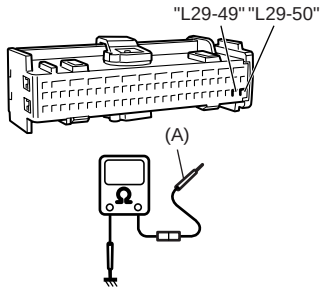
CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
Forward-sensor abnormal signal is detected by SDM.

Flow Test Description
Step 1: Check for short circuit between forward-sensor circuit and ground.
Step 2: Check if malfunction is in forward-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect forward-sensor connector “E13”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-49” and “L29-50” or terminals. 4) Measure resistance between “L29-49” terminal and body ground, “L29-50” terminal and body ground. **Special tool** **(A): 09932–76010**  I4RS0A820038- *Is each measured resistance infinity?*	Go to Step 3.	“GRY/RED” circuit or “GRY” circuit shorted to ground.
2	1) Check forward-sensor referring to “Forward-Sensor Inspection: ”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace forward-sensor referring to “Forward-Sensor Removal and Installation: ”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE:

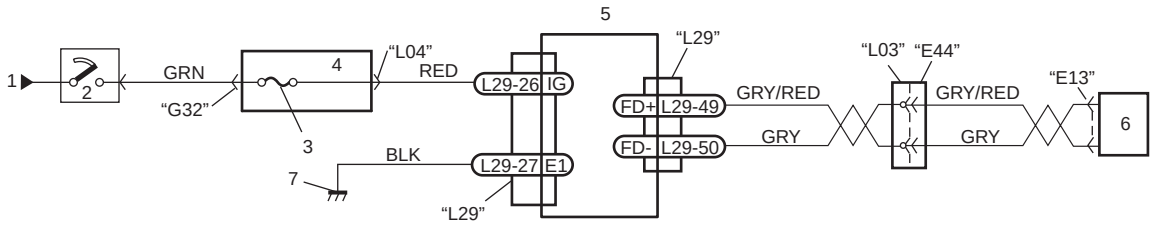
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1074: Forward-Sensor Circuit Short to Power Circuit or Open

S4RS0A8204077

Wiring Diagram



I4RS0A820037-

1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	
3. "A/BAG" fuse	6. Forward-sensor	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

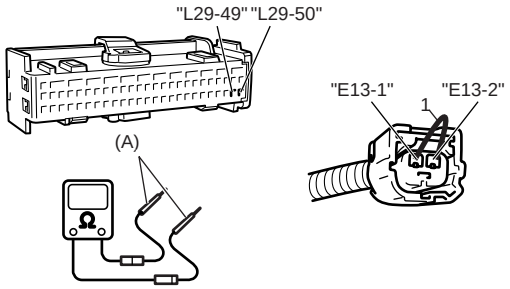
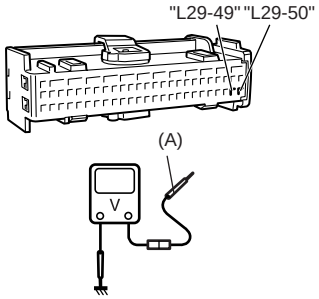
DTC Will Set when

Forward-sensor abnormal signal is detected by SDM.

Flow Test Description

Step 1: Check for open circuit in forward-sensor circuit.
Step 2: Check for short circuit between forward-sensor circuit and ground.
Step 3: Check for short circuit between forward-sensor circuit and power supply circuit.
Step 4: Check if malfunction is in forward-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect forward-sensor connector “E13”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-49” and “L29-50” or terminals. 4) Check proper connection to forward-sensor connector at terminals “E13-1” and “E13-2”. 5) Using service wire (1), connect “E13-1” terminal and “E13-2” terminal of forward-sensor connector. 6) Measure resistance between terminals “L29-49” and “L29-50” of SDM connector. **Special tool** **(A): 09932-76010**  I4RS0A820039- *Is each measured resistance 1 Ω or less?*	Go to Step 2.	High resistance or open wire in “GRY/RED” circuit or “GRY” circuit.
2	1) Disconnect service wire from “E13” connector. 2) Measure voltage between “L29-49” terminal and body ground, “L29-50” terminal and body ground.  I4RS0A820040- *With ignition switch ON, is each measured value 1 V or less?*	Go to Step 3.	“GRY/RED” circuit or “GRY” circuit shorted to power supply circuit.
3	1) Check forward-sensor referring to “Forward-Sensor Inspection: ”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace forward-sensor referring to “Forward-Sensor Removal and Installation: ”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1081 / B1091: Driver / Passenger Side-Sensor Performance Problem

S4RS0A8204078

DTC Will Set when

SDM receives internal fault signal from side-sensor.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace driver or passenger side-sensor referring to "Side-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

DTC B1082 / B1092: Driver / Passenger Side-Sensor Communication Error

S4RS0A8204079

DTC Will Set when

Side-sensor abnormal signal is detected by SDM.

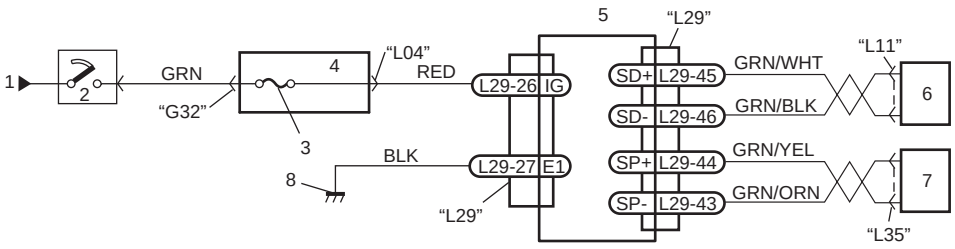
DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace driver or passenger side-sensor referring to "Side-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

DTC B1083 / B1093: Driver / Passenger Side-Sensor Circuit Short to Ground

S4RS0A8204080

Wiring Diagram



I4RS0A820041-

1. From main fuse	4. Junction block assembly	7. Passenger side-sensor
2. Ignition switch	5. SDM	8. Ground for air bag system
3. "A/BAG" fuse	6. Driver side-sensor	

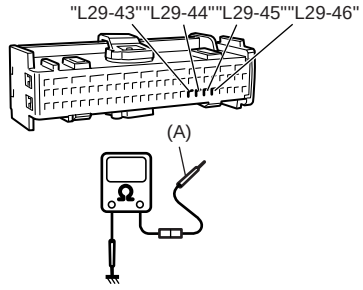
CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The resistance measured between side-sensor circuit and ground circuit is below a specified value for specified time.

Flow Test Description
Step 1: Check for short circuit between side-sensor circuit and ground.
Step 2: Check if malfunction is in side-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect side-sensor connector “L11” or “L35”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-45” and “L29-46” or terminals “L29-43” and “L29-44”. 4) Measure resistance between “L29-45” terminal and body ground, “L29-46” terminal and body ground, or “L29-43” terminal and body ground, “L29-44” terminal and body ground. **Special tool** **(A): 09932–76010**  I4RS0A820042- *Is each measured resistance infinity?*	Go to Step 3.	DTC B1083: “GRN/WHT” circuit or “GRN/BLK” circuit shorted to ground. DTC B1093: “GRN/YEL” circuit or “GRN/ORN” circuit shorted to ground.
2	1) Check side-sensor referring to “Side-Sensor Inspection: ”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace side-sensor referring to “Side-Sensor Removal and Installation: ”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE:

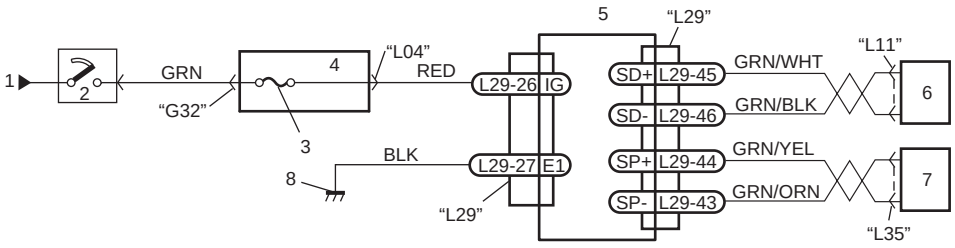
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1084 / B1094: Driver / Passenger Side-Sensor Circuit Short to Power Circuit or Open

S4RS0A8204081

Wiring Diagram



I4RS0A820041-

1. From main fuse	4. Junction block assembly	7. Passenger side-sensor
2. Ignition switch	5. SDM	8. Ground for air bag system
3. "A/BAG" fuse	6. Driver side-sensor	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

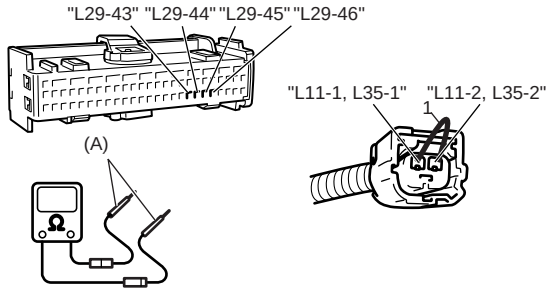
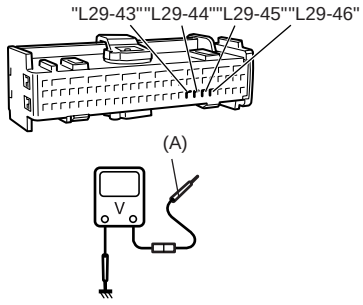
DTC Will Set when

The resistance measured between side-sensor circuit and power source circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check for open circuit in side-sensor circuit.
Step 2: Check for short circuit between side-sensor circuit and power supply circuit.
Step 3: Check if malfunction is in side-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect side-sensor connector “L11” or “L35”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-45” and “L29-46” or terminals “L29-43” and “L29-44”. 4) Check proper connection to side-sensor connector at terminals “L11-1” and “L11-2” or terminals “L35-1” and “35-2”. 5) Using service wire (1), connect “L11-1” terminal and “L11-2” terminal of driver side-sensor connector or “L35-1” terminal and “L35-2” terminal of passenger side-sensor connector. 6) Measure resistance between terminals “L29-45” and “L29-46” or between “L29-43” and “L29-44” of SDM connector. **Special tool** **(A): 09932–76010**  *Is each measured resistance 1 Ω or less?*	Go to Step 2.	DTC B1084: High resistance or open wire in “GRN/WHT” circuit or “GRN/BLK” circuit. DTC B1094: High resistance or open wire in “GRN/YEL” circuit or “GRN/ORN” circuit.
2	1) Disconnect service wire from “L11” or “L35” connector. 2) Measure voltage between “L29-45” terminal and body ground, “L29-46” terminal and body ground or “L29-43” terminal and body ground, “L29-44” terminal and body ground.  *With ignition switch ON, is each measured value 1 V or less?*	Go to Step 3.	DTC B1084: “GRN/WHT” circuit or “GRN/BLK” circuit shorted to power supply circuit. DTC B1094: “GRN/YEL” circuit or “GRN/ORN” circuit shorted to power supply circuit.
3	1) Check side-sensor referring to “Side-Sensor Inspection: ”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace side-sensor referring to “Side-Sensor Removal and Installation: ”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1085 / B1095: Wrong Side-Sensor (Driver Side / Passenger) ID

S4RS0A8204082

DTC Will Set when

SDM receives wrong ID (Part No.) signal from side-sensor.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace driver or passenger side-sensor referring to "Side-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

NOTE:

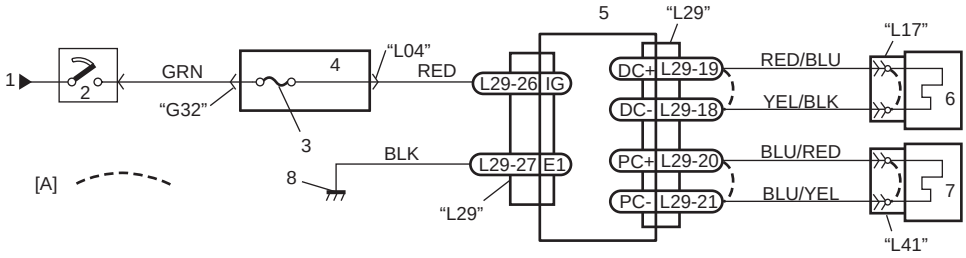
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1361 / B1365: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance High

S4RS0A8204083

Wiring Diagram



I4RS0A820095-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

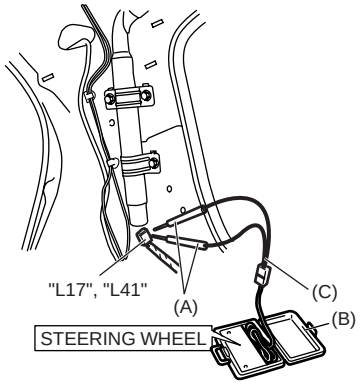
CAUTION:

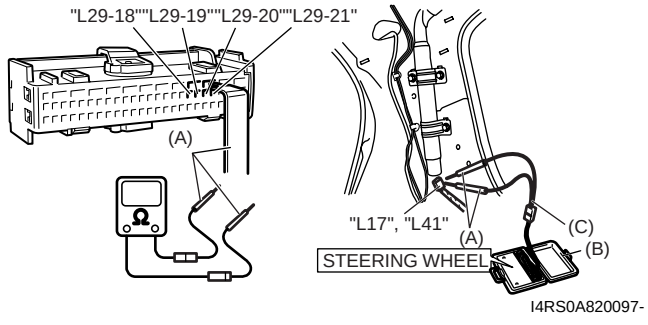
- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The combined resistance of the side curtain-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is above a specified value for specified time.

Flow Test Description
Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side curtain-air bag (inflator) module at terminals in “L17” or “L41” connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820096- 4) Check SDM DTC. *With ignition switch ON, is DTC B1361 or B1365 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to “Side Curtain-Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-18” and “L29-19” or “L29-20” and “L29-21”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-18” and “L29-19” terminals (for DTC B1361) or “L29-20” and “L29-21” terminals (for DTC B1365) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820097- *Is resistance 2.82 Ω or less?*	Substitute a known-good SDM and recheck.	DTC B1361: Repair high resistance or open in “RED/BLU” or “YEL/BLK” wire circuit. DTC B1365: Repair high resistance or open in “BLU/RED” or “BLU/YEL” wire circuit.

NOTE:

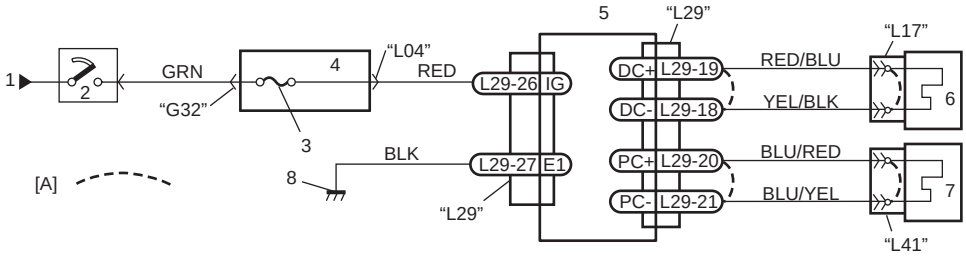
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1362 / B1366: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance Low

S4RS0A8204084

Wiring Diagram



I4RS0A820095-

[A]: Shorting bar	3. “A/BAG” fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

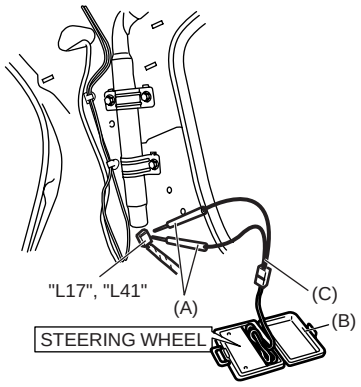
DTC Will Set when

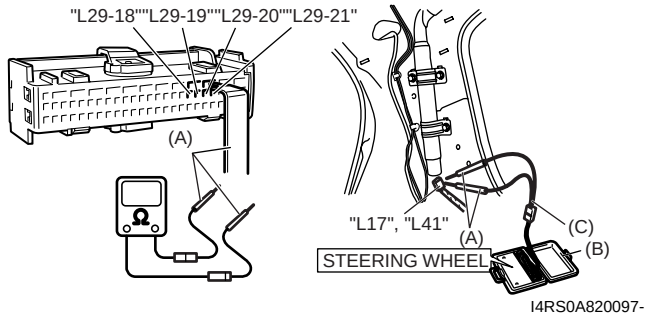
The combined resistance of the side curtain-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is below a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side curtain-air bag (inflator) module at terminals in “L17” or “L41” connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820096- 4) Check SDM DTC. *With ignition switch ON, is DTC B1362 or B1366 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to “Side Curtain-Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Check proper connection to SDM at terminals "L29-18" and "L29-19" or "L29-20" and "L29-21". 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between "L29-18" and "L29-19" terminals (for DTC B1362) or "L29-20" and "L29-21" terminals (for DTC B1366) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820097- *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	DTC B1362: Repair short from "RED/BLU" wire circuit to "YEL/BLK" wire circuit or from "RED/BLU" or "YEL/BLK" wire circuit to other wire circuit. DTC B1366: Repair short from "BLU/RED" wire circuit to "BLU/YEL" wire circuit or from "BLU/RED" or "BLU/YEL" wire circuit to other wire circuit.

NOTE:

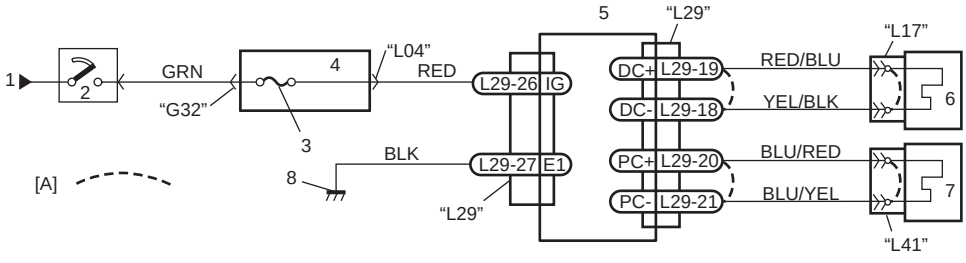
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1363 / B1367: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Ground

S4RS0A8204085

Wiring Diagram



I4RS0A820095-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

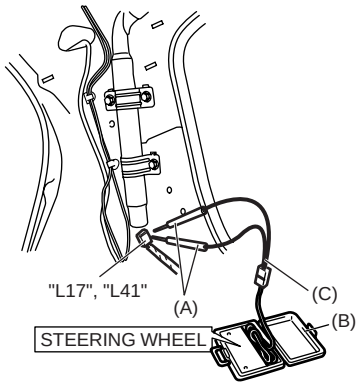
DTC Will Set when

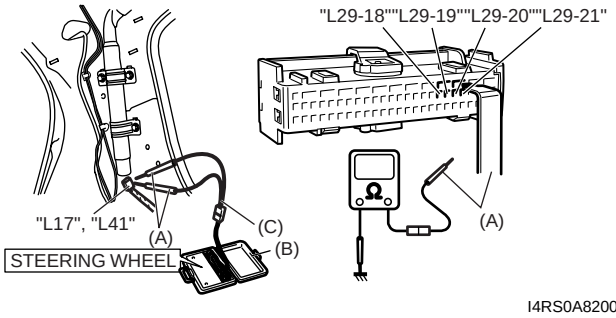
The voltage measured at side curtain-air bag (driver or passenger) initiator circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side-air bag (inflator) module at terminals in “L17” or “L41” connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820096- 4) Check SDM DTC. *With ignition switch ON, is DTC B1363 or B1367 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to “Side Curtain-Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between "L29-18" and body ground, and between "L29-19" and body ground (for DTC B1363) or "L29-20" and body ground, and between "L29-21" and body ground (for DTC B1367) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820098- *Is resistance infinity?*	Substitute a known-good SDM and recheck.	DTC B1363: Repair short from "RED/BLU" or "YEL/BLK" wire circuit to ground. DTC B1367: Repair short from "BLU/RED" or "BLU/YEL" wire circuit to ground.

NOTE:

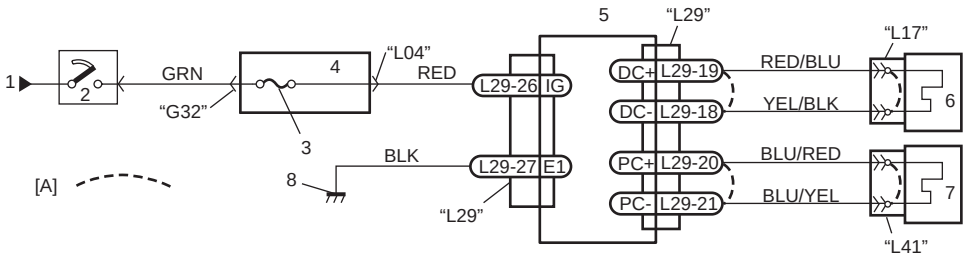
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1364 / B1368: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Power Circuit

S4RS0A8204086

Wiring Diagram



I4RS0A820095-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

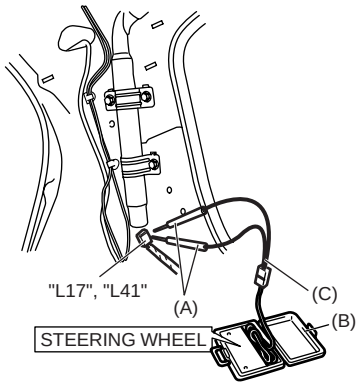
DTC Will Set when

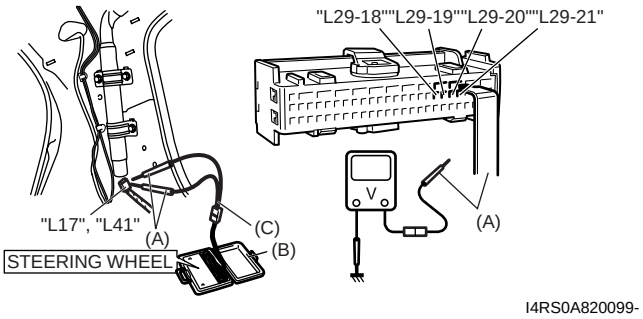
The voltage measured at side curtain-air bag (driver or passenger) initiator circuit is above a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side curtain-air bag (inflator) module at terminals in “L17” or “L41” connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820096- 4) Check SDM DTC. *With ignition switch ON, is DTC B1364 or B1368 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to “Side Curtain-Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage between "L29-18" and body ground, and between "L29-19" and ground (for DTC B1364) or "L29-20" and body ground, and between "L29-21" and body ground (for DTC B1368) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820099- *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	DTC B1064: Repair short from "RED/BLU" or "YEL/BLK" wire circuit to power circuit. DTC B1068: Repair short from "BLU/RED" or "BLU/YEL" wire circuit to power circuit.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

Inspection of Intermittent and Poor Connections

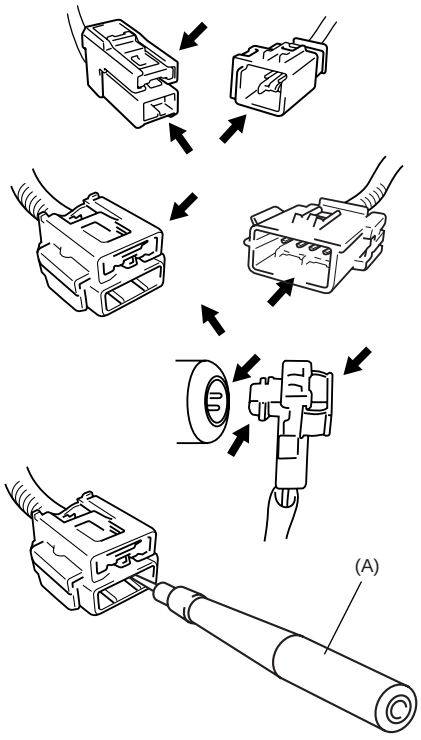
S4RS0A8204032

Most intermittents are caused by faulty electrical connections or wiring. When a check for proper connection is requested in a diagnostic flow, perform careful check of suspect circuits.
If any abnormality is found, repair or replace as a wire harness assembly.

- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.
  However, cleaning the terminal with a sand paper or the like is prohibited.
- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals.

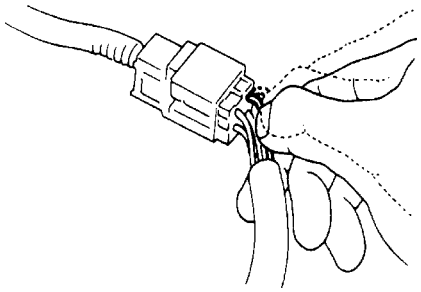
Check each connector terminal in problem circuits carefully to ensure good contact tension by using the corresponding mating terminal included in the connector test adapter kit (special tool).
If contact tension is not enough, reform the terminal to increase contact tension or replace it.

Special tool
(A): 09932-76010 (Connector test adapter kit)



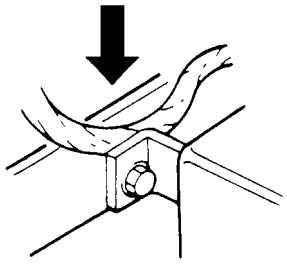
I4RS0A820045-

- Poor terminal-to-wire connection.
  Check each wire harness in problem circuits for poor connection by shaking it by hand lightly. If any abnormal condition is found, change the wire harness assembly or component parts with new ones.



IYSQ01010028-

- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wire broken inside the insulation. This condition could cause a continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are intact, resistance could be far too high.



IYSQ01820025-

Repair and Inspection Required after Accident

S4RS0A8204033

CAUTION:

- **All air bag system components, including the electrical harness (component mounting points), must be inspected after an accident. If any components are damaged or bent, they must be replaced even if air bag system activation did not occur.**
- **Never use air bag system parts from another vehicle.**
- **Do not attempt to service the parts below. Service of these parts is by replacement only.**
  - **Driver / Passenger air bag (inflator) modules**
  - **Driver / Passenger side-air bag (inflator) modules**
  - **Driver / Passenger side curtain-air bag (inflator) modules**
  - **Driver / Passenger seat belt pretensioners**
  - **Forward-sensor**
  - **Driver / Passenger side-sensors**
  - **SDM**
  - **Contact coil and combination switch assembly**
  - **Air bag wire harness in main harness, instrument panel harness and floor harness.**
- **Proper operation of the sensors and air bag system requires that any repairs to the vehicle structure return it to its original production configuration.**

CAUTION:

After detecting one time of such collision as to meet deployment conditions, the SDM must not be used.
Refer to "Air Bag Diagnostic System Check: " when checking the SDM.

Accident with Deployment / Activation – Component Replacement

When driver and passenger air bags are deployed, the following components must be replaced.

- Driver and passenger air bag (inflator) modules
- Driver and passenger seat belt pretensioners
- SDM after detecting such collision as to meet deployment conditions
- Forward-sensor
- Instrument panel

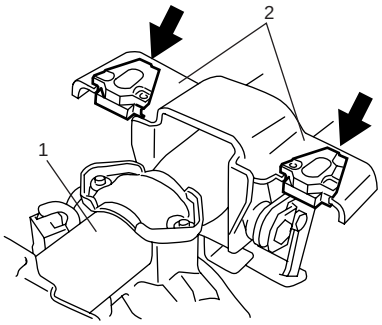
When side-air bag and side curtain-air bag are deployed, the following components must be replaced.

- Deployed side-air bag (inflator) module
- Deployed side curtain-air bag (inflator) module
- Side-sensor
- SDM

Accident with or without Deployment / Activation – Component Inspections

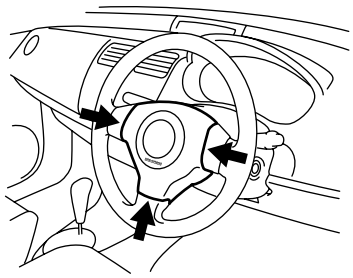
Certain air bag and restraint system components must be inspected after any crash, whether the air bag system activated or not. If any faulty condition is found in the following checks, replace faulty part.
Those components are:

- Steering column (1) and shaft joints
  - Check for length, damage and bend according to "Checking Steering Column for Accident Damage: in Section 6B".
- Steering column bracket (2) and capsules
  - Check for damage and bent.



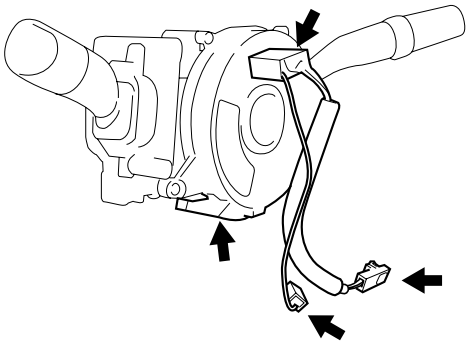
I4RS0A820046-

- Steering wheel and driver air bag (inflator) module
  - Check for damage or air bag (inflator) module fitness.
  - Check trim cover (pad surface) for cracks.
  - Check wire harness and connector for damage or tightness.



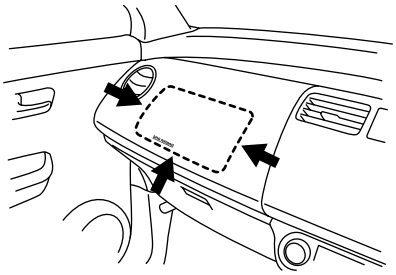
I4RS0A820047-

- Contact coil and combination switch assembly
  - Check wire harness and connectors for damage or tightness.
  - Check contact coil case for damage.



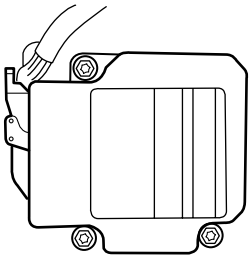
I4RS0A820048-

- Instrument panel member and reinforcement
  - Check for any distortion, bending, cracking or other damage.
  - Check instrument panel for cracks or deformities.
- Passenger air bag (inflator) module
  - Check for dents, cracks, damage or fitness.
  - Check harness and connector for damage or tightness.



I4RS0A820049-

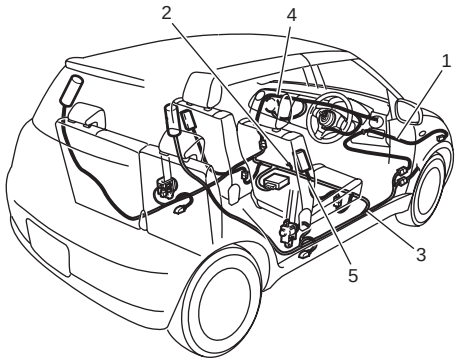
- SDM
  - Check for external damage such as deformation, scratch, crack, peeled paint, etc.
  - Check SDM for a cause in itself preventing its proper installation. (There is a gap between SDM and SDM plate, or it cannot be fixed securely.)
  - Check connector or lead wire of SDM for scorching, melting or damage.
  - Check SDM connector and terminals for tightness.
  - Check if SDM sets a DTC and is judged as malfunctioning according to the diagnostic flow.



I5RH01820092-

- Air bag wire harness and connections
  - Check for damages, deformities or poor connections.
    Refer to "Inspection of Intermittent and Poor Connections: ".

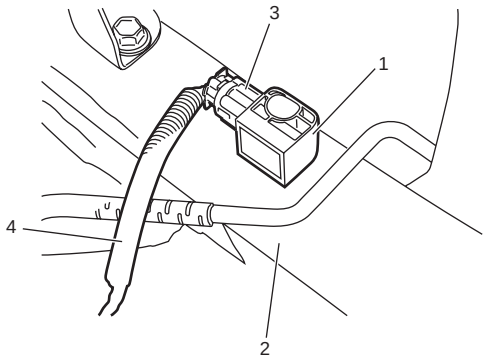
– Check wire harness clamps for tightness.
– For air bag harness including in instrument panel harness replacement, refer to “Passenger Air Bag (Inflator) Module Repair Harness Installation: ”.



I4RS0A820004-

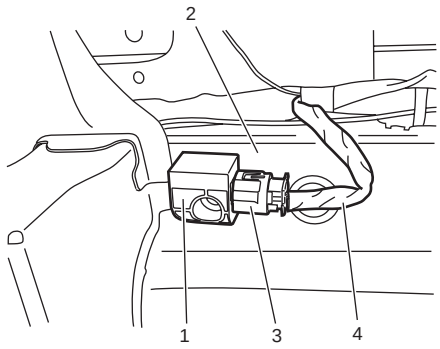
1. Main harness	4. Instrument panel harness
2. Grounding point	5. Seat harness
3. Floor harness	

- Forward-sensor
  – Check sensor (1) and front panel (2) for damage, bend or rust.
  – Check connector (3) or lead wire (4) of forward-sensor for scorching, melting or damage.



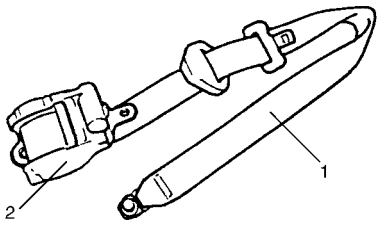
I4RS0A820050-

- Side-sensor
  – Check sensor (1) and under body (2) for dents, cracks, deformation or rust.
  – Check sensor connector (sensor side and harness side) (3) or sensor lead wire (4) for damage, crack, scorching or melting.



I4RS0A820051-

- Seat belt pretensioner
  – Check for dents, cracks, damage or fitness
  – Check harness and connector for damage or tightness.



I3JA01820043-

1. Seat belt	
2. Retractor assembly	

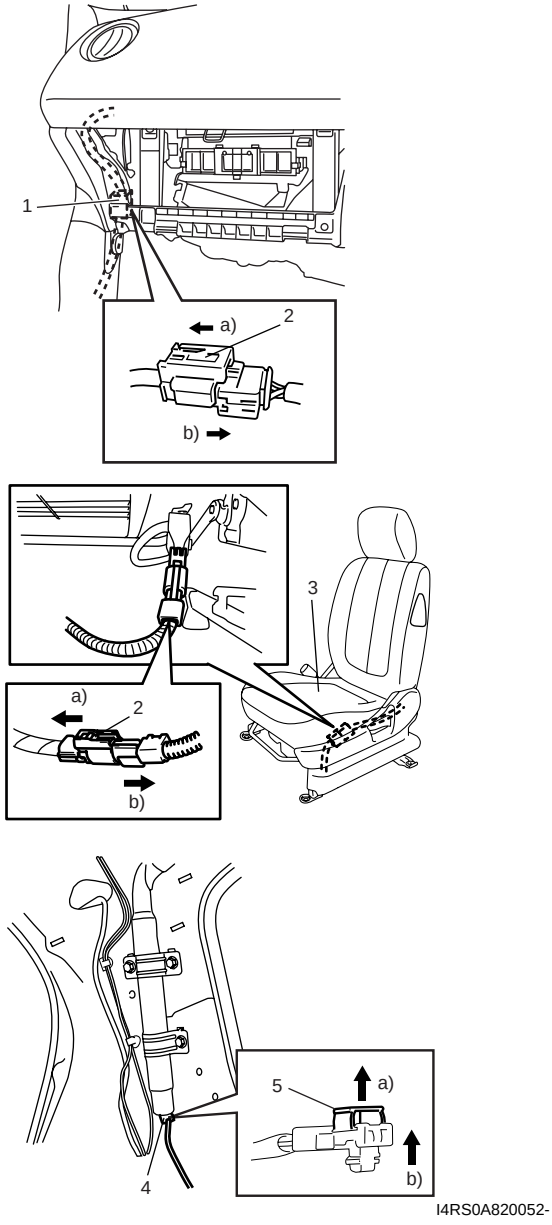
- Seat belts and mounting points
  – Refer to “Front Seat Belt Components: in Section 8A”.
- “AIR BAG” warning lamp
  – After vehicle is completely repaired, perform “Air Bag Diagnostic System Check: ”.
- Side-air bag (inflator) module
  – Check for dents, cracks, damage or fitness.
  – Check trim cover for cracks or deformities.
  – Check wire harness and connector for damage or tightness.
- Side curtain-air bag (inflator) module
  – Check for dents, cracks, damage or fitness.
  – Check harness wire harness and connector for damage or tightness.
  – Check headlining for cracks or deformation.

Repair Instructions

Disabling Air Bag System

S4RS0A8206001

1) Turn steering wheel so that vehicle's wheels (front tires) are pointing straight ahead.
2) Disconnect negative (–) cable at battery.
3) Turn ignition switch to "LOCK" position and remove key.
4) Remove "A/BAG" fuse from fuse box.
5) Pull out glove box while pushing its stopper from both right and left sides and disconnect yellow connector (1) for driver and passenger air bags as follows.
   a) Release locking of lock slider (2).
   b) After unlocked, disconnect connector.
6) If equipped with side-air bag (inflator) module, disconnect yellow connector of side-air bag (inflator) module under front seat cushion (3).
   a) Release locking of lock slider.
   b) After unlocked, disconnect connector.
7) If equipped with side curtain-air bag (inflator) module, remove quarter inner trim and disconnect black connector (4) of side curtain-air bag (inflator) module.
   a) Unlock button (5).
   b) With lock button unlocked, disconnect connector.



I4RS0A820052-

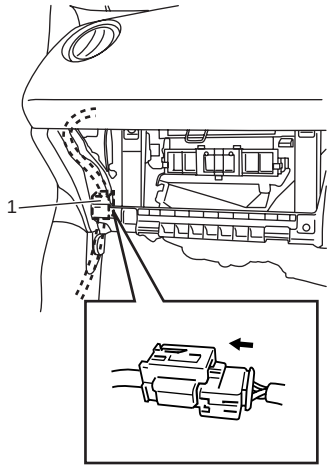
NOTE:

With "A/BAG" fuse removed and ignition switch ON, "AIR BAG" warning lamp will be ON.
This is normal operation and does not indicate air bag system malfunction.

Enabling Air Bag System

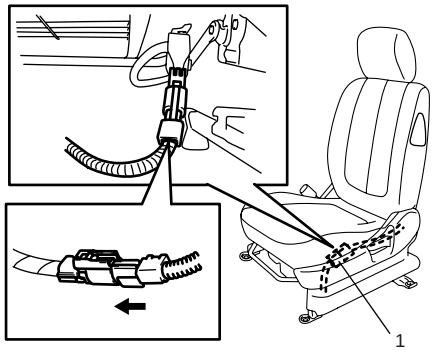
S4RS0A8206002

1) Confirm that battery negative (–) cable is disconnected.
2) Turn ignition switch to "LOCK" position and remove key.
3) Connect yellow connector (1) of passenger air bag (inflator) module by pushing connector till click is heard from it.



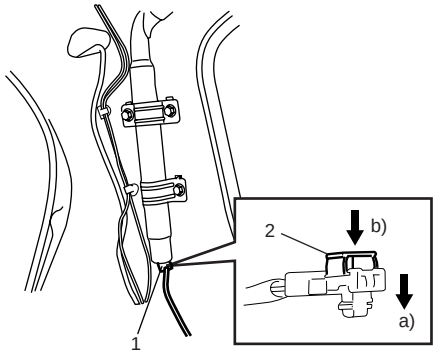
I4RS0A820053-

4) Install glove box.
5) If equipped with side-air bag (inflator) module, connect yellow connector (1) of side-air bag (inflator) module by pushing connector till click is heard from it.



I4RS0A820054-

6) If equipped with side curtain-air bag (inflator) module, connect black connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820055-

7) Install “A/BAG” fuse to fuse box.
8) Connect negative (–) cable at battery.
9) Turn ignition switch to ON position and verify that “AIR BAG” warning lamp flashes 6 times and then turns OFF. If it does not operate as described, perform “Air Bag Diagnostic System Check: ”.

SDM Removal and Installation

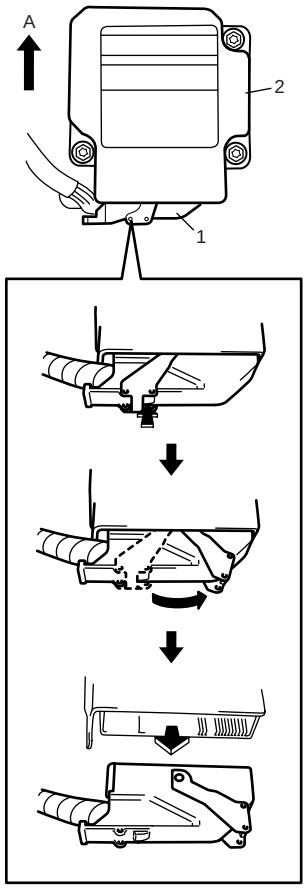
S4RS0A8206003

WARNING:

During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).
Be sure to read “Precautions on Service and Diagnosis of Air Bag System: ” before starting to work and observe every precaution during work. Neglecting them may result in personal injury or inactivation of the air bag system when necessary.

Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System: ”.
3) Remove center console box referring to “Console Box Components: in Section 9H”.
4) Disconnect SDM connector (1) from SDM (2).
5) Remove SDM (2) from vehicle.



I4RS0A820056-

A: Forward

Installation

1) Check that none of the following faulty conditions exists.
   - Bend, scratch, deformity in vehicle body where SDM is mounted.
   - Foreign matter or rust on mating surface of vehicle body where SDM is mounted.
2) Install SDM (2) to vehicle.

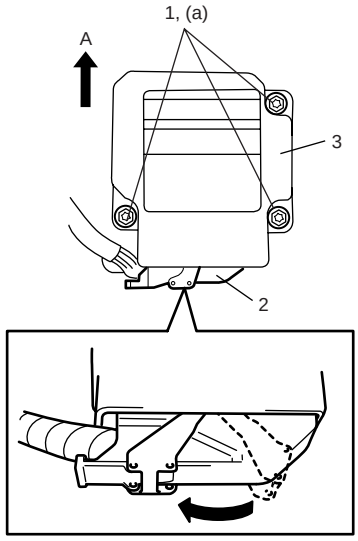
CAUTION:

Ensure that arrow on the SDM is pointing toward the front of the vehicle.

3) Tighten SDM bolts (1) to specified torque.

Tightening torque
SDM bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

4) Connect SDM connector (2) to SDM (3) securely.



I4RS0A820107-

A: Forward

5) Install center console box upper cover.
6) Enable air bag system referring to “Enabling Air Bag System: ”.
7) Connect negative cable at battery.

SDM Inspection

S4RS0A8206004

WARNING:

During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).
Be sure to read “Precautions on Service and Diagnosis of Air Bag System: ” before starting to work and observe every precaution during work. Neglecting them may result in personal injury or inactivation of the air bag system when necessary.

CAUTION:

- **Do not connect a tester whatever type it may be.**
- **Never repair or disassemble SDM.**
- **If SDM has been dropped, it should be replaced.**

If any faulty condition is found in the following checks, replace.

- Check SDM and SDM plate for dents, cracks or deformation.
- Check SDM connector for damage, cracks or lock mechanism.
- Check SDM terminal for bend, corrosion or rust.

Driver Air Bag (Inflator) Module Removal and Installation

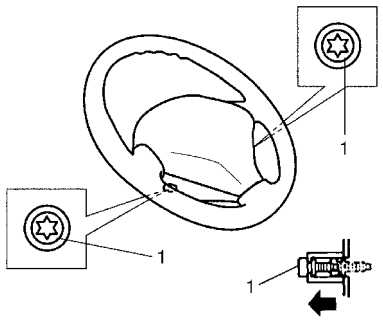
S4RS0A8206005

WARNING:

When handling an air bag (inflator) module, be sure to read “Precautions on Handling and Storage of Air Bag System Components: ” and observe each instruction. Failure to follow them could cause a damage to the air bag (inflator) module or result in personal injury.

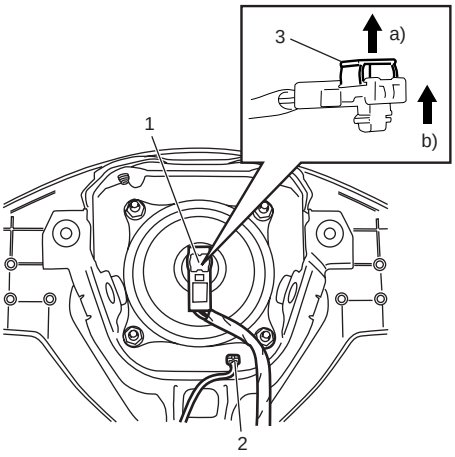
Removal

1) Disconnect negative cable at battery.
2) Disable air bag system. Refer to “Disabling Air Bag System: ”.
3) Loosen driver air bag (inflator) module mounting bolts (1) till it turns freely, pull them out and fix them to bolt clamps.



I3JA01820031-

4) Remove air bag (inflator) module from steering wheel.
5) Disconnect driver air bag (inflator) module connector (1) of driver air bag (inflator) module and horn connector (2) as shown in figure.
   a) Unlock lock button (3).
   b) With lock button unlocked, disconnect connector.



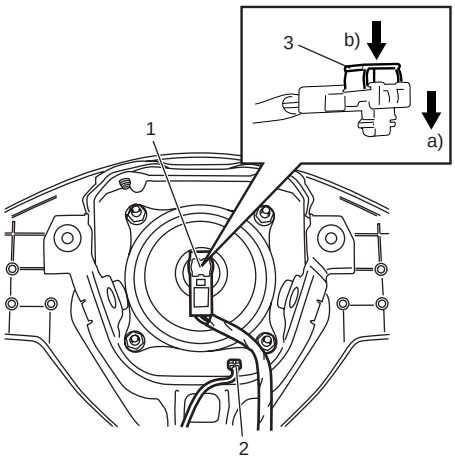
I4RS0A820057-

WARNING:

Special care is necessary when handling and storing a live (undeployed) air bag (inflator) module. Observe "Precautions on Handling and Storage of Air Bag System Components: ". Otherwise, personal injury may result.

Installation

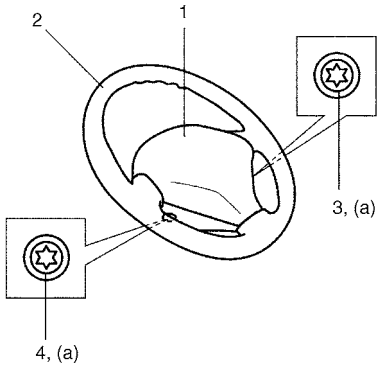
1) Connect horn connector (1) securely.
2) Connect driver air bag (inflator) module connector (2) to driver air bag (inflator) module (3) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button.



I4RS0A820058-

3) Install driver air bag (inflator) module (1) to steering wheel (2), taking care so that no part of wire harness is caught between them.
4) Make sure that clearance between module (1) and steering wheel (2) is uniform all the way.
5) Tighten driver air bag (inflator) module mounting bolt (left side) (3) to specified torque first and then driver air bag (inflator) module mounting bolt (right side) (4) to specified torque.

Tightening torque
Driver air bag (inflator) module mounting bolt
(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



I5RH01820103-

6) Enable air bag system. Refer to "Enabling Air Bag System: ".
7) Connect negative cable at battery.

Driver Air Bag (Inflator) Module Inspection

S4RS0A8206006

WARNING:

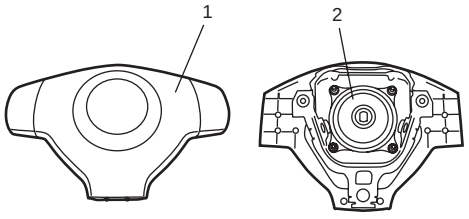
Never disassemble air bag (inflator) module or measure its resistance. Otherwise, personal injury may result.

CAUTION:

If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module visually and if any of the following is found, replace it with a new one.

- Air bag being deployed
- Trim cover (pad surface) (1) being cracked
- Inflator case (2) being damaged or having been exposed to strong impact (dropped)
- Bend or deformity of air bag (inflator) module bracket.



I4RS0A820059-

Passenger Air Bag (Inflator) Module Removal and Installation

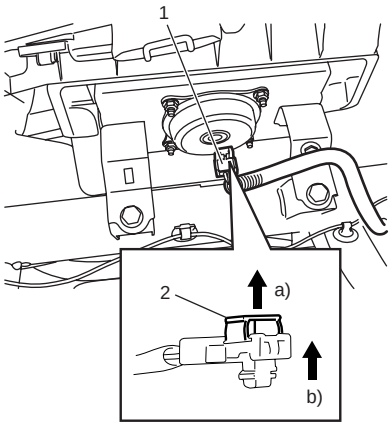
S4RS0A8206007

WARNING:

- **Never attempt to disassemble or repair the passenger air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: ", "Precautions on Handling and Storage of Air Bag System Components: " and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

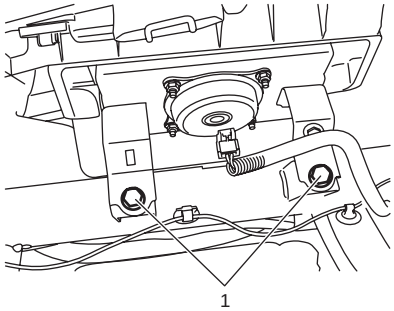
Removal

1) Disable air bag system. Refer to "Disabling Air Bag System: ".
2) Disconnect passenger air bag (inflator) module connector (1) as shown in figure.
   a) Unlock lock button (2).
   b) With lock button unlocked, disconnect connector.



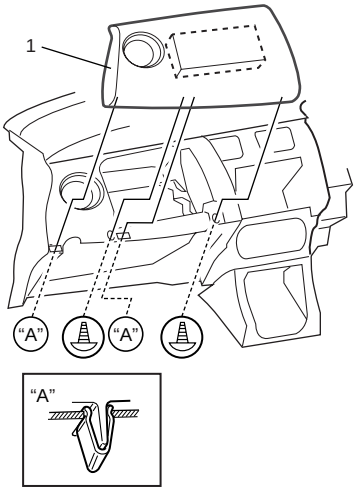
I4RS0A820060-

3) Remove passenger air bag (inflator) module attaching bolts (1).



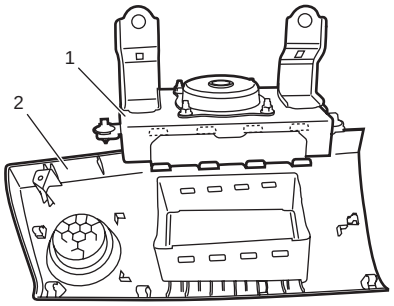
I4RS0A820061-

4) Remove passenger air bag (inflator) module with air bag hole cover (1) from instrument panel as shown.



I4RS0A820062-

5) Remove passenger air bag (inflator) module (1) from air bag hole cover (2).



I4RS0A820063-

WARNING:

- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you.**
  Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.
- **As the live passenger air bag (inflator) module must be kept with its bag (trim cover) facing up while being stored or left standing, place it on the workbench with a slit facing down or use the workbench vise to hold it securely at its lower mounting bracket. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Precautions on Handling and Storage of Air Bag System Components: " for handling and storing it.**

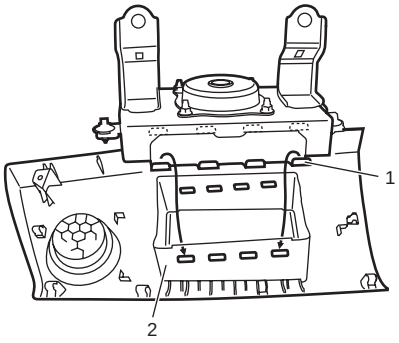
Otherwise, personal injury may result.

Installation

1) Install passenger air bag (inflator) module to air bag hole cover (2).

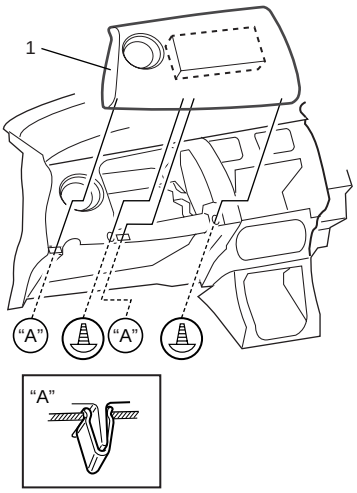
CAUTION:

Confirm claw (1) of passenger air bag (inflator) module hangs in air bag hole cover (2).



I4RS0A820064-

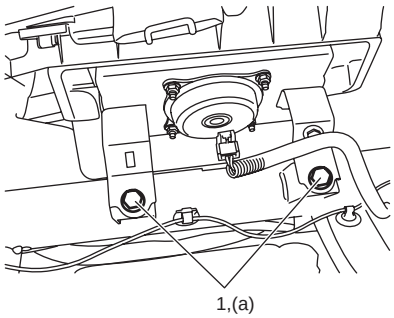
2) Install passenger air bag (inflator) module with air bag hole cover (1) to instrument panel as shown.



I4RS0A820062-

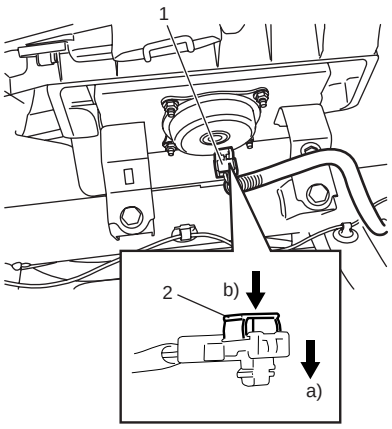
3) Tighten passenger air bag (inflator) module attaching bolts (1) to specified torque.

Tightening torque
Passenger air bag (inflator) module attaching bolt (a): 23 N·m (2.3 kg-m, 16.5 lb-ft)



I4RS0A820065-

4) Connect passenger air bag (inflator) module connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820066-

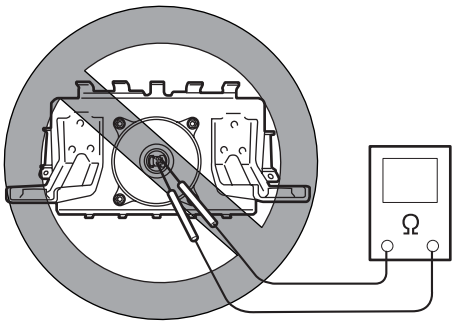
5) Enable air bag system. Refer to "Enabling Air Bag System: ".

Passenger Air Bag (Inflator) Module Inspection

S4RS0A8206008

WARNING:

- **Never measure resistance of passenger air bag (inflator) module or disassemble it. Otherwise personal injury may result.**
- **Never attempt to disassemble or repair the passenger air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: ", "Precautions on Handling and Storage of Air Bag System Components: " and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



I3RH0A820071-

CAUTION:

If air bag (Inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for the following symptoms and if any one of them is found, replace with a new one.

- Air bag has deployed.
- Wire harness or connector is damaged.
- Air bag (inflator) module is damaged or a strong impact was applied to it.
- Bend or deformity of air bag (inflator) module bracket.

Side-Air Bag (Inflator) Module Removal and Installation

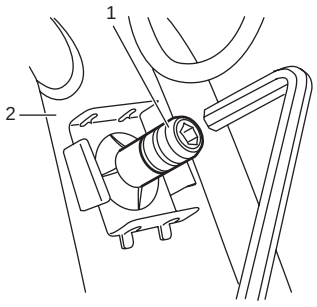
S4RS0A8206021

WARNING:

- **Never attempt to disassemble or repair the side-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: ", "Precautions on Handling and Storage of Air Bag System Components: " and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

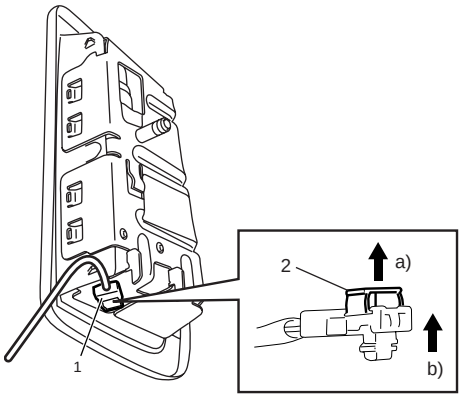
Removal

1) Disable air bag system. Refer to "Disabling Air Bag System: ".
2) Roll up the seat surface of the seat back.
3) Remove sleeve lock nut (1) from seat back (2).



I4RS0A820067-

4) Remove side-air bag (inflator) module from seat back.
5) Disconnect side-air bag (inflator) module connector (1) as shown in figure.
   a) Unlock lock button (2).
   b) With lock button unlocked, disconnect connector.



I4RS0A820068-

WARNING:

- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you.**
  Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.
- **As the live side-air bag (inflator) module must be kept with its bag (trim cover) facing up while being stored or left standing. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Precautions on Handling and Storage of Air Bag System Components: " for handling and storing it.**

Otherwise, personal injury may result.

CAUTION:

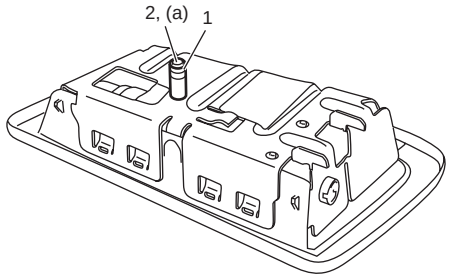
Do not damage the sleeve. Otherwise, the side-air bag cannot be correctly installed to seat back.

Installation

1) Confirm sleeve (1) is surely installed in side-air bag (inflator) module.
2) Tighten sleeve lock nut (2) to specified torque.

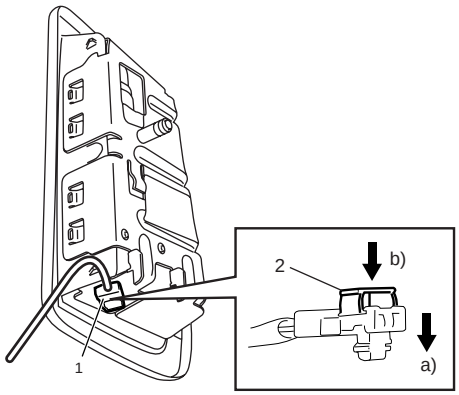
   Tightening torque
   Sleeve lock nut (a): 2.5 N·m (0.25 kg-m, 2.0 lb-ft)

3) Install new clip to seat back.



I4RS0A820073-

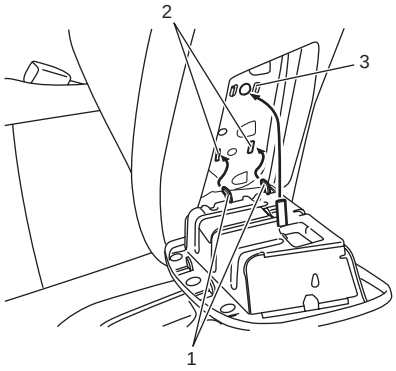
4) Connect side-air bag (inflator) module connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820070-

5) Insert claw (1) of side-air bag (inflator) module on installation hole (2).
6) Push side-air bag (inflator) module into clip (3) with specified force.

   Side-air bag (inflator) module installation force
   Pushing force: 180 N



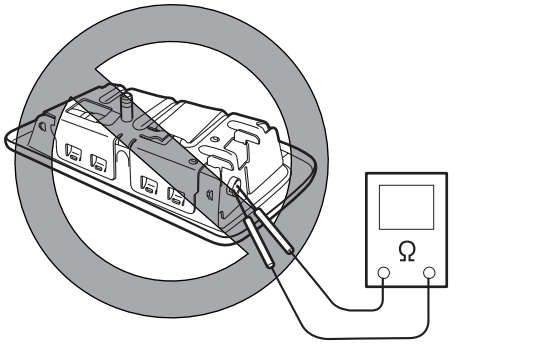
I4RS0A820074-

Side-Air Bag (Inflator) Inspection

S4RS0A8206022

WARNING:

- **Never attempt to disassemble or repair the side-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



I4RS0A820075-

CAUTION:

If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for the following symptoms and if any one of them is found, replace with a new one.

- Air bag has deployed.
- There is a crack in trim cover (pad surface).
- Wire harness or connector is damaged.
- Air bag (inflator) module is damaged or a strong impact was applied to it.
- Bend or deformity of air bag (inflator) module bracket.

Side Curtain-Air Bag (Inflator) Module Removal and Installation

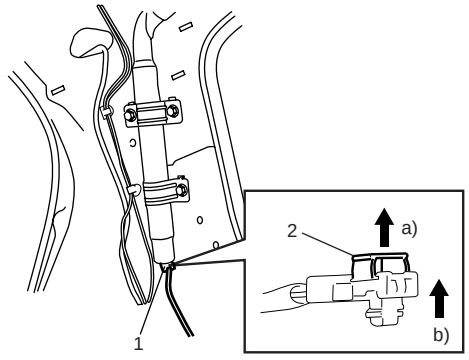
S4RS0A8206025

WARNING:

- **Never attempt to disassemble or repair the side curtain-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: ", "Precautions on Handling and Storage of Air Bag System Components: " and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

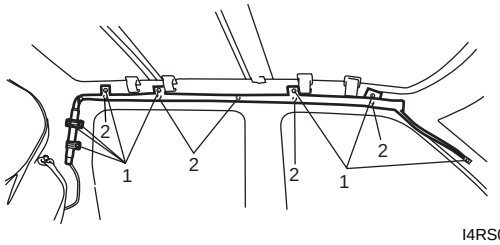
Removal

1) Disable air bag system. Refer to "Disabling Air Bag System: ".
2) Remove head lining referring to "Head Lining Removal and Installation: in Section 9H".
3) Disconnect side curtain-air bag (inflator) module connector (1) as shown in figure.
   a) Unlock lock button (2).
   b) With lock button unlocked, disconnect connector.



I4RS0A820077-

4) Remove side curtain-air bag (inflator) module fixing bolts (1) and clips (2).



I4RS0A820076-

5) Remove side curtain-air bag (inflator) module.

WARNING:

- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you.**
  Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.
- **As the live curtain air bag (inflator) module must be kept with its bag facing up while being stored or left standing. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Precautions on Handling and Storage of Air Bag System Components: " for handling and storing it.**

Otherwise, personal injury may result.

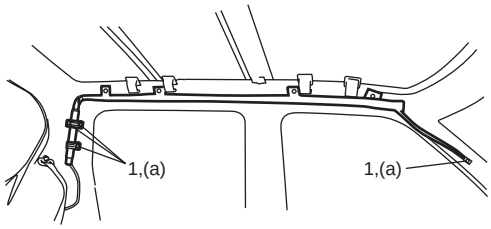
Installation

WARNING:

Do not install side curtain-air bag (inflator) module while twisted or bended. Otherwise, side curtain-air bag (inflator) module may not deploy and injury may result.

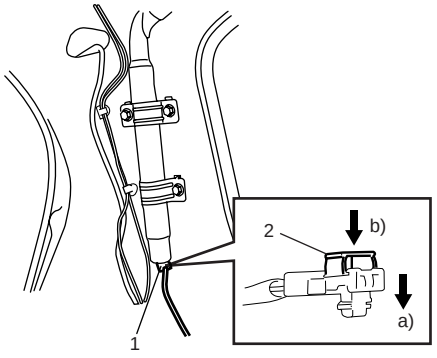
1) Install side curtain-air bag (inflator) module (1) with clips and new bolts.
2) Tighten side curtain-air bag (inflator) module attaching bolts (1) to specified torque.

Tightening torque
Side curtain-air bag (inflator) module attaching bolts (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A820110-

3) Connect side curtain-air bag (inflator) module connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820055-

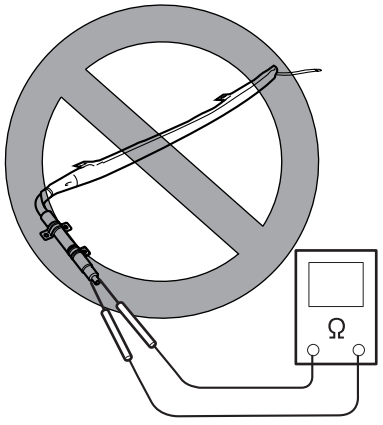
4) Install head lining referring to “Head Lining Removal and Installation: in Section 9H”.
5) Enable air bag system. Refer to “Enabling Air Bag System: ”.

Side Curtain-Air Bag (Inflator) Module Inspection

S4RS0A8206026

WARNING:

- **Never measure resistance of side curtain-air bag (inflator) module or disassemble it. Otherwise personal injury may result.**
- **Never attempt to disassemble or repair the side curtain-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read “Precautions on Service and Diagnosis of Air Bag System: ”, “Precautions on Handling and Storage of Air Bag System Components: ” and “Precautions on Disposal of Air Bag and Seat Belt Pretensioner: ” before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



I4RS0A820078-

CAUTION:

If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for the following symptoms and if any one of them is found, replace with a new one.

- Air bag has deployed.
- Inflator case being damaged or having been exposed to strong impact (dropped).

Forward-Sensor Removal and Installation

S4RS0A8206009

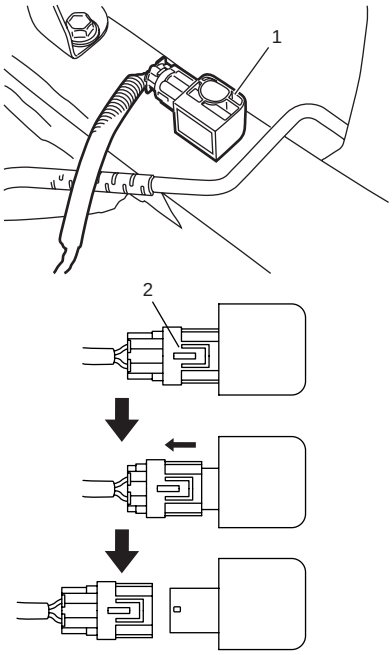
WARNING:

During service procedures, be very careful when handling a sensor.

- **Never strike or jar a sensor.**
- **A sensor and mounting bracket bolts must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

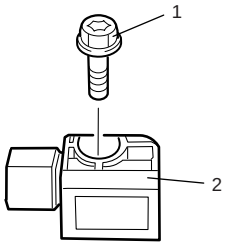
Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System: ”.
3) Disconnect forward-sensor connector sliding connector outer (2) as shown.



I4RS0A820079-

4) Remove forward-sensor bolt (1) and forward-sensor (2).



I5RH01820119-

Installation

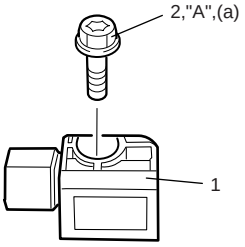
CAUTION:

Proper operation of forward-sensor requires sensor be rigidly attached to vehicle structure and that the arrow on sensor be pointing toward the front of the vehicle.

1) Check that none of the following faulty conditions exists.
   - Bend, deformity or rust of front panel.
   - Foreign matter on mating surface of sensor.
2) Apply thread lock cement to mounting bolts thread. Install forward-sensor (1) on front panel and tighten mounting bolt (2) to specified torque.

   "A": Thread lock cement 99000–32100

   Tightening torque
   Forward-sensor mounting bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



I5RH01820120-

3) Connect forward-sensor connector by pushing connector till click is heard from it.
4) Connect negative cable at battery.
5) Enable air bag system referring to "Enabling Air Bag System: ".

Forward-Sensor Inspection

S4RS0A8206010

WARNING:

During service procedures, be very careful when handling a sensor.
- **Never strike or jar a sensor.**
- **A sensor and mounting bracket bolts must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

CAUTION:

- **Never disassemble forward-sensor.**
- **Sensor should be replaced when it was dropped from a height of 90 cm (3 ft) or more.**

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust.

Side-Sensor Removal and Installation

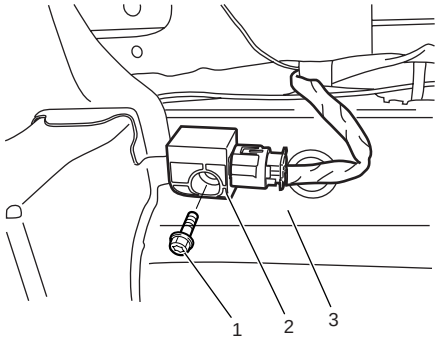
S4RS0A8206023

WARNING:

During service procedures, be very careful when handling a sensor.
- **Never strike or jar a sensor.**
- **A sensor bolt must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

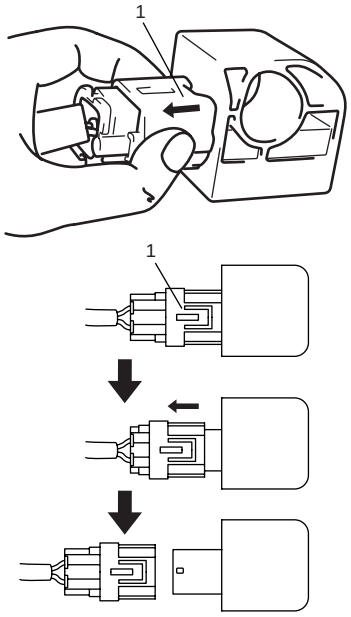
Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system. Refer to "Disabling Air Bag System: ".
3) Remove center pillar lower trim and side sill scuff.
4) Turn up floor carpet at front seat side.
5) Remove side-sensor bolt (1), and side-sensor (2) from under body (3).



I4RS0A820080-

6) Disconnect side-sensor connector sliding connector outer (1) as shown.



I4RS0A820109-

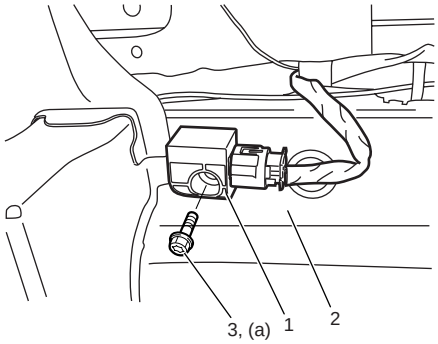
Installation

CAUTION:

Proper operation of side-sensor requires sensor be rigidly attached to specified position.

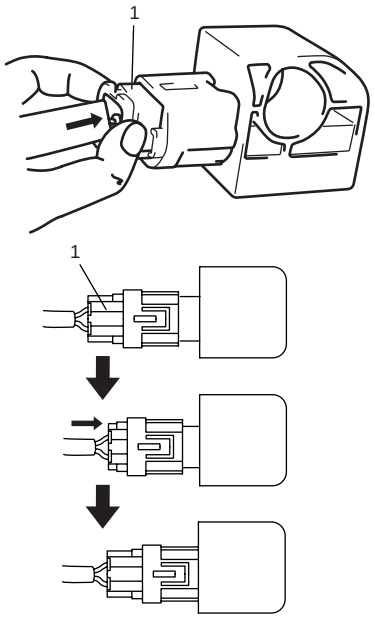
1) Check that none of following faulty conditions exists.
   - Bend, deformity or rust of under body.
   - Foreign matter on mating surface of sensor.
2) Install side-sensor (1) on under body (2) and tighten side-sensor bolt (3) to specified torque.

Tightening torque
Side-sensor bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



I4RS0A820081-

3) Connect side-sensor connector pushing connector inner (1) as shown.



I4RS0A820106-

4) Connect negative cable at battery.
5) Enable air bag system. Refer to “Enabling Air Bag System: ”.

Side-Sensor Inspection

S4RS0A8206024

WARNING:

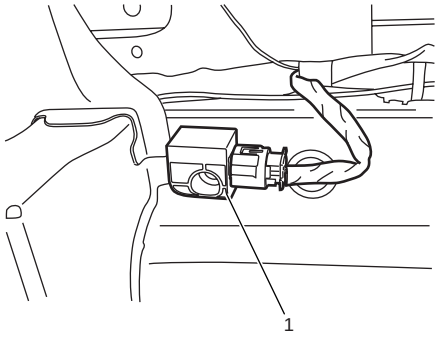
During service procedures, be very careful when handling a sensor.

- **Never strike or jar a sensor.**
- **A sensor and mounting bracket bolts must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

CAUTION:

- **Never disassemble side-sensor.**
- **Sensor should be replaced when it was dropped from a height of 90 cm (3 ft) or more.**

- Check sensor (1) for dents, crack, deformation.
- Check sensor connector (sensor side and harness side), lock mechanism or sensor lead wire for damage, crack, scorching or melting.
- Check connector terminals for bent, corrosion or rust. If any faulty condition is found in above checks, replace.

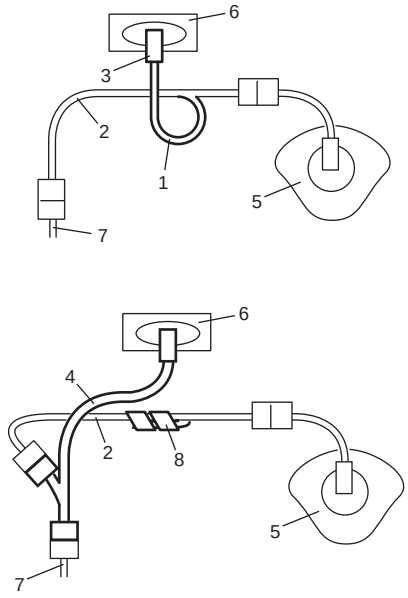


I4RS0A820082-

Passenger Air Bag (Inflator) Module Repair Harness Installation

S4RS0A8206027

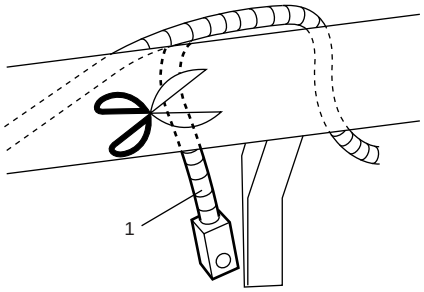
Replace passenger air bag (inflator) module repair harness (4) according to the following procedure when the harness (1) connected with passenger air bag (inflator) module of the air bag harness included in instrument panel harness (2) and passenger air bag (inflator) module connector (3) is damaged.



I4RS0A820103-

5. Driver air bag (inflator) module	7. Floor harness
6. Passenger air bag (inflator) module	8. Vinyl tape

1) Disable air bag system. Refer to “Disabling Air Bag System: ”.
2) Disconnect “L32” connector from floor harness located near the glove box.
3) Cut off passenger air bag (inflator) module harness (1) included in instrument panel harness (2) as shown, and then fasten it to instrument panel harness with vinyl tape for avoiding interference with other parts.



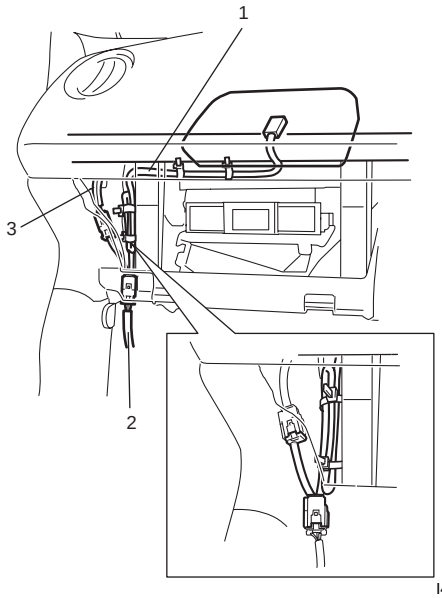
I4RS0A820083-

4) Install passenger air bag (inflator) module repair harness (1) to floor harness (2), instrument panel harness (3) and passenger air bag (inflator) module.

CAUTION:

To avoid interference with other parts, fasten the repair harness to instrument wire harness with a clamp or vinyl tape as shown in figure.

5) Connect each connector securely till click is heard.



I4RS0A820085-

Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal

S4RS0A8206013

WARNING:

Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which may cause personal injury. Do not dispose of live (undeployed) air bag (inflator) modules and seat belt pretensioners. Because undeployed air bag (inflator) module / inactivated seat belt pretensioner must not be disposed of through normal refuse channels. Undeployed air bag (inflator) module and inactivated seat belt pretensioner contain substances that can cause severe illness or personal injury if sealed container is damaged during disposal.

Air bag (inflator) module / seat belt pretensioner can be deployed / activated inside or outside of vehicle. Deployment / Activation method used depends upon final disposition of vehicle. Review the following instructions in order to determine which will work best in a given situation.

Deployment / Activation Outside of Vehicle: When you intend to return the vehicle to service, deploy the air bag (inflator) module(s) and/or activate seat belt pretensioner(s) outside of the vehicle.

Deployment / Activation Inside of Vehicle: When the vehicle will be destroyed, or salvaged for component parts, deploy the air bag module(s) and/or activate seat belt pretensioner(s) installed on vehicle.

WARNING:

The following precautions must be observed for this work. Failure to observe any of them may result in personal injury.

- **Procedure should be followed strictly as described here.**
- **Be sure to read “Precautions on Service and Diagnosis of Air Bag System: ” beforehand.**
- **To avoid accidental deployment / activation, this work should be performed by no more than one person.**
- **Since smoke is produced when air bag (inflator) module is deployed and pretensioner is activated, select well-ventilated area.**
- **Air bag (inflator) module and seat belt pretensioner will immediately deploy / activate when 12 volts vehicle battery is connected to it. Wear safety glasses throughout this entire deployment / activation and disposal procedure.**
- **Wear suitable ear protection when deploying air bag (inflator) module / activating seat belt pretensioner. Also, advise those who are in area close to deployment / activation site to wear suitable ear protection.**
- **Do not deploy / activate two or more air bag system components (air bag (inflator) modules and seat belt pretensioners) at the same time.**
- **Never connect deployment harness to any 12 volts vehicle battery before connecting deployment harness to air bag (inflator) module and seat belt pretensioner. Deployment harness shall remain shorted and not be connected to 12 volts vehicle battery till you are ready to deploy air bag (inflator) module or activate seat belt pretensioner.**

Deployment / Activation Outside of Vehicle
When you intend to return the vehicle to service, deploy the air bag (inflator) module(s) or activate seat belt pretensioner(s) outside of the vehicle.

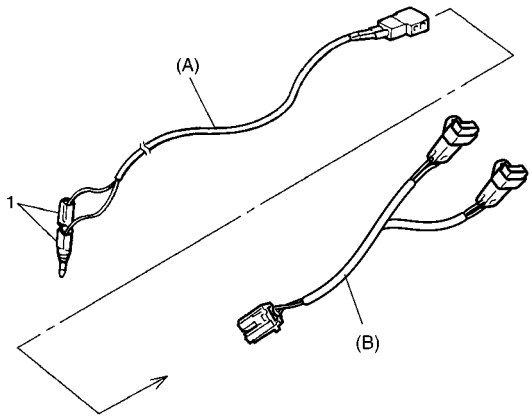
1) Turn ignition switch to LOCK position and remove key.
2) Wear safety glasses during this deployment / activation procedure.
3) Check that there is no open, short or damage in special tools (deployment harness (A) and adapter cable (B)). If any faulty is found, do not use it and be sure to use new special tool.

   Special tool
   (A): 09932-75031
   (B): 09932–76510

4) Short two deployment harness leads (1) together by fully seating one banana plug into the other.

   WARNING:

   Deployment harness (A) shall remain shorted and not be connected to 12 volts vehicle battery till you are ready to deploy air bag module or activate seat belt pretensioner.



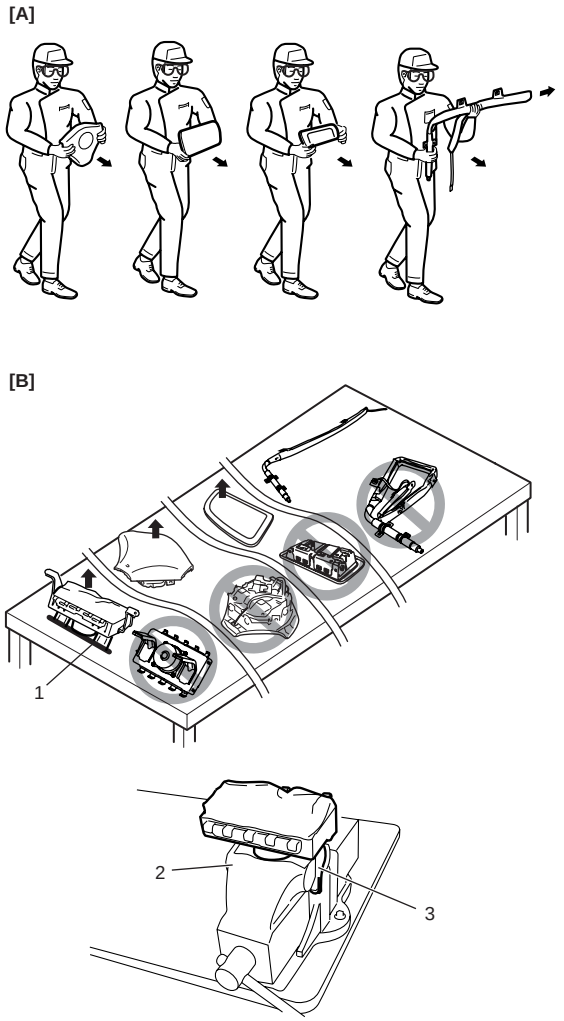
I4RS0A820084-

5) Remove air bag (inflator) module(s) or seat belt pretensioner(s) from vehicle referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”, “Passenger Air Bag (Inflator) Module Removal and Installation: ”or “Front Seat Belt Removal and Installation: in Section 8A”.

WARNING:

- **For handing and storage of live air bag (inflator) module, select place where ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Always carry live air bag (inflator) module with trim cover away from you.**
- **When storing live air bag (inflator) module or when leaving live air bag (inflator) module unattended on bench or other surface, always face trim cover up and away from surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit (1) or use the workbench vise (2) to hold it securely at its lower mounting bracket (3). It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules. This is necessary so that free space is provided to allow air bag (inflator) module to expand in the unlikely event of accidental deployment.**

Failure to follow procedures may result in personal injury.



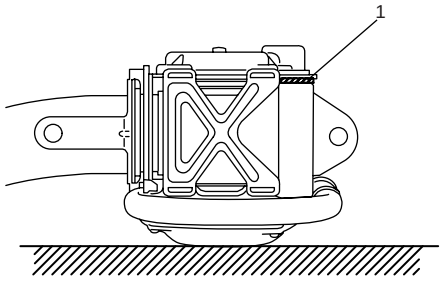
I4RS0A820086-

[A]:	Always carry air bag (inflator) module with trim cover (air bag opening) away from body.
[B]:	Always place air bag (inflator) module on workbench with trim cover (air bag opening) up, away from loose objects.
2.	Lower mounting bracket
3.	Workbench vise

WARNING:

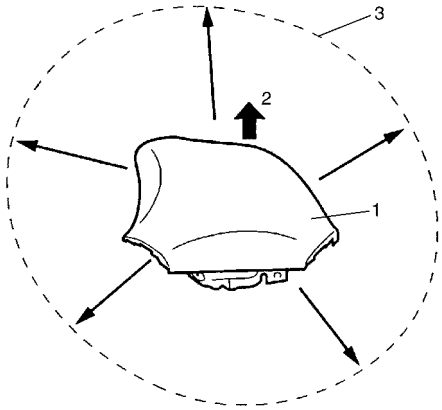
- **For handling and storage of seat belt pretensioner, select place where ambient temperature is below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Never carry seat belt pretensioner by webbing.**
- **When placing seat belt pretensioner on workbench or other surface, be sure to lay it with its exhaust hole (1) side facing up. It is also prohibited to put something on seat belt pretensioner.**

Otherwise, personal injury may result.



I4JA01822118-

6) Set air bag (inflator) module or seat belt pretensioner as follows.
   - For driver air bag (inflator) module
     a. Clear space (3) on ground about 185 cm (6 ft) in diameter where driver air bag (inflator) module (1) is set for deployment. Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where there is no activity and sufficient ventilation is provided. Ensure no loose or flammable object exists within deployment area.
     b. Place driver air bag (inflator) module (1) with its vinyl trim cover facing up (2) on ground in step a.



I3JA01820036-

   - For passenger air bag (inflator) module
     a. Clear space (3) on ground about 185 cm (6 ft) in diameter where passenger air bag (inflator) module (1) is set for deployment. Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where there is no activity and sufficient ventilation is provided. Ensure no loose or flammable object exists within deployment area.
     b. Place deployment fixture (A) on ground in step a.

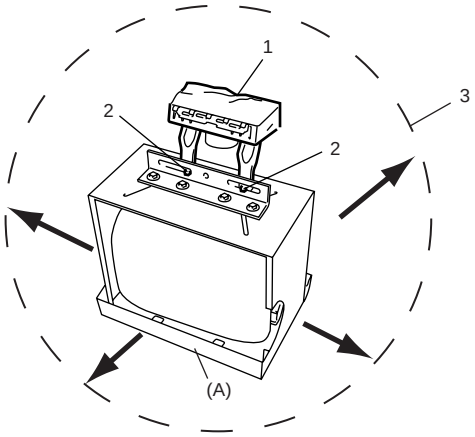
Special tool
(A): 09932-75041

c. Fill plastic reservoir in deployment fixture (A) with water or sand. This is necessary to provide sufficient stabilization of fixture during deployment.

d. Attach passenger air bag (inflator) module (1) in deployment fixture (A) securely using M8 bolt (2).

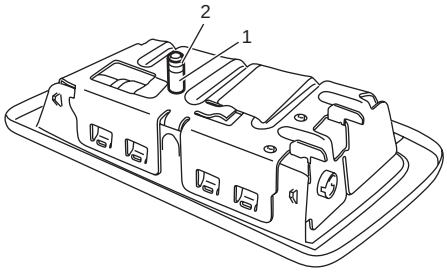
CAUTION:

Be sure to use M8 size and 7T strength bolt for fixing passenger air bag (inflator) module (1) to deployment fixture (A).



I4RS0A820087-

- For side-air bag (inflator) module
  a. Remove sleeve (1) and sleeve lock nut (2), if equipped.



I4RS0A820088-

b. Clear space (3) on ground about 185 cm (6 ft) in diameter where side-air bag (inflator) module for deployment. Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, space on shop floor where there is no activity and provide sufficient ventilation. Ensure no loose or flammable objects are within deployment area.

c. Place deployment fixture (A) on ground.

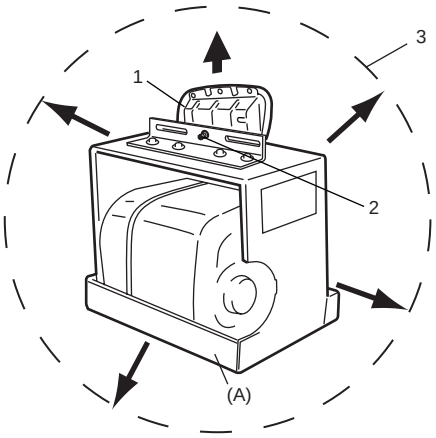
Special tool
(A): 09932–75041

d. Fill plastic reservoir in deployment fixture (A) with water or sand. This is necessary to provide sufficient stabilization of fixture during deployment.

e. Attach side-air bag (inflator) module (1) in deployment fixture using mounting attachment, sleeve lock nut and washer (2).

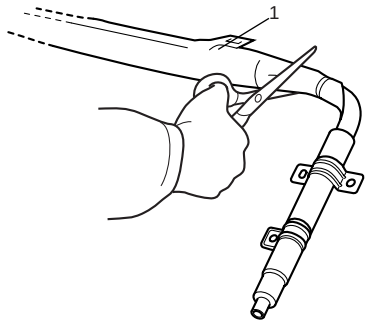
NOTE:

Make sure that deploying direction faces as shown in figure against mounting attachment.



I4RS0A820089-

- For side curtain-air bag (inflator) module
  a. Cut off bag (1) of side curtain-air bag (inflator) module.



I4RS0A820090-

b. Tie side curtain-air bag inflator (1) to tire (3) with wire harness (2) as shown.

Wire harness specifications
Stripped wire harness section 1.25 mm^2 (0.0019 in.^{2}) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

CAUTION:

Make sure that wire harness is tight. It is very dangerous if looseness in wire harness results in side curtain-air bag inflator flying off due to shock from inflator deploying.

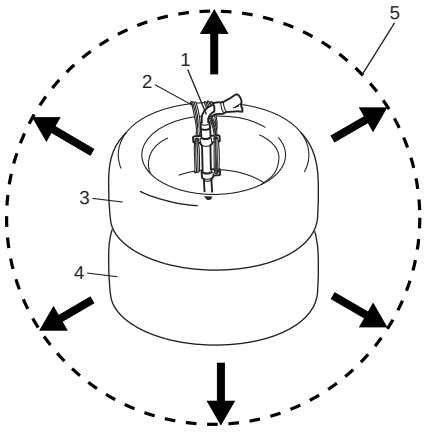
NOTE:

Wind wire harness (2) around at least 3 times.

c. Clear space (5) on ground about 185 cm (6 ft) in diameter where side curtain-air bag (inflator) module (1) is set for deployment.

Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where there is no activity and sufficient ventilation is provided. Ensure no loose or flammable object exists within activation area.

d. Pile tire with side curtain-air bag (inflator) module on tire (4).



I4RS0A820091-

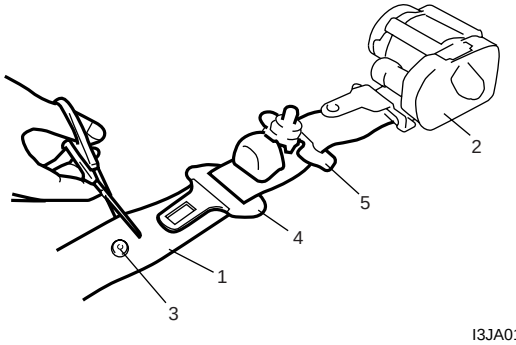
- For seat belt pretensioner
  a. Cut webbing (1) at tongue plate stopper (3) of seat belt pretensioner (2) side as shown.

NOTE:

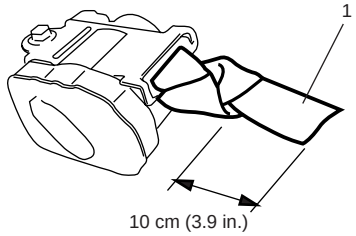
Hold seat belt pretensioner (2) vertically in the same condition as it is installed. Otherwise, webbing can't be pulled out.

b. Remove tongue plate (4) and shoulder anchor (5) from webbing.

c. Tie webbing (1) tightly at 10 cm (3.9 in.) from cutting edge as shown.



I3JA01820037-



I4RS0A820104-

d. Tie seat belt pretensioner (2) with wire harness (3) to wheel-installed tire (4) as shown.

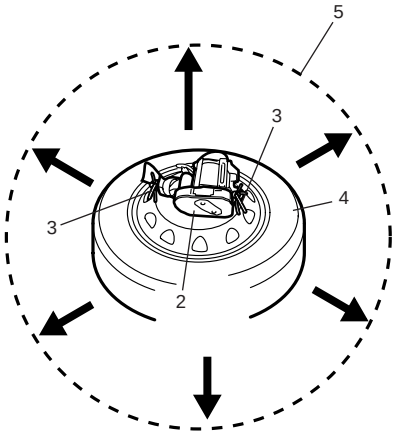
Wire harness specifications
Stripped wire harness section 1.25 mm^2 (0.0019 in.^{2}) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

NOTE:

Wind wire harness (3) around at least 3 times.

e. Clear space (5) on ground about 185 cm (6 ft) in diameter where seat belt pretensioner (2) is to be activated. Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where there is no activity and sufficient ventilation is provided. Ensure no loose or flammable object exists within activation area.

f. Place wheel-installed tire (4) with seat belt pretensioner (2) on ground in step e.



I4RS0A820105-

1. Webbing

7) Stretch deployment harness (A) from air bag (inflator) module or seat belt pretensioner to its full length 10 m (33 ft).

Special tool
(A): 09932-75031

8) Place 12 volts vehicle battery (1) near the shorted end of deployment harness (A).

9) Check that area around air bag (inflator) module or seat belt pretensioner is clear of all people and loose or flammable objects.

10) Connect adapter cable (B) as follows.

Special tool
(B): 09932–76510

- For driver air bag (inflator) module [A]
  Check that driver air bag (inflator) module is placed with its vinyl trim cover facing up, and connect adapter cable (B) to driver air bag (inflator) module.

- For passenger air bag (inflator) module [B]
  Check that passenger air bag (inflator) module is firmly and properly secured on deployment fixture (special tool), and connect adapter cable (B) to passenger air bag (inflator) module.
- For side-air bag (inflator) module [C]
  Verify that side-air bag (inflator) module is firmly and properly on deployment fixture (special tool), and connect adapter cable (B) to side-air bag (inflator) module.
- For side curtain-air bag (inflator) module [D]
  a. Connect adapter cable (B) to side curtain-air bag (inflator) module.
  b. Pile 2 tires (2) and wheel-installed tire (3) on top of tire with side curtain-air bag (inflator) (4), and tie them with wire harness (5) as shown.

  Wire harness specifications
  Stripped wire harness section 1.25 mm² (0.0019 in.²) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

NOTE:

Wind wire harness (5) around at least 2 times.

- For seat belt pretensioner [E]
  a. Connect adapter cable (B) to seat belt pretensioner.
  b. Pile 2 wheel-installed tires (3) on top of tire with seat belt pretensioner (6), and tie them with wire harness (5) as shown.

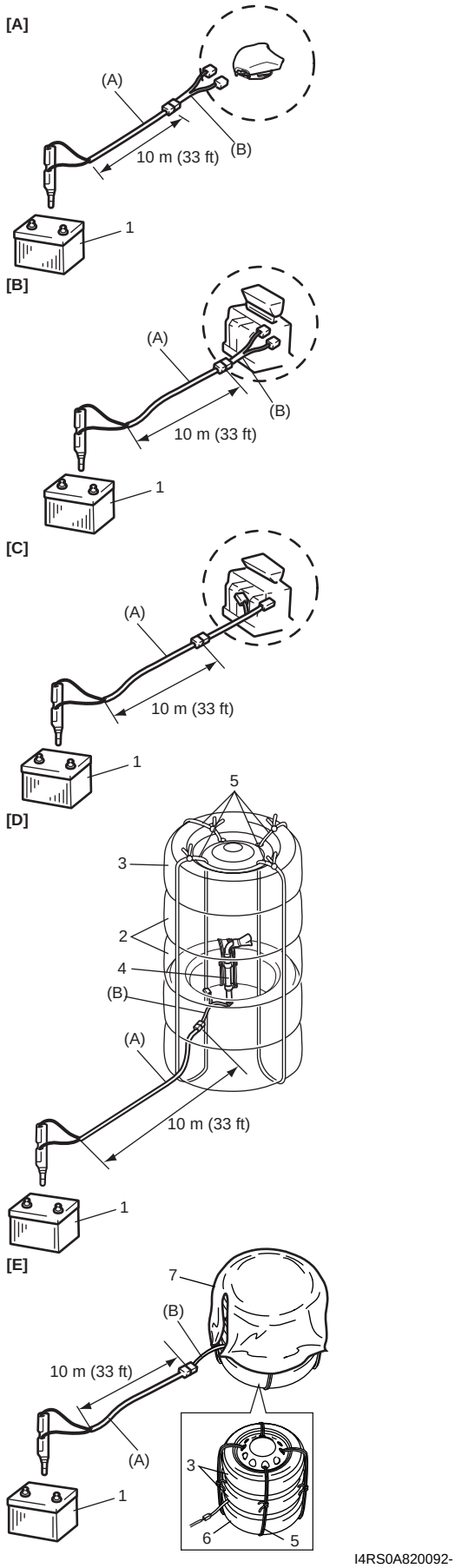
  Wire harness specifications
  Stripped wire harness section 1.25 mm² (0.0019 in.²) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

NOTE:

Wind wire harness (5) around at least 2 times.

  c. Drape blanket (7) over those tires.

11) Connect adapter cable (B) to deployment harness (A) connector and lock connectors with lock lever.



I4RS0A820092-

12) Notify all people in immediate area that you intend to deploy / activate air bag (inflator) module or seat belt pretensioner.

NOTE:

- **When air bag (inflator) module deploys and seat belt pretensioner activates, rapid gas expansion will create substantial report. Wear suitable ear protection. Notify all people in immediate area that you intend to deploy air bag (inflator) module or activate seat belt pretensioner and suitable ear protection should be worn.**
- **When driver air bag (inflator) module deploys, driver air bag (inflator) module may jump about 30 cm (1 ft) vertically. This is normal reaction to force of rapid gas expansion inside of drive air bag (inflator) module.**
- **After air bag (inflator) module has been deployed, surface of air bag (inflator) may contain powdery residue. This powder consists primarily of cornstarch (used to lubricate bag (inflator) as it inflates) and byproducts of chemical reaction.**

WARNING:

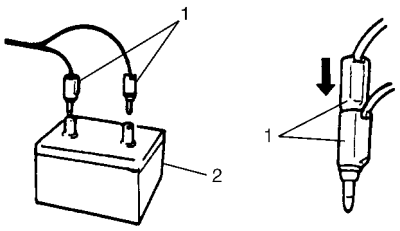
- **Do not place deployed air bag (inflator) module and activated seat belt pretensioner near any flammable objects.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module and activated seat belt pretensioner.**
- **Wait for about 30 minutes before touching any metal surface of air bag (inflater) module or seat belt pretensioner module. Disregarding these precautions may cause fire or personal injury.**

Failure to follow procedures may result in fire or personal injury.

13) Separate two banana plugs (1) on deployment harness.

14) Connect deployment harness to 12 volts vehicle battery (2). This will immediately deploy or activate air bag (inflator) module or seat belt pretensioner.

15) Disconnect deployment harness from 12 volts vehicle battery (2) and short two deployment harness leads together by fully seating one banana plug into the other.



I2RH01820069-

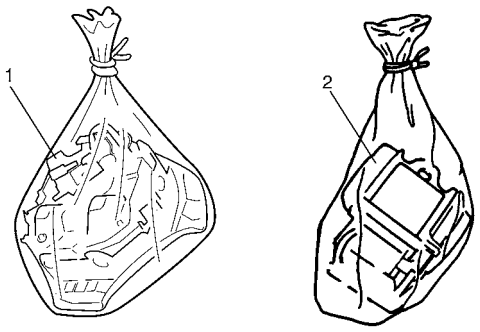
16) In the unlikely event that air bag (inflator) module or seat belt pretensioner did not deploy / activate after following these procedures, proceed immediately with Step 22) through 25). If air bag (inflator) module or seat belt pretensioner did deploy or activate, proceed with Steps 18) through 21).

17) Put on pair of shop gloves to protect your hands from possible irritation and heat when handling deployed air bag (inflator) module or activated seat belt pretensioner.

18) Disconnect adapter cable (special tool) from air bag (inflator) module or seat belt pretensioner as soon as possible. This will prevent adapter cable (special tool) from damage due to possible contact with hot air bag (inflator) module or hot seat belt pretensioner.

19) Check adapter cable as follows.
    - For air bag (inflator) module
      Be sure to check air bag (inflator) module adapter cable (special tool) for damage after deployment and replace it with new adapter cable (special tool), if it is damaged.
    - For seat belt pretensioner
      Be sure to check seat belt pretensioner adapter cable (special tool) for damage after seat belt pretensioner is activated. Replace it with spare connector (special tool) or new adapter, if necessary.

20) Dispose of deployed air bag (inflator) module (1) or activated seat belt pretensioner (2) through normal refuse channels after it has cooled for at least 30 minutes and tightly seal air bag (inflator) module (1) or seat belt pretensioner (2) in strong vinyl bag. Refer to “Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal: ” for details.



I3JA01820116-

21) Wash your hands with mild soap and water afterward.

NOTE:

Remaining steps are to be followed in the unlikely event that air bag (inflator) module did not deploy or seat belt pretensioner did not activate.

22) Ensure that deployment harness has been disconnected from 12 volts vehicle battery and that its two banana plugs have been shorted together by fully seating one banana plug into the other.
23) Disconnect deployment harness and adapter cable from air bag (inflator) module or seat belt pretensioner.
24) Temporarily store undeployed air bag (inflator) module referring to “Precautions on Service and Diagnosis of Air Bag System: ” for details.
25) Contact your local distributor for further assistance.

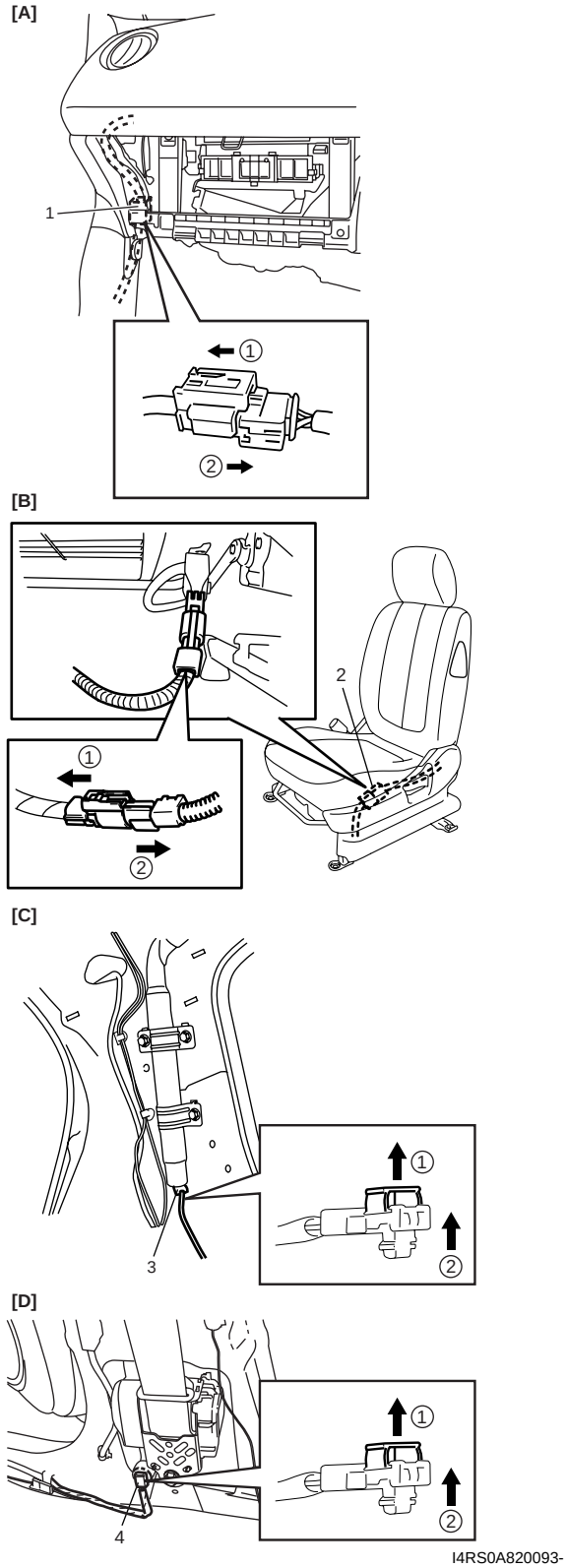
Deployment / Activation Inside of Vehicle

When the vehicle will be destroyed, or salvaged for component parts, deploy the air bag modules and/or activate seat belt pretensioners installed on vehicle.

NOTE:

If equipped with the seat belt pretensioners, activate both side of seat belt pretensioners at the same time when using special tool (C).

1) Turn ignition switch to LOCK position, remove key and put on safety glasses.
2) Remove all loose objects from front seats and instrument panel.
3) Disconnect air bag (inflator) module or seat belt pretensioner connector as follows.
   - For driver and passenger air bag (inflator) module [A]
     Remove glove box from instrument panel and disconnect driver and passenger air bag (inflator) module connector (1).
   - For side-air bag (inflator) module [B]
     Disconnect side-air bag (inflator) module connectors (2) under front seat cushion.
   - For side curtain-air bag (inflator) module [C]
     Remove rear pillar trim and disconnect side curtain-air bag (inflator) module connectors (3).
   - For seat belt pretensioners (right and left) [D]
     Remove both side (driver and passenger side) center pillar lower trim and disconnect seat belt pretensioner connectors (4).
4) Confirm that each air bag (inflator) module and/or seat belt pretensioners is securely mounted.



I4RS0A820093-

5) Check that there is no open, short or damage in special tools (deployment harness (A), adapter cable (B) and (C)). If any faulty condition is found, do not use it and be sure to use new special tool. And connect adapter cable (B), (C) or (D) to deployment harness (A) and lock connectors with lock slider.

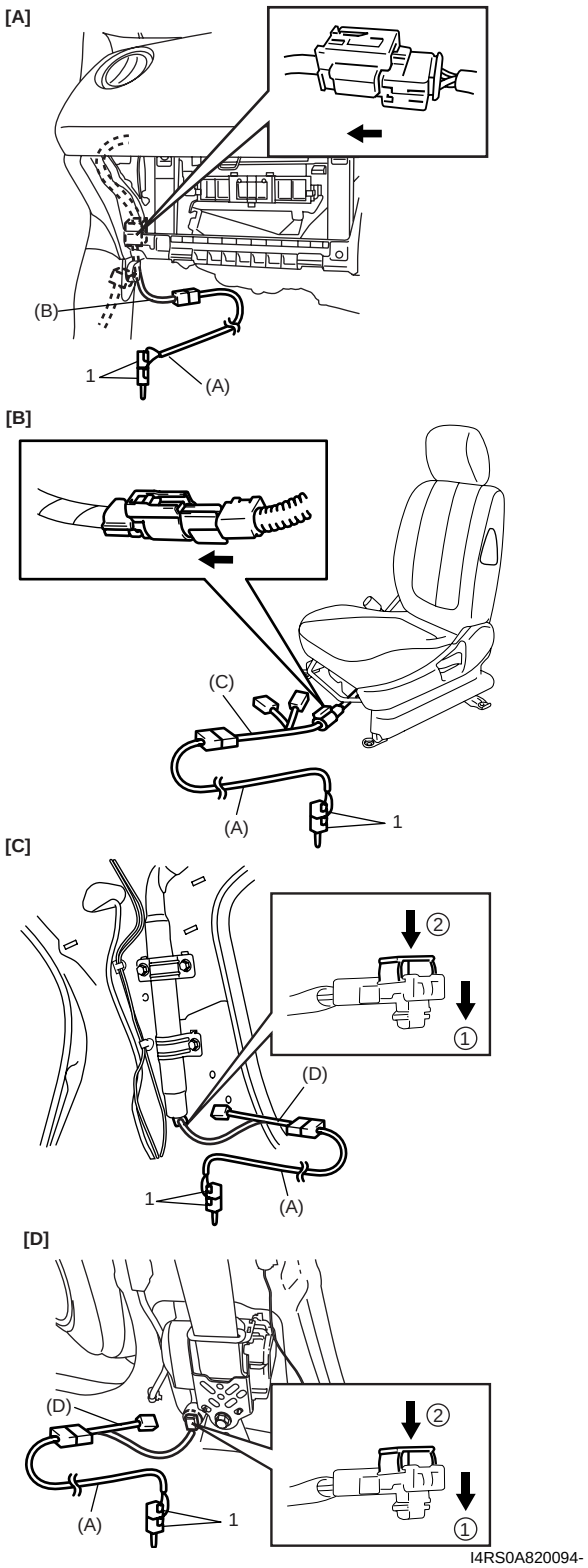
Special tool
(A): 09932-75031
(B): 09932–77310
(C): 09932–78332
(D): 09932–76510

6) Short two deployment harness leads together by fully seating one banana plug into the other.

WARNING:

Deployment harness (A) shall remain shorted and not be connected to 12 volts vehicle battery until you are ready to deploy air bag (inflator) module or activate seat belt pretensioner.

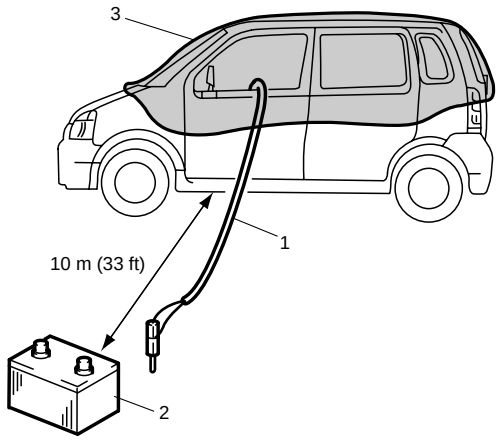
7) Connect adapter cable (B) or (C) in series with deployment harness (A) to air bag (inflator) module or seat belt pretensioner as follows.
   - For driver and passenger air bag (inflator) module [A]
     Connect adapter cable (B) in series with deployment harness (A) and push adapter cable (B) connector to air bag (inflator) module connector till click can be heard.
   - For side-air bag (inflator) module [B]
     Connect adapter cable (C) in series with deployment harness (A) and push adapter cable (C) connector to side bag (inflator) module connector till click can be heard.
   - For side curtain-air bag (inflator) module [C]
     Connect adapter cable (D) in series with deployment harness (A) to curtain bag (inflator) module and lock connector with lock part.
   - For seat belt pretensioners [D]
     Connect adapter cable (D) in series with deployment harness (A) to seat belt pretensioner and lock connector with lock part.



I4RS0A820094-

8) Route deployment harness (1) out of vehicle.
9) Check that inside of vehicle and area surrounding vehicle are clear of all people and loose or flammable objects.
10) Stretch deployment harness (1) to its full length 10 m (33 ft).
11) Place 12 volts vehicle battery (2) near shorted end of deployment harness (1).

12) Completely cover windshield area and front door window openings with drop cloth, a blanket or any similar item. This reduces possibility of injury due to possible fragmentation of vehicle's glass or interior.



I2RH01820073-

13) Notify all people in immediate area that you intend to deploy air bag (inflator) module or activate seat belt pretensioners.

NOTE:

- **When air bag (inflator) module deploys or seat belt pretensioners activate, rapid gas expansion will create substantial report. Wear suitable ear protection. Notify all people in immediate area that you intend to deploy air bag (inflator) module or to activate seat belt pretensioner and suitable ear protection should be worn.**
- **After air bag (inflator) module has been deployed, surface of air bag may contain powdery residue. This powder consists primarily of cornstarch (used to lubricate air bag (inflator) module as it inflates) and by-products of chemical reaction.**

WARNING:

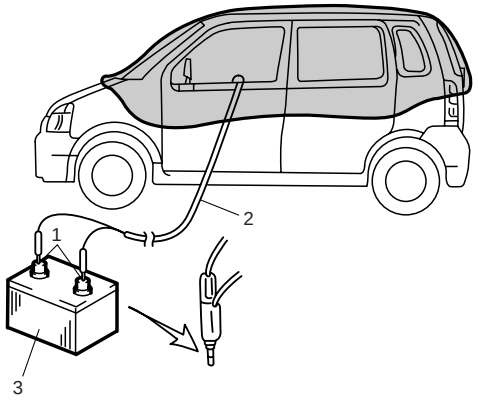
- **Do not place deployed air bag (inflator) module and activated seat belt pretensioners near any flammable objects.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module and activated seat belt pretensioners.**
- **Wait for about 30 minutes before touching any metal surface of air bag (inflater) module or seat belt pretensioner modules. Disregarding these precautions may cause fire or personal injury.**

Failure to follow procedures may result in fire or personal injury.

14) Separate two banana plugs (1) on deployment harness (2).

15) Connect deployment harness (2) to 12 volts vehicle battery (3). This will immediately deploy or activate air bag (inflator) module or seat belt pretensioners.

16) Disconnect deployment harness (2) from 12 volts vehicle battery (3) and short two deployment harness leads together by fully seating one banana plug into the other.



I2RH01820074-

17) Repeat Steps 3) through 16) to deploy / activate air bag (inflator) modules and seat belt pretensioners which has not been deployed / activated, if any.

18) In the unlikely event that air bag (inflator) module and seat belt pretensioners after following these procedures, proceed immediately with Step 24) through 26). If air bag (inflator) module and seat belt pretensioners did deploy / activate, proceed with Steps 19) through 23).

19) Carefully remove drop cloth from vehicle and clean off any fragments or discard it entirely.

20) Put on pair of shop gloves to protect your hands from possible irritation and heat when handling deployed air bag (inflator) module and activated seat belt pretensioners.

21) Disconnect adapter cable (special tool) from air bag (inflator) module or seat belt pretensioner as soon as possible. This will prevent adapter cable (special tool) from damage due to possible contact with hot air bag (inflator) module or hot seat belt pretensioner.

22) Check adapter cable connector as follows. Adapter cable connector (special tool) is designed to be reused. However it should be inspected for damage after deployment and replaced if necessary.

23) With air bag (inflator) modules deployed and seat belt pretensioners activated, vehicle may be scrapped in the same manner as non-air bag system / seat belt pretensioner equipped vehicle.

NOTE:

Remaining steps are to be followed in the unlikely event that air bag (inflator) module did not deploy or seat belt pretensioner did not activate.

24) Remove undeployed air bag (inflator) module(s) and/or inactivated seat belt pretensioner(s) from vehicle. For driver air bag (inflator) module, refer to “Driver Air Bag (Inflator) Module Removal and Installation: ”. For passenger air bag (inflator) module, refer to “Passenger Air Bag (Inflator) Module Removal and Installation: ”. For seat belt pretensioner, refer to “Front Seat Belt Removal and Installation: in Section 8A”.
25) Temporarily store undeployed air bag (inflator) module referring to “Precautions on Service and Diagnosis of Air Bag System: ” for details.
26) Contact your local distributor for further assistance.

Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal

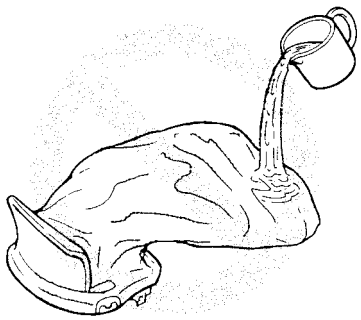
S4RS0A8206012

WARNING:

Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which may cause personal injury. The undeployed air bag (inflator) module and the inactivated seat belt pretensioner must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module and the inactivated seat belt pretensioner contains substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

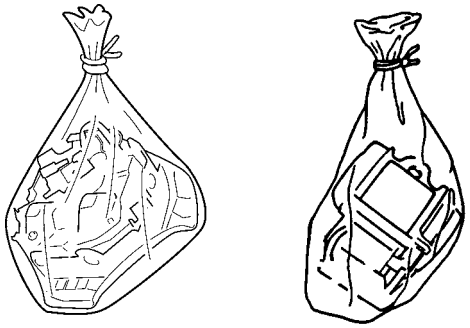
Deployed air bag (inflator) module and the activated seat belt pretensioner can be disposed of through normal refuse channels just like any other parts. For their disposal, however, the following points should be noted.

- The air bag (inflator) module and the seat belt pretensioner immediately after deployment / activation is very hot. Wait for 30 minutes to cool it off before handling it.
- Never apply water, oil, etc. to deployed air bag (inflator) module and the activated seat belt pretensioner to cool it off and be careful so that water, oil etc. does not get on the deployed air bag (inflator) module and the activated seat belt pretensioner.



IYSQ01820095-

- After the air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and by-products of the chemical reaction. As with many service procedures, you should wear gloves and safety glasses.
- When disposing of the deployed air bag (inflator) module and the activated seat belt pretensioner, be sure to seal it in a vinyl bag.



I3JA01820119-

- When air bag (inflator) module and seat belt pretensioner have been deployed / activated inside the vehicle which is going to be scrapped, leave them as installed to the vehicle.
- Be sure to wash your hands with mild soap and water after handling them.

Specifications

Tightening Torque Specifications

S4RS0A8207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
SDM bolt	9	0.9	6.5	☞
Driver air bag (inflator) module mounting bolt	9	0.9	6.5	☞
Passenger air bag (inflator) module attaching bolt	23	2.3	16.5	☞
Sleeve lock nut	2.5	0.25	2.0	☞
Side curtain-air bag (inflator) module attaching bolts	11	1.1	8.0	☞
Forward-sensor mounting bolt	9	0.9	6.5	☞
Side-sensor bolt	9	0.9	6.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Air Bag System Components, Wiring and Connectors Location: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Use of Special Tools

S4RS0A8208003

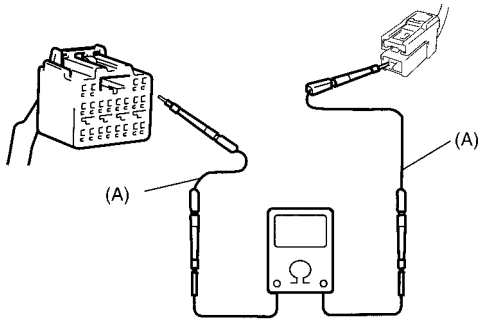
WARNING:

To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified. Do not use a non-powered probe type tester.
Instructions must be followed carefully, otherwise personal injury may result.

You should be familiar with the tools listed under the heading “Special Tool”. You should be able to measure voltage and resistance. You should be familiar with proper use of a scan tool such as Air Bag Driver / Passenger Load Tool, Connector Test Adapter Kit and the Digital Multimeter.

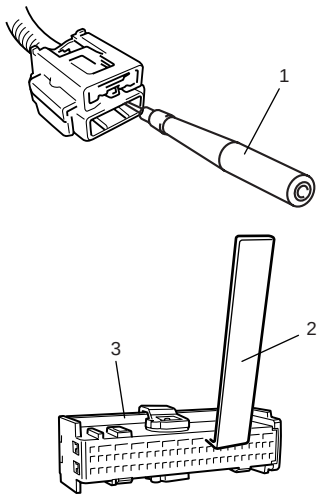
Special tool
(A): 09932-76010 (Connector Test Adapter Kit)

This must be used whenever a diagnostic procedure requests checking or probing a terminal.
Using the appropriate adapter in the special tool will ensure that no damage to the terminal will occur from the multimeter probe, such as spreading or bending.



I3JA01820041-

The adapter (1) will also give an idea of whether or not contact tension is sufficient, helping to find an open or intermittent open due to poor terminal contact. An SDM short bar release tool (2) is included in the connector test adapter kit. Inserting it into the SDM connector (3) will releases the shorting bar.



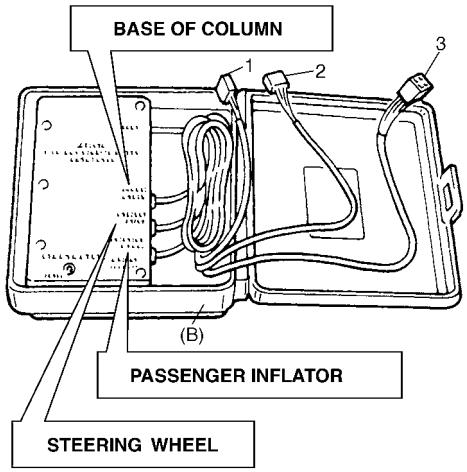
I4RS0A820108-

Special tool
(B): 09932-75010 (Air bag driver / passenger load tool)

This tool is used as a diagnostic aid and safety device to prevent inadvertent air bag (inflator) module deployment. The load tool has three connectors attached to its case which are electrically functional and serve as resistive load substitutions.
No more than two connectors are used at any time.
One of connectors (“STEERING WHEEL”) is used to substitute the load of the followings.

- Driver air bag (inflator) module when it is connected at the top of the column to the contact coil assembly.
- Passenger air bag (inflator) module when it is connected to the air bag harness connector in instrument panel harness for passenger air bag (inflator) module.
- Each of driver and passenger seat belt pretensioners when it is connected to air bag harness connector in instrument panel harness for driver and passenger seat belt pretensioners.
- Side-air bag (inflator) module when it is connected to the floor harness connector for side-air bag (inflator) module.
- Side curtain-air bag (inflator) module when it is connected to the floor harness connector for side curtain-air bag (inflator) module.

Another connector (“BASE OF COLUMN”) is used to substitute the load of the driver air bag (inflator) module and the contact coil assembly when it is connected at the base of the column to the air bag wire harness.
The third connector (“PASSENGER INFLATOR”) is not used.
By substituting the resistance of the load tool when called for, a determination can be made as to whether an inflator circuit component is causing system malfunction and which component is causing the malfunction.
The load tool should be used only when specifically called for in the diagnostic procedures.



I1JA01820004-

1.	Connector for contact coil and driver air bag (inflator) module (Located near the base of the steering column)
2.	Connector for driver, passenger air bag (inflator) module, side-air bag (inflator) module and driver and passenger seat belt pretensioners
3.	Not used

Recommended Service Material

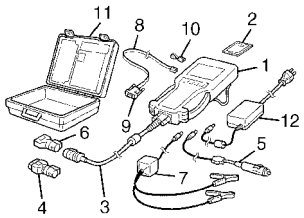
S4RS0A8208004

Material	SUZUKI recommended product or Specification		Note
Thread lock cement	Thread Lock Cement Super 1332B	P/No.: 99000–32100	☞

Special Tool

S4RS0A8208005

09932–75010 Air bag load tool ☞ / ☞ / ☞ /

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞		

Section 9

Body, Cab and Accessories

CONTENTS

Precautions 9-1
Precautions 9-1
Precautions on Body, Cab and Accessories 9-1
Precautions for Body Service 9-1
Fastener Caution for Body Service 9-1

Wiring Systems 9A-1
Precautions 9A-1
Cautions in Body Electrical System Servicing 9A-1
Precautions for Wiring System 9A-1
General Description 9A-2
Applicable model 9A-2
Abbreviations 9A-2
Wire / Connector Color Symbols 9A-3
Symbols and Marks 9A-3
How to Read Connector Layout Diagram 9A-5
How to Read Connector Codes and Terminal Nos. 9A-6
How to Read Ground Point 9A-8
How to Read Power Supply Diagram 9A-9
How to Read System Circuit Diagram 9A-9
Connector Layout Diagram 9A-11
Connector Layout Diagram 9A-11
Engine Compartment 9A-11
A: Battery cable / C: Engine harness 9A-11
E: Main harness 9A-12
Instrument Panel 9A-13
E: Main harness and power steering wire 9A-13
G: Instrument panel harness 9A-14
Door, Roof 9A-15
J: Front and rear door wire and rear door joint wire / K: Roof wire 9A-15
Floor 9A-16
L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire 9A-16
Rear 9A-18
O: Rear end door harness, Rear defogger wire 9A-18
Ground Point 9A-19
Ground (earth) Point 9A-19
Power Supply Diagram 9A-20
Power Supply Diagram 9A-20
Fuses and the Protected Parts 9A-21
Fuses in Main Fuse Box 9A-22
Individual Circuit Fuse Box No. 1 ..... 9A-22
Individual Circuit Fuse Box No. 2 (In J/B) 9A-23
Junction Block (J/B) Connector / Fuse Layout 9A-25
BCM side 9A-25
Fuse side 9A-26
Junction Block Inner Circuit (Overview) 9A-27
Junction Block Inner Circuit (Detail) 9A-28
System Circuit Diagram 9A-33
System Circuit Diagram 9A-33
A-1 Cranking System Circuit Diagram 9A-34
A-2 Charging System Circuit Diagram 9A-35
A-3 Ignition System Circuit Diagram 9A-36
A-4 Cooling System Circuit Diagram 9A-37
A-5 Engine and A/C Control System Circuit Diagram 9A-38
A-6 A/T Control System Circuit Diagram 9A-43
A-7 Immobilizer System Circuit Diagram 9A-45
A-8 Body Control System Circuit Diagram 9A-46
B-1 Windshield Wiper and Washer Circuit Diagram 9A-50
B-2 Rear Wiper and Washer Circuit Diagram 9A-51
B-3 Rear Defogger Circuit Diagram 9A-52
B-4 Power Window Circuit Diagram 9A-53
B-5 Power Door Lock Circuit Diagram 9A-55
B-6 Power Mirror Circuit Diagram 9A-57
B-7 Horn Circuit Diagram 9A-58
C-1 Combination Meter Circuit Diagram (Meter) 9A-59
C-2 Combination Meter Circuit Diagram (Indicator) 9A-60
C-3 Combination Meter Circuit Diagram (Warning Light) 9A-61
D-1 Headlight System Circuit Diagram 9A-63
D-2 Position, Tail and Licence Plate Light System Circuit Diagram 9A-64
D-3 Front Fog Light System Circuit Diagram 9A-65
D-4 Illumination Light System Circuit Diagram 9A-66
D-5 Interior Light System Circuit Diagram 9A-67
D-6 Turn Signal and Hazard Warning Light System Circuit Diagram 9A-68
D-7 Brake Light System Circuit Diagram 9A-70
D-8 Back-Up Light System Circuit Diagram 9A-71
E-1 Heater System Circuit Diagram 9A-72
F-1 Air-Bag System Circuit Diagram 9A-74
F-2 Anti-Lock Brake System Circuit Diagram 9A-76
F-3 Power Steering System Circuit Diagram 9A-78
G-1 Audio System Circuit Diagram 9A-80
G-2 Multi Information Display / Accessory Socket System Circuit Diagram 9A-81
List of Connectors 9A-82
List of Connectors 9A-82

C Connector 9A-82
E Connector 9A-83
G Connector 9A-84
J Connector 9A-86
K Connector 9A-87
L Connector 9A-87
O Connector 9A-88
R Connector 9A-88

Lighting Systems 9B-1

Component Location 9B-1
Lighting System Location 9B-1
Interior Light System Location 9B-2
Diagnostic Information and Procedures 9B-2
Headlight Symptom Diagnosis 9B-2
Turn Signal and Hazard Warning Light Symptom Diagnosis 9B-3
Clearance, Tail and License Plate Light Symptom Diagnosis 9B-3
Back-Up Light Symptom Diagnosis 9B-4
Stop (Brake) Lamp Symptom Diagnosis 9B-4
Front Fog Light Symptom Diagnosis (If Equipped) 9B-4
Interior Light Symptom Diagnosis 9B-5
Repair Instructions 9B-5
Headlight Housing Removal and Installation 9B-5
Headlight Bulb Replacement 9B-6
Headlight Aiming Adjustment with Screen 9B-6
Headlight Switch (in Lighting Switch) Removal and Installation 9B-7
Headlight Switch (in Lighting Switch) Inspection 9B-8
Hazard Warning Switch Removal and Installation 9B-8
Hazard Warning Switch Inspection 9B-8
Stop (Brake) Lamp Switch Inspection 9B-9
Turn Signal Light Switch (in Lighting Switch) Removal and Installation 9B-9
Turn Signal Light Switch (in Lighting Switch) Inspection 9B-9
Turn Signal and Hazard Warning Relay Removal and Installation 9B-9
Turn Signal and Hazard Warning Relay Inspection 9B-9
License Lamp Assembly Removal and Installation 9B-10
Front Fog Light Assembly Removal and Installation 9B-10
Front Fog Light Bulb Replacement 9B-11
Front Fog Light Switch Inspection 9B-11
Front Fog Light Relay Inspection 9B-11
Front Fog Light Aiming Adjustment with Screen 9B-12

Instrumentation / Driver Info. / Horn 9C-1

General Description 9C-1
CAN Communication Data of Combination Meter 9C-1
Schematic and Routing Diagram 9C-2
Combination Meter Circuit Diagram 9C-2
Component Location 9C-3
Audio System Component Location 9C-3
Diagnostic Information and Procedures 9C-4
Speedometer and VSS Symptom Diagnosis 9C-4
Tacho meter Symptom Diagnosis 9C-4
Engine Coolant Temperature (ECT) Meter Symptom Diagnosis 9C-4
Fuel Meter Symptom Diagnosis 9C-4
Low Fuel Warning Light Symptom Diagnosis 9C-5
Oil Pressure Warning Light Symptom Diagnosis 9C-5
Brake and Parking Brake Warning Light Symptom Diagnosis 9C-6
Seat Belt Reminder Light Symptom Diagnosis (If Equipped) 9C-6
A/T Shift Position Indicator (A/T Vehicle Only) Symptom Diagnosis 9C-6
Charge Warning Light Symptom Diagnosis 9C-7
Main Beam (High Beam) Indicator Symptom Diagnosis 9C-7
Warning Buzzer Circuit Symptom Diagnosis 9C-7
Cigarette Lighter Symptom Diagnosis (If Equipped) 9C-7
Horn Symptom Diagnosis 9C-8
Information Display Symptom Diagnosis (If Equipped) 9C-8
Audio System Symptom Diagnosis (If Equipped) 9C-9
Remote Audio Control Switch (If Equipped) Symptom Diagnosis 9C-10
Repair Instructions 9C-10
Ignition Switch Removal and Installation 9C-10
Ignition Switch Inspection 9C-11
Combination Meter Removal and Installation 9C-11
Fuel Level Sensor Removal and Installation 9C-11
Fuel Level Sensor Inspection 9C-11
Oil Pressure Switch Removal and Installation 9C-12
Oil Pressure Switch Inspection 9C-12
VSS Removal and Installation 9C-12
VSS Inspection 9C-12
Engine Coolant Temperature (ECT) Sensor Inspection 9C-12
Brake Fluid Level Switch Inspection 9C-12
Parking Brake Switch Inspection 9C-13
Door Switch (Front / Rear Door) Inspection 9C-13
Rear End Door Switch Inspection 9C-13
Outside Air Temperature Sensor Removal and Installation 9C-13
Outside Air Temperature Sensor Inspection 9C-14
Instrument Panel Removal and Installation 9C-14
Information Display Removal and Installation 9C-15
Radio Assembly Removal and Installation 9C-16
Front Speaker Removal and Installation 9C-16
Rear Speaker Removal and Installation 9C-16
Horn Removal and Installation 9C-16

Horn Inspection 9C-17
Horn Relay Inspection 9C-17
Antenna Amplifier Removal and Installation 9C-17
Remote Audio Control Switch Inspection 9C-17
Specifications 9C-18
Tightening Torque Specifications 9C-18

Wipers / Washers 9D-1

Diagnostic Information and Procedures 9D-1
Front Wiper and Washer Symptom Diagnosis 9D-1
Rear Wiper and Washer (If Equipped) Symptom Diagnosis 9D-1
Repair Instructions 9D-2
Wipers and Washers Components 9D-2
Washer Tank and Washer Pump Removal and Installation 9D-3
Washer Pump Inspection 9D-3
Windshield Wiper Removal and Installation 9D-4
Windshield Wiper Motor Inspection 9D-4
Rear Wiper (If Equipped) Removal and Installation 9D-5
Rear Wiper Motor (If Equipped) Inspection 9D-6
Windshield Wiper and Washer Switch Removal and Installation 9D-7
Windshield Wiper and Washer Switch Inspection 9D-7
Rear Wiper and Washer Switch Removal and Installation 9D-8
Rear Wiper and Washer Switch Inspection 9D-9
Rear Wiper Relay Removal and Installation 9D-9
Rear Wiper Relay Inspection 9D-9
Specifications 9D-9
Tightening Torque Specifications 9D-9

Glass / Windows / Mirrors 9E-1

General Description 9E-1
Rear End Door Window Defogger System Description 9E-1
Windshield Construction 9E-1
Diagnostic Information and Procedures 9E-2
Rear End door Window Defogger Symptom Diagnosis 9E-2
Power Window Control System Symptom Diagnosis 9E-2
Power Door Mirror Control System (If Equipped) Symptom Diagnosis 9E-3
Repair Instructions 9E-3
Windshield Removal and Installation 9E-3
Front Door Window Components 9E-6
Front Door Glass Removal and Installation 9E-7
Front Door Window Regulator Removal and Installation 9E-8
Front Door Window Regulator Inspection 9E-8
Rear Door Window Components 9E-9
Rear Door Glass Removal and Installation 9E-9
Rear Door Window Regulator Removal and Installation 9E-10
Rear Door Window Regulator Inspection 9E-11
Rear End Door Window Components 9E-11
Rear End Door Glass Removal and Installation 9E-11
Rear End Door Window Defogger Switch Inspection 9E-12
Rear End Door Window Defogger Relay Inspection 9E-12
Rear End Door Window Defogger Wire Inspection 9E-13
Rear End Door Window Defogger Wire Repair 9E-13
Power Window Main Switch Inspection 9E-14
Power Window Sub Switch Inspection 9E-15
Door Mirror Components 9E-15
Door Mirror Removal and Installation 9E-16
Power Door Mirror Switch Inspection 9E-16
Power Door Mirror Actuator Inspection 9E-16
Special Tools and Equipment 9E-16
Recommended Service Material 9E-16

Security and Locks 9F-1

General Description 9F-1
Key Coding Construction 9F-1
Rear End Door Opener System Description 9F-1
Component Location 9F-2
Power Door Lock and Keyless Entry System Component Location 9F-2
Diagnostic Information and Procedures 9F-3
Power Door Lock System Symptom Diagnosis 9F-3
Power Door Lock System Operation Inspection 9F-3
Keyless Entry System Symptom Diagnosis 9F-4
Keyless Entry System Operation Inspection 9F-4
Rear End Door Opener System Symptom Diagnosis 9F-5
Rear End Door Opener System Operation Inspection 9F-5
Repair Instructions 9F-5
Front Door Lock Assembly Components 9F-5
Front Door Lock Assembly Removal and Installation 9F-6
Front Door Lock Assembly Inspection 9F-7
Power Door Lock Switch Inspection 9F-7
Door Key Cylinder Switch Inspection 9F-8
Power Door Lock Actuator Inspection 9F-8
Rear Door Lock Assembly Components 9F-9
Rear Door Lock Assembly Removal and Installation 9F-9
Rear Door Lock Assembly Inspection 9F-9
Rear End Door Lock Assembly Components 9F-10
Rear End Door Lock Assembly Removal and Installation 9F-10
Rear End Door Lock Assembly Inspection 9F-11
Rear End Door Opener Switch Inspection 9F-11
Replacement of Transmitter Battery 9F-11
Programming Transmitter Code 9F-12

Keyless Entry Receiver Removal and Installation 9F-12
Keyless Entry Receiver and Its Circuit Inspection 9F-13
Specifications 9F-14
Tightening Torque Specifications 9F-14
Special Tools and Equipment 9F-14
Recommended Service Material 9F-14

Seats 9G-1
Repair Instructions 9G-1
Front Seat Components 9G-1
Front Seat Removal and Installation 9G-1
Rear Seat Components 9G-2
Rear Seat Removal and Installation 9G-2
Specifications 9G-2
Tightening Torque Specifications 9G-2

Interior Trim 9H-1
Repair Instructions 9H-1
Floor Carpet Removal and Installation 9H-1
Head Lining Removal and Installation 9H-1
Console Box Components 9H-2
Roof Molding Components 9H-3
Splash Guard (If Equipped) Components 9H-3
Specifications 9H-4
Tightening Torque Specifications 9H-4

Hood / Fenders / Doors 9J-1
Repair Instructions 9J-1
Hood Removal and Installation 9J-1
Hood Inspection and Adjustment 9J-1
Front Fender Components 9J-2
Front Fender Removal and Installation 9J-2
Front Door Assembly Components 9J-3
Front Door Assembly Removal and Installation 9J-3
Rear Door Assembly Components 9J-4
Rear Door Assembly Removal and Installation 9J-5
Rear End Door Assembly Components 9J-5
Rear End Door Assembly Removal and Installation 9J-5
Specifications 9J-7
Tightening Torque Specifications 9J-7
Special Tools and Equipment 9J-7
Recommended Service Material 9J-7

Body Structure 9K-1
Repair Instructions 9K-1
Front Bumper and Rear Bumper Components 9K-1
Cowl Top Components 9K-2
Specifications 9K-3
Body Dimensions 9K-3
Panel Clearance 9K-10

Paint / Coatings 9L-1
General Description 9L-1
Anti-Corrosion Treatment Construction 9L-1
Plastic Parts Finishing 9L-1
Component Location 9L-2
Sealant Application Areas 9L-2
Under Coating Application Areas 9L-7
Anti-Corrosion Compound Application Area 9L-9

Exterior Trim 9M-1
Repair Instructions 9M-1
Roof Molding Components 9M-1
Splash Guard (If Equipped) Components 9M-2

Precautions

Precautions

Precautions on Body, Cab and Accessories

S4RS0A9000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Fastener Caution
Refer to “Fastener Caution: in Section 00”.

Precautions for Body Service
Refer to “Precautions for Body Service: ”.

Fastener Caution for Body Service:
Refer to “Fastener Caution for Body Service: ”.

Cautions in Body Electrical System Servicing
Refer to “Cautions in Body Electrical System Servicing: in Section 9A”.

Precautions for Wiring System
Refer to “Precautions for Wiring System: in Section 9A”.

Precautions for Body Service

S4RS0A9000002

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:
When servicing vehicle body, if shock may be applied to air bag system component parts, remove those parts beforehand.

Fastener Caution for Body Service

S4RS0A9000003

CAUTION:

- **Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number of with an equivalent part if replacement become necessary.**
- **Do not use a replacement part of lesser quality or substitute a design. Torque values must be used as specified during reassembly to assure proper retention of these parts.**

Wiring Systems

Precautions

Cautions in Body Electrical System Servicing

S4RS0A9100001

When performing works related to electric systems, observe the cautions described in “Precautions for Electrical Circuit Service: in Section 00” for the purpose of protection of electrical parts and prevention of a fire from occurrence.

Precautions for Wiring System

S4RS0A9100002

WARNING:

(For the vehicles with the Supplemental Restraint System (Air Bags) and/or the Seat Belt Pretensioner System)
Service on or around the air bag system / Seat belt pretensioner system components or their wiring must be performed only by an authorized SUZUKI dealer. Observe all the warnings of the “Air Bag System” and disable the systems before performing the service. Failure to follow the Warnings could result in unintended activation of the systems or could render the systems inoperative. Either of these two conditions may result in severe injury.

CAUTION:

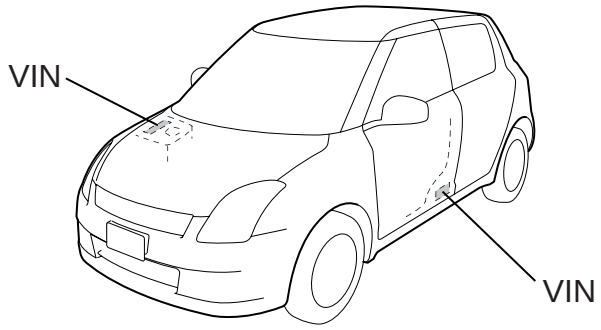
To prevent damage to the electrical/ electronic parts (especially computers or semi-conductors) or to prevent fire:

- When disconnecting the battery terminals, be sure to 1: turn off the ignition switch and all other switches, 2: disconnect the negative (–) terminal wire and then 3: disconnect the positive (+) terminal wire. Connect the wires in the reverse order of disconnecting.
- When disconnecting the connectors, be sure to unlock the connector lock (if equipped) and then pull the connector shells to detach them. Do not pull the wires.
- Connect the connectors by holding the connector shells. Make sure they are securely locked.
- Install the wiring harness securely without any slack.
- When installing parts, make sure the wiring harness is not interfered with or pinched by them.
- Avoid routing the wiring harness near or around a sharp corner or edge of the vehicle body or parts as much as possible. If necessary, protect the wiring harness by winding tape or the like around on it.
- When replacing a fuse, make sure to use the specified capacity fuse. Using a fuse with a larger capacity can cause damage to the electrical parts or a fire.
- Do not handle electrical/ electronic parts (computer, relay, etc.) roughly or drop them.
- Do not expose electrical/ electronic parts to high temperature (Approximately 80 °C (176 °F) or higher) or water.
- Be sure to insert the tester probe (or, if necessary, an appropriate needle or wire designed for the inspection work) into the back side (wiring harness side) of the connector for inspection not to damage or deform the terminal of the connector.

General Description

Applicable model

S4RS0A9101001



(M15A Engine)
JSAEZC2100100001~

I4RS0A910901-

Abbreviations

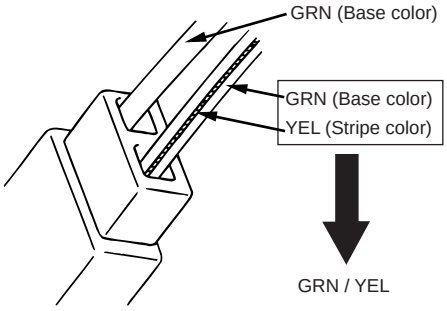
S4RS0A9101002

Abbreviation	Full term	Abbreviation	Full term
2WD	2 wheel drive vehicles	ILL	Illumination
4WD	4 wheel drive vehicles	IND	Indicator
A/B	Air bag	INT	Intermittent
A/C	Air conditioning	ISC	Idle speed control
A/T	Automatic transaxle	J/B	Junction block
ACC	Accessory	J/C	Joint connector
BCM	Body control module	L	Left
CKP	Crank shaft position	LED	Light emitting diode
CMP	Cam shaft position	LHD	Left hand drive vehicle
COMB	Combination	LO	Low
DLC	Data link connector	MAP	Manifold absolute pressure
DRL	Daytime running light	M/T	Manual transaxle
DSL	Diesel engine	O/D	Over drive
ECM	Engine control module	P/N	Power/Normal
ECT	Engine coolant temperature	P/S	Power steering
EGR	Exhaust gas recirculation	PSP	Power steering pressure
EVAP	Evaporative	R	Right
FWD	Forward	RHD	Right hand drive vehicle
HI	High	SDM	Sensing and diagnostic module
IAC	Idle air control	ST	Starter
IAT	Intake air temperature	TCC	Torque converter clutch
ICM	Immobilizer control module	TCM	Transmission control module
IF EQPD	If equipped	VSS	Vehicle speed sensor
IG	Ignition	VSV	Vacuum switching valve
IG COIL	Ignition coil	5 dr	5 door

Wire / Connector Color Symbols

S4RS0A9101003

Symbol	Wire / connector Color	Symbol	Wire / connector Color
BLK	Black	ORN	Orange
BLU	Blue	RED	Red
BRN	Brown	WHT	White
GRN	Green	YEL	Yellow
GRY	Gray	PNK	Pink
LT BLU	Light blue	PPL	Purple
LT GRN	Light green	N	Natural

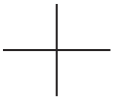
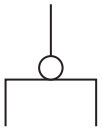
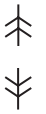
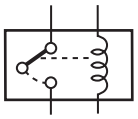
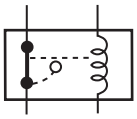


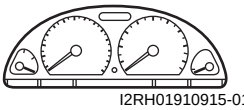
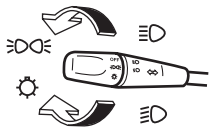
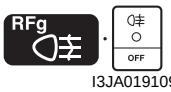
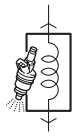
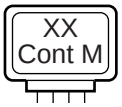
I2RH01910941-

Symbols and Marks

S4RS0A9101004

Battery	Ground		Normal fuse	Slow blow fuse
I2RH01910910-01	IYSQ01910915-01	IYSQ01910916-01	IYSQ01910917-01	IYSQ01910918-01
Circuit breaker	Coil, Solenoid	Heater	Bulb	
IYSQ01910919-01	IYSQ01910920-01	IYSQ01910921-01	IYSQ01910922-01	IYSQ01910923-01
Cigarette lighter	Motor	Pump	Horn	Speaker
IYSQ01910924-01	IYSQ01910925-01	IYSQ01910926-01	I2RH01910911-01	IYSQ01910928-01
Buzzer	Chime	Condenser	Thermistor	Reed switch
IYSQ01910929-01	IYSQ01910930-01	IYSQ01910931-01	IYSQ01910932-01	IYSQ01910933-01
Resistance	Variable resistance		Transistor	
IYSQ01910934-01	IYSQ01910935-01	IYSQ01910936-01	IYSQ01910937-01 NPN	IYSQ01910938-01 PNP

Photo transistor	Diode	Zener diode	Light emitting diode	Photo diode
IYSQ01910939-01	IYSQ01910940-01	IYSQ01910941-01	IYSQ01910942-01	IYSQ01910943-01
Piezoelectric element	Harness		Ring terminal	Connector
IYSQ01910944-01	IYSQ01910945-01 Connected	 IYSQ01910946-01 Not connected	 IYSQ01910947-01	 IYSQ01910948-01
Relay				
 IYSQ01910949-01 Normal open	 IYSQ01910950-01 Normal closed			
Switch				
IYSQ01910951-01 Open switch	IYSQ01910952-01 Closed switch			

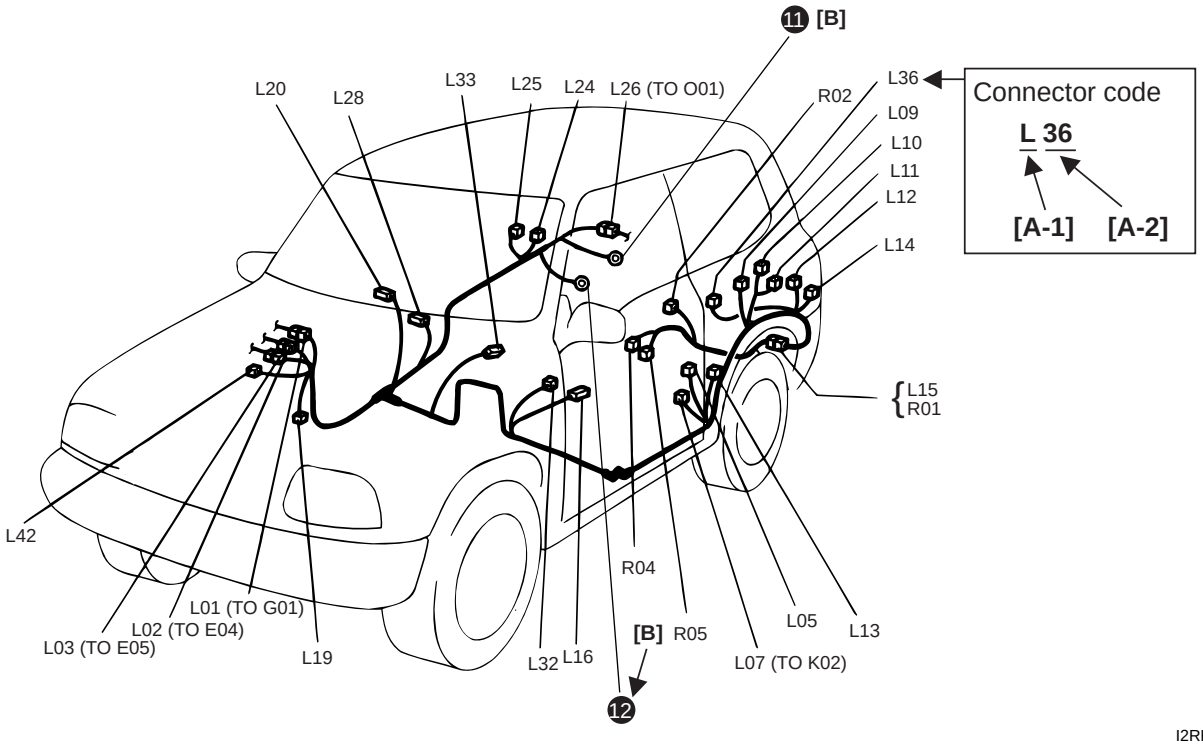
Ignition switch	Keyless entry	Immobilizer system	Combination meter	Lighting switch
I2RH01910912-01	I3JA01910902-01	I3JA01910903-01	 I2RH01910915-01	 I2RH01910916-01
Headlight leveling	Hazard warning light	Front fog light	Rear fog light	Spark plug
I3JA01910904-01	I3JA01910905-01	I3JA01910906-01	 I3JA01910907-01	I2RH01910921-01
Radiator fan	Fuel pump	Injector	XX control module	Windshield wiper
I2RH01910922-01	I3JA01910908-01	 I2RH01910924-01	 I2RH01910925-01	I3JA01910909-01
Windshield washer	Rear wiper	Rear washer	Rear defogger	Power window
I3JA01910910-01	I3JA01910911-01	I3JA01910912-01	I2RH01910930-01	I3JA01910913-01
Power door lock	Power mirror	A/B	Pretensioner	Passenger side
I3JA01910914-01	I3JA01910915-01	I3JA01910916-01	I3JA01910917-01	I3JA01910918-01
Driver side	Seat heater	A/C	Power steering	Side air-bag (R)
I3JA01910919-01	I2RH01910938-01	I3JA01910920-01	I3JA01910921-01	I4JA01910901-01

Side air-bag (L)	Glow plug			
I4JA01910902-01	I4JA01910903-01			

How to Read Connector Layout Diagram

S4RS0A9101005

[A-1]: Harness symbol and corresponding harness name
A: Battery harness
B: A/C harness
C: Engine harness
D: Injector harness
E: Main harness, Oil pressure switch wire, Console wire
G: Instrument panel harness
J: Side door wire (Power window)
K: Interior light harness, Rear speaker wire, Roof wire
L: Floor harness, G sensor wire (Fuel pump harness)
M: Rear bumper harness
O: Rear end door harness
Q: Air bag/Pretensioner harness
R: (Fuel pump wire)
[A-2]: Connector Number
[B]: Ground point No.



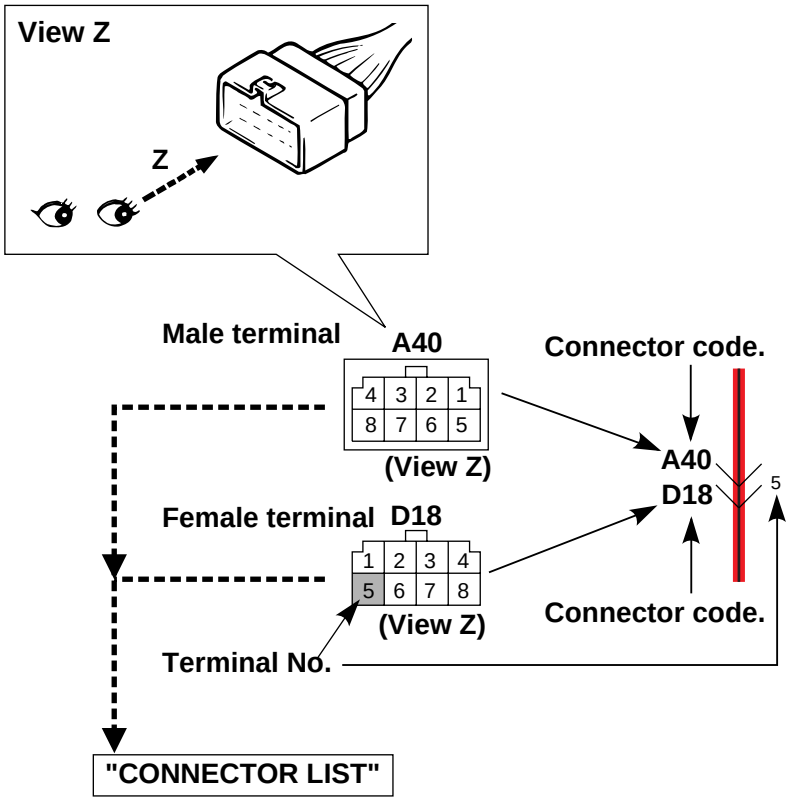
I2RH01910901-

How to Read Connector Codes and Terminal Nos.

S4RS0A9101006

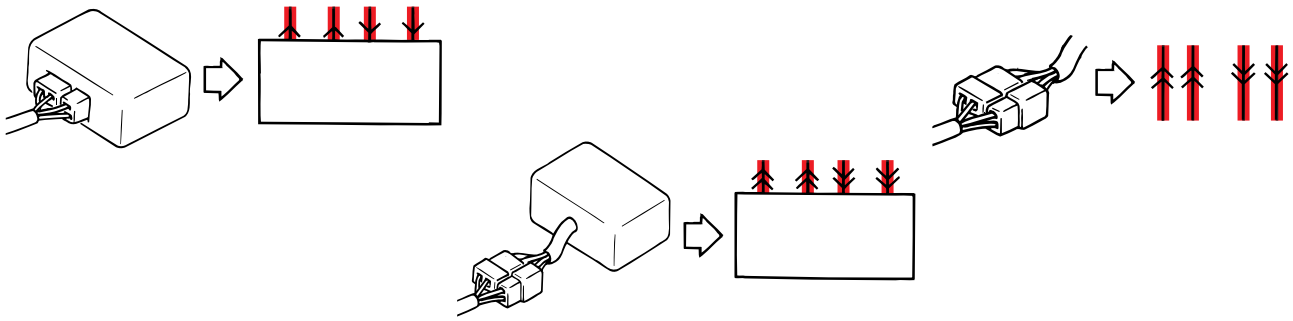
1) Connector code/Terminal No./Terminal layout

- The connector shape and terminal layout shown in this manual are those when viewed from “Z” in the illustration.
  Refer to “List of Connectors: ”.



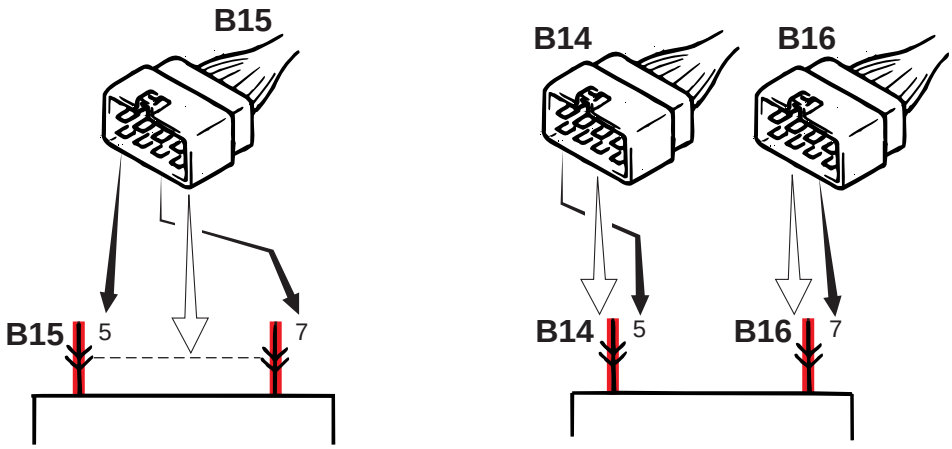
I2RH01910902-

2) Connector type



I2RH01910903-

3) Terminals in one connector (Broken line) (B15)/Terminals in different connectors (B14, B16)

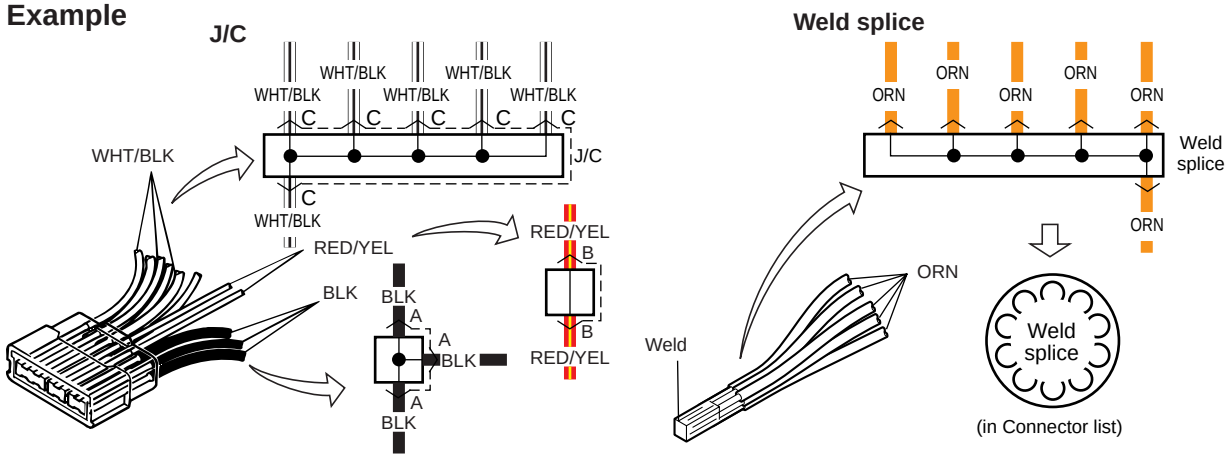


I2RH01910904-

4) Joint connector (J/C)

- The joint connector (J/C) connects several different wires with the same wire color at one place instead of connecting them by welding or caulking one by one. It is not an ordinary connector but a part of the continuous wire in the harness.

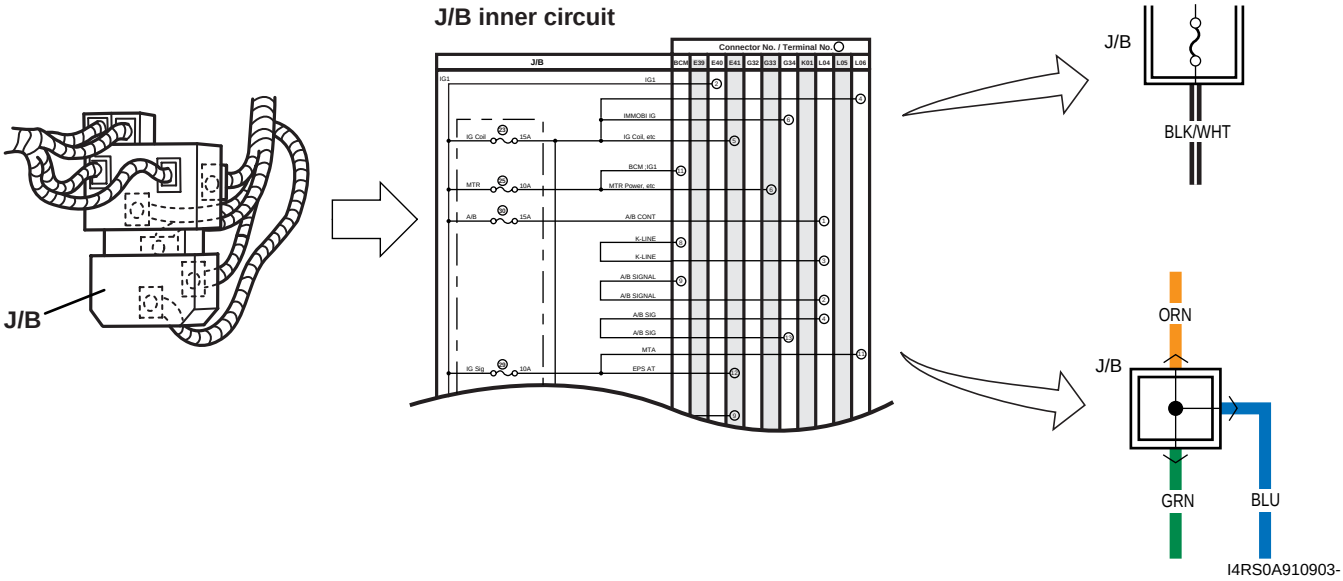
Example



I4RS0A910902-

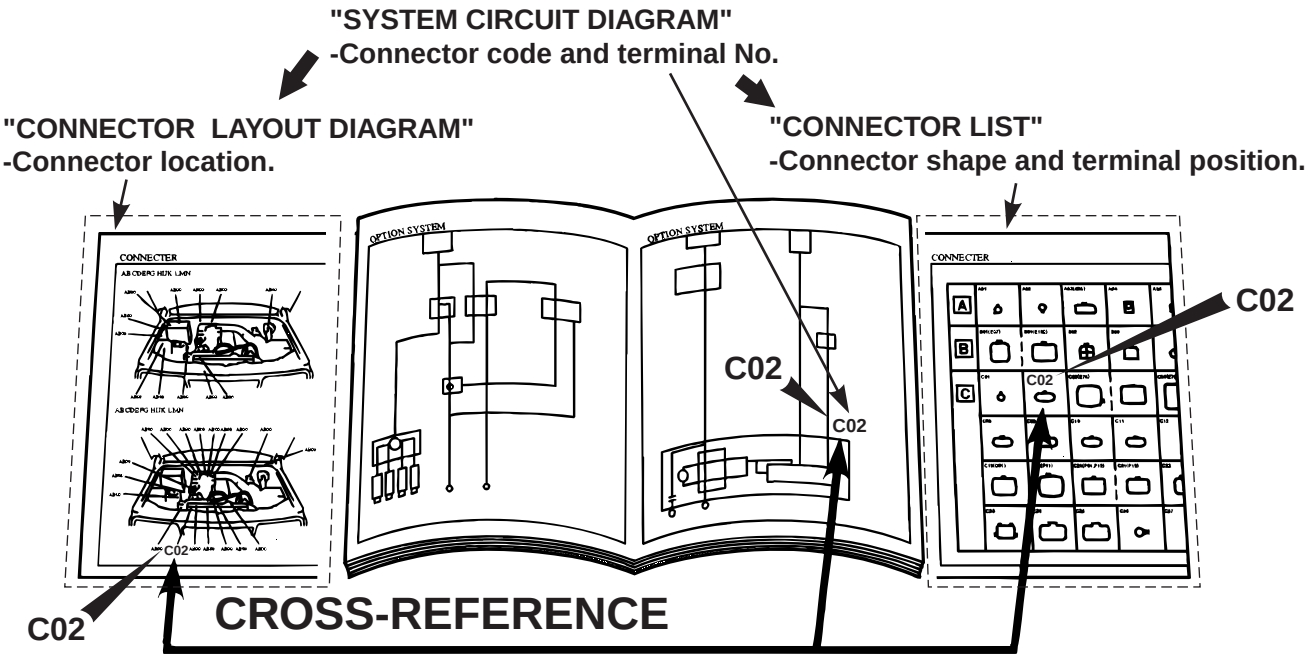
5) Junction block (J/B)

Example



I4RS0A910903-

6) Connector location, shape and terminal No.
Refer to “Connector Layout Diagram: ”.
Refer to “System Circuit Diagram: ”.
Refer to “List of Connectors: ”.

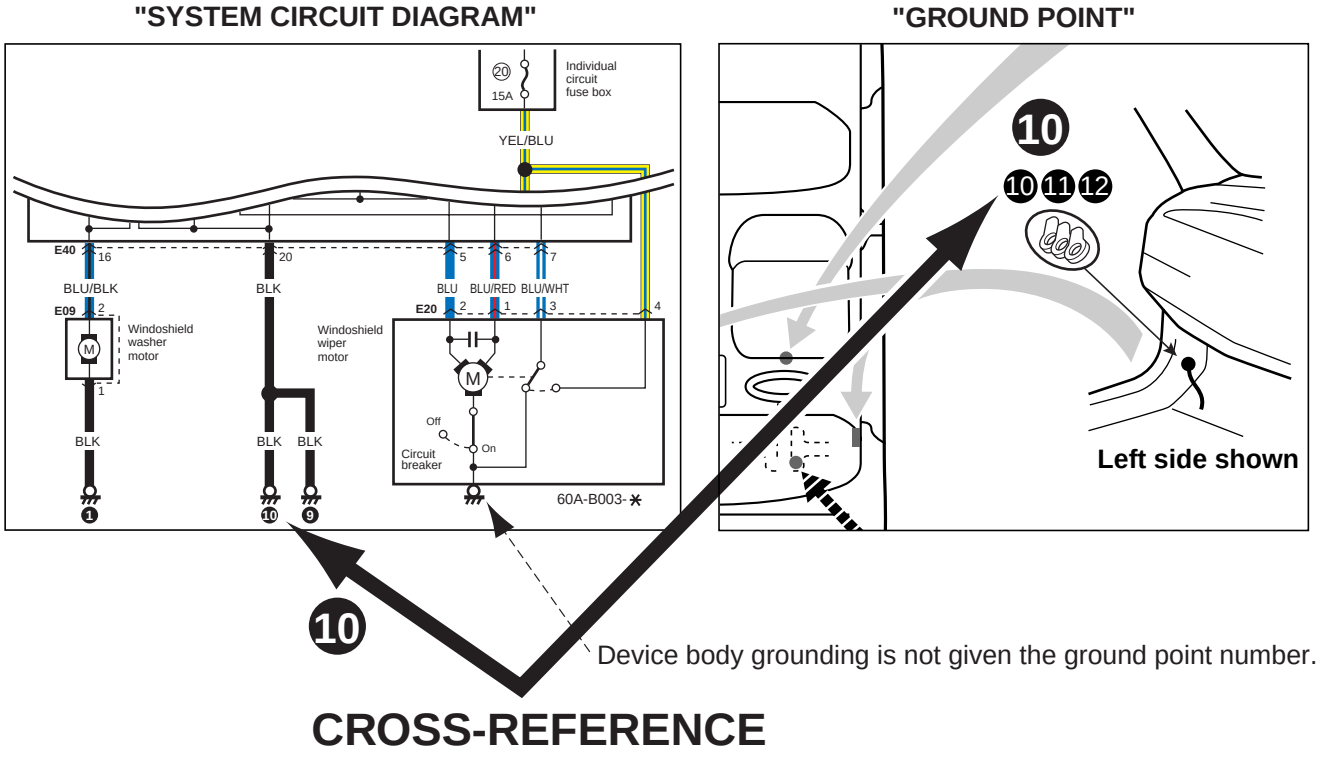


I2RH01910906-

How to Read Ground Point

S4RS0A9101007

Refer to “System Circuit Diagram: ”.
Refer to “Ground (earth) Point: ”.

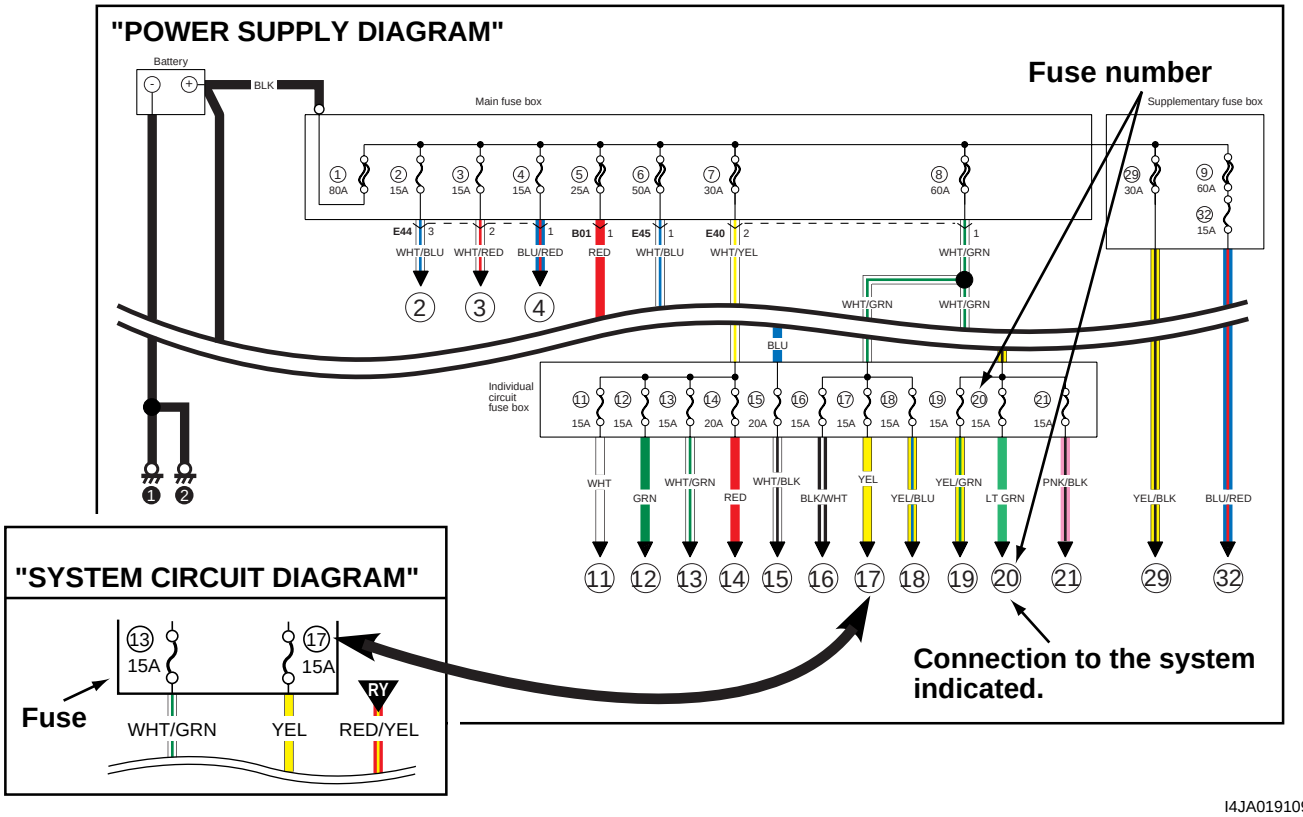


I4JA01910985-

How to Read Power Supply Diagram

S4RS0A9101008

Refer to “Power Supply Diagram: ”.
Refer to “System Circuit Diagram: ”.



I4JA01910986-

How to Read System Circuit Diagram

S4RS0A9101009

The circuit diagram is designed so the current flows from the top of the diagram (power source) to the bottom of the diagram (ground) as if giving an image of water flow.

[A]: Fuse No.
[B]: Circuit jumping page / direction

NOTE:

This means “Jump to the page directed with the arrow(s) by their number.
(For example:” Two arrows directing left” means” Jump to two pages before”.)
You will find the same symbol with the arrows directing opposite in the referenced page. The circuit continues between the symbols.

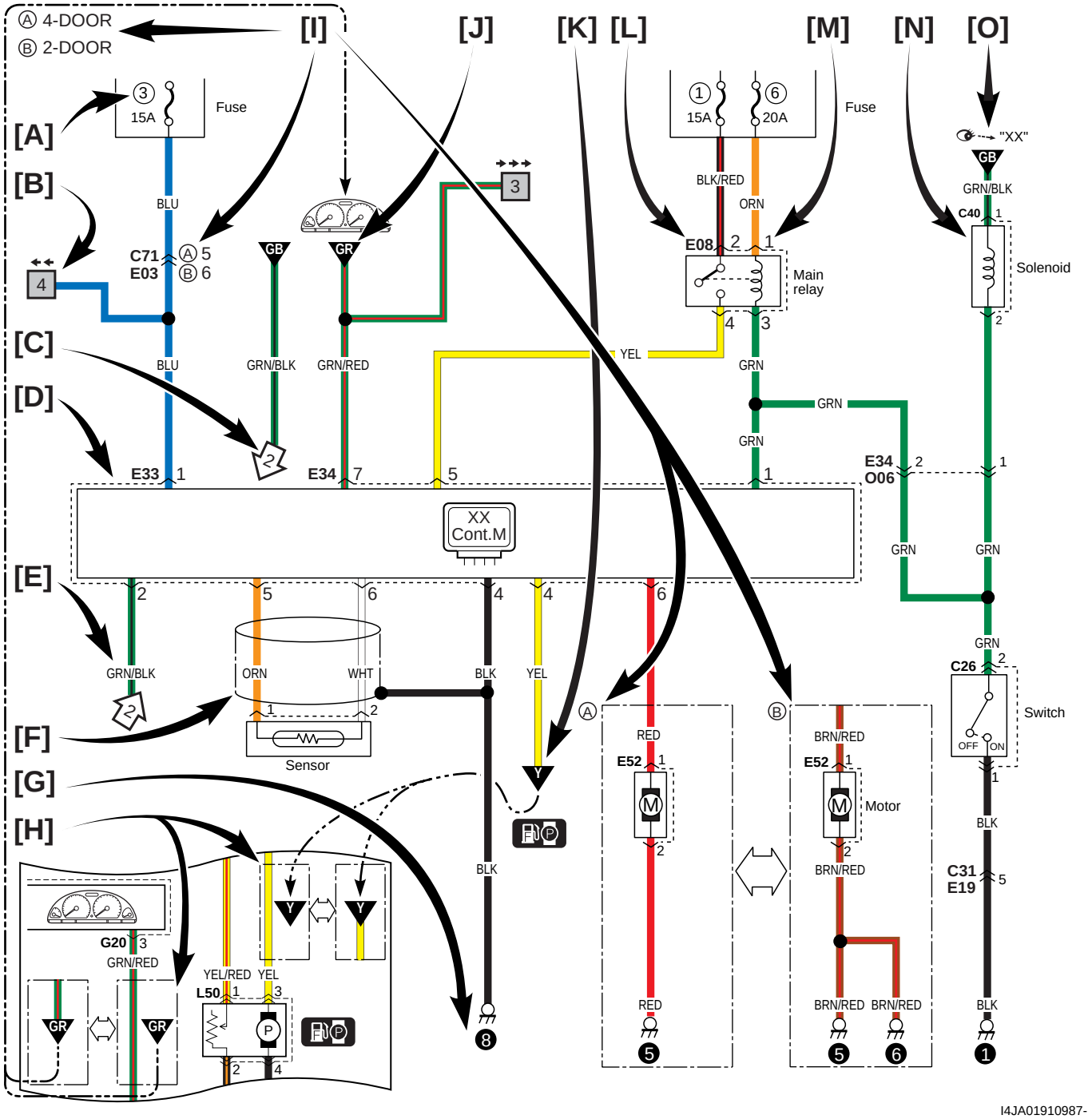
[C]: Circuit jumping point / direction

NOTE:

The circuit continues to the same symbol with opposite direction within the page.
You will find the other symbol in the direction of the arrow.

[D]: Terminals-in-one-connector mark
[E]: Wire color
[F]: Shield wire
[G]: Ground point
[H]: “From” or “To” (With ID letter (s))
[I]: Specification variation
The white arrow between A and B means “or”.
[J]: “From” (With ID letter (s))
[K] “To” (With ID letter (s))
[L]: Connector code

[M]: Terminal No.
[N]: Symbol mark
[O]: “SEE” mark



Connector Layout Diagram

Connector Layout Diagram

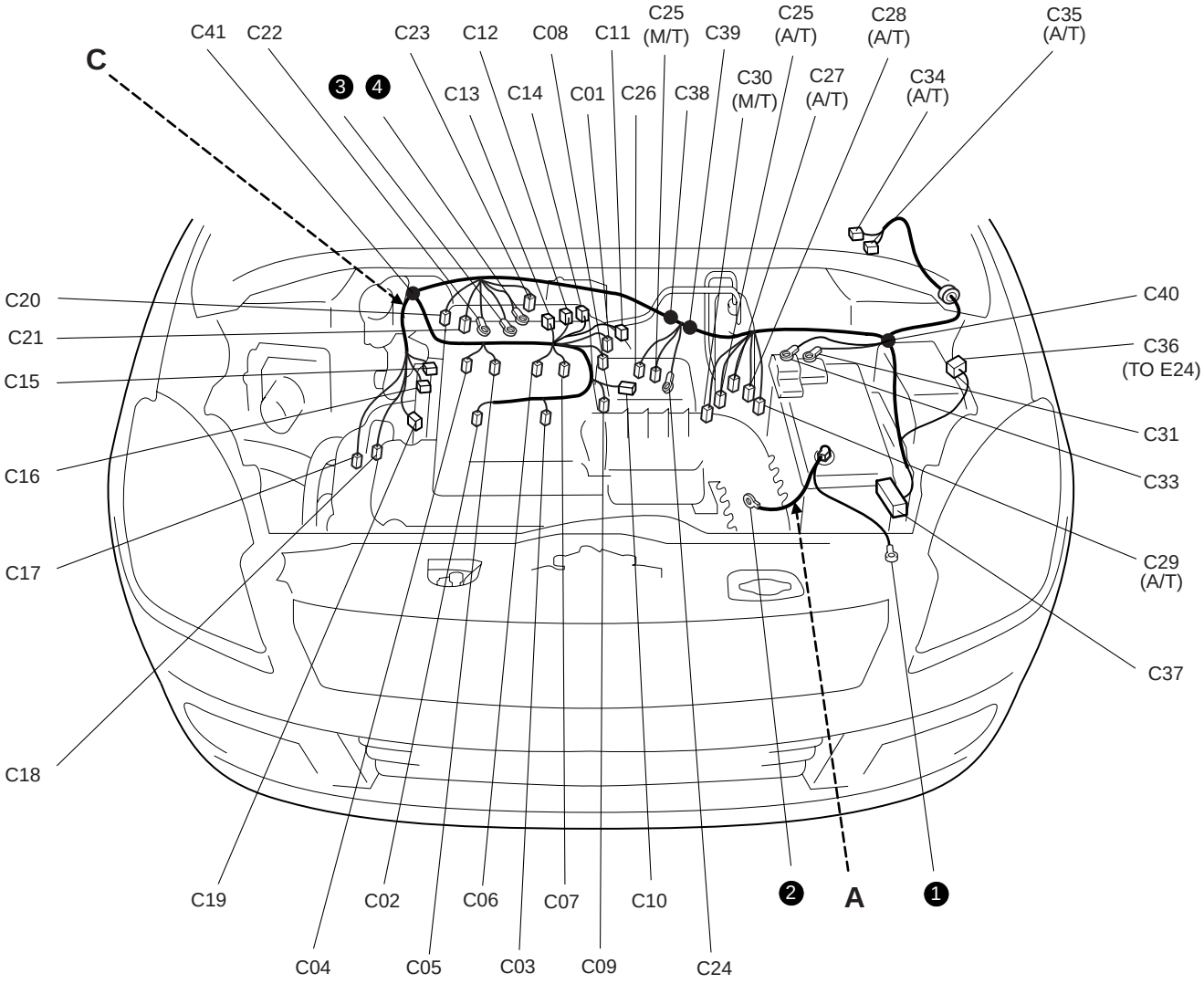
S4RS0A910A001

Refer to “Engine Compartment: ”.
Refer to “Instrument Panel: ”.
Refer to “Door, Roof: ”.
Refer to “Floor: ”.
Refer to “Rear: ”.

Engine Compartment

S4RS0A910A002

A: Battery cable / C: Engine harness



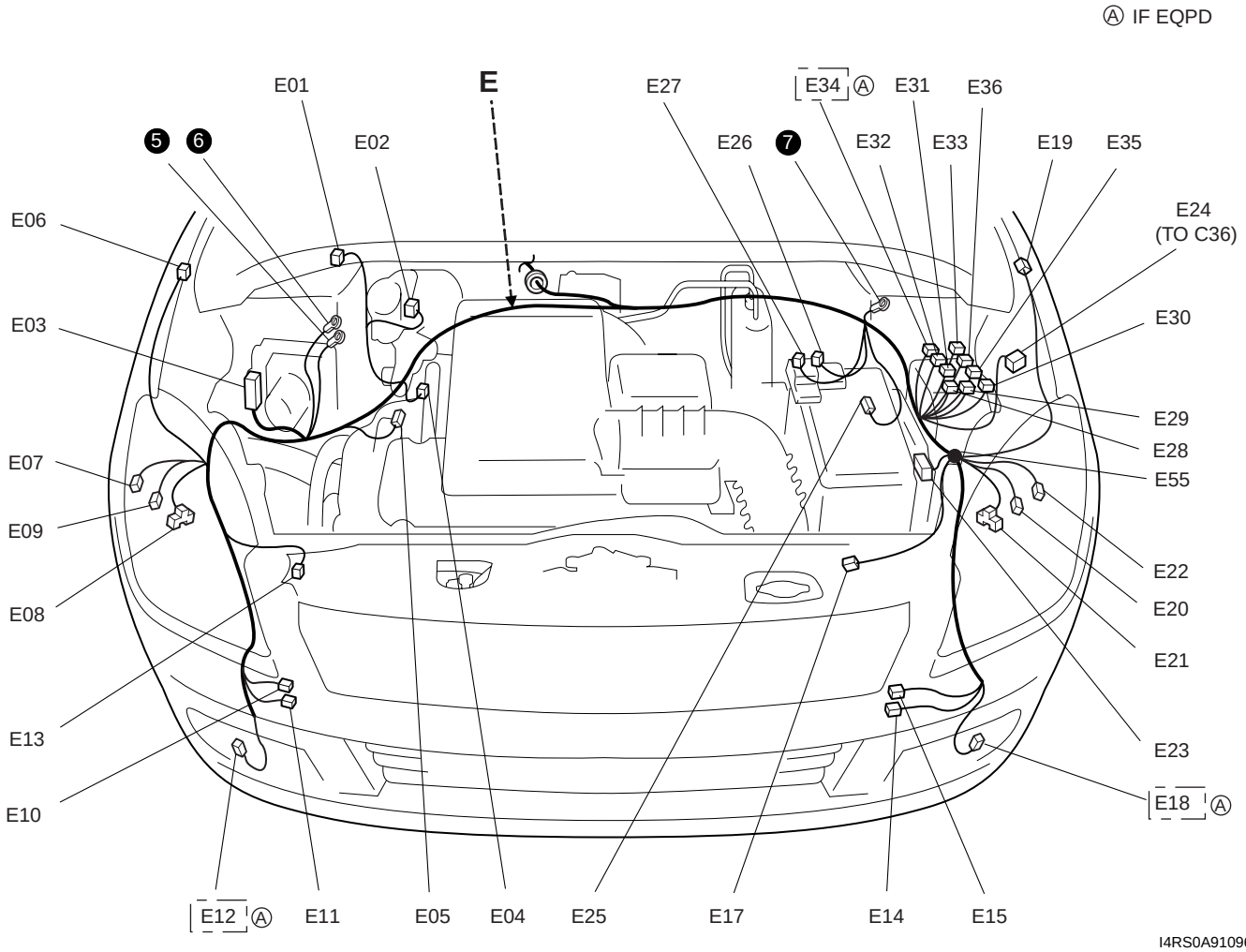
I4RS0A910964-

C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/GRY	IAC valve	C21/GRY	Generator #1
C02/GRY	IG Coil #1	C22/-	Generator #2
C03/GRY	IG Coil #2	C23/BLK	Starting motor #1
C04/GRY	Injector #1	C24/-	Starting motor #2
C05/GRY	Injector #2	C25/GRY	Vehicle speed sensor
C06/GRY	Injector #3	C26/GRY	Knock sensor
C07/GRY	Injector #4	C27/BLU (A/T)	Input sensor
C08/BLK	CMP sensor	C28/GRY (A/T)	Trans axle range sensor

No./Color	Connective position	No./Color	Connective position
C09/GRN	ECT sensor	C29/GRY (A/T)	Shift solenoid
C10/GRY	EGR stepper motor	C30/BLK (M/T)	Back-up light switch
C11/BLK	Throttle position sensor	C31/-	Main fuse box
C12/BLK	MAP sensor	C33/-	Main fuse box
C13/BLK	MAF sensor	C34/N (A/T)	TCM
C14/BLK	EVAP canister vent valve	C35/N (A/T)	TCM
C15/GRY	Heated oxygen sensor #1	C36/N	Main harness (To E24)
C16/GRN	Heated oxygen sensor #2	C37/GRY	ECM
C17/BLK	A/C compressor	C38/-	Weld splice
C18/N	Oil pressure sensor	C39/-	Weld splice
C19/BLU	VVT solenoid	C40/-	Weld splice
C20/GRY	CKP sensor	C41/-	Weld splice

E: Main harness



E: Main harness

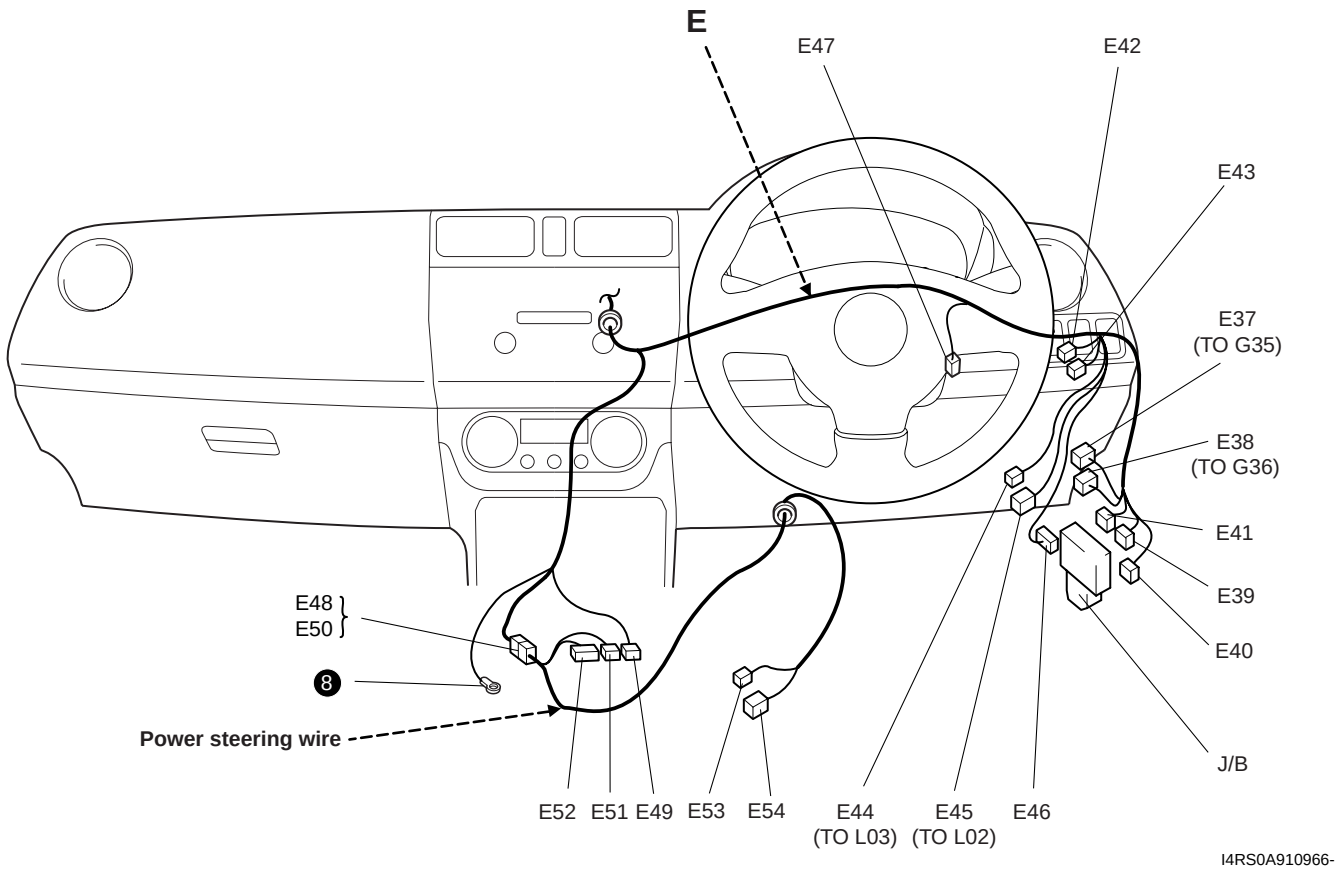
No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E20/GRY	Front turn signal light (L)
E02/GRY	Brake fluid level switch	E21/BLK	Headlight (R)
E03/BLK	ABS control module	E22/N	Front position light (L)
E04/BLK	A/C pressure sensor	E23/GRY	ECM
E05/BLK	Wheel speed sensor (FR)	E24/N	Engine Harness (To C36)
E06/N	Side turn signal light (R)	E25/BLK	Wheel speed sensor (FL)
E07/N	Front position light (R)	E26/N	Main fuse box

No./Color	Connective position	No./Color	Connective position
E08/BLK	Head light (R)	E27/BLK	Main fuse box
E09/GRY	Front turn signal light (R)	E28/N	Radiator fan relay #1
E10/GRN	Rear washer motor	E29/N	Radiator fan relay #2
E11/BLU	Windshield washer motor	E30/N	Radiator fan relay #3
E12/BLK (IF EQPD)	Front fog light (R)	E31/N	Starting motor relay
E13/YEL	Forward sensor	E32/N	Main relay
E14/BLK	Ambient temperature sensor	E33/N	A/T relay
E15/BLK	Horn	E34/N	Front fog light relay
E17/BLK	Radiator fan motor	E35/N	Fuel pump relay
E18/BLK (IF EQPD)	Front fog light (L)	E36/N	A/C compressor relay
E19/N	Side turn signal light (L)	E55/-	Weld splice

Instrument Panel

S4RS0A910A003

E: Main harness and power steering wire



I4RS0A910966-

E: Main harness

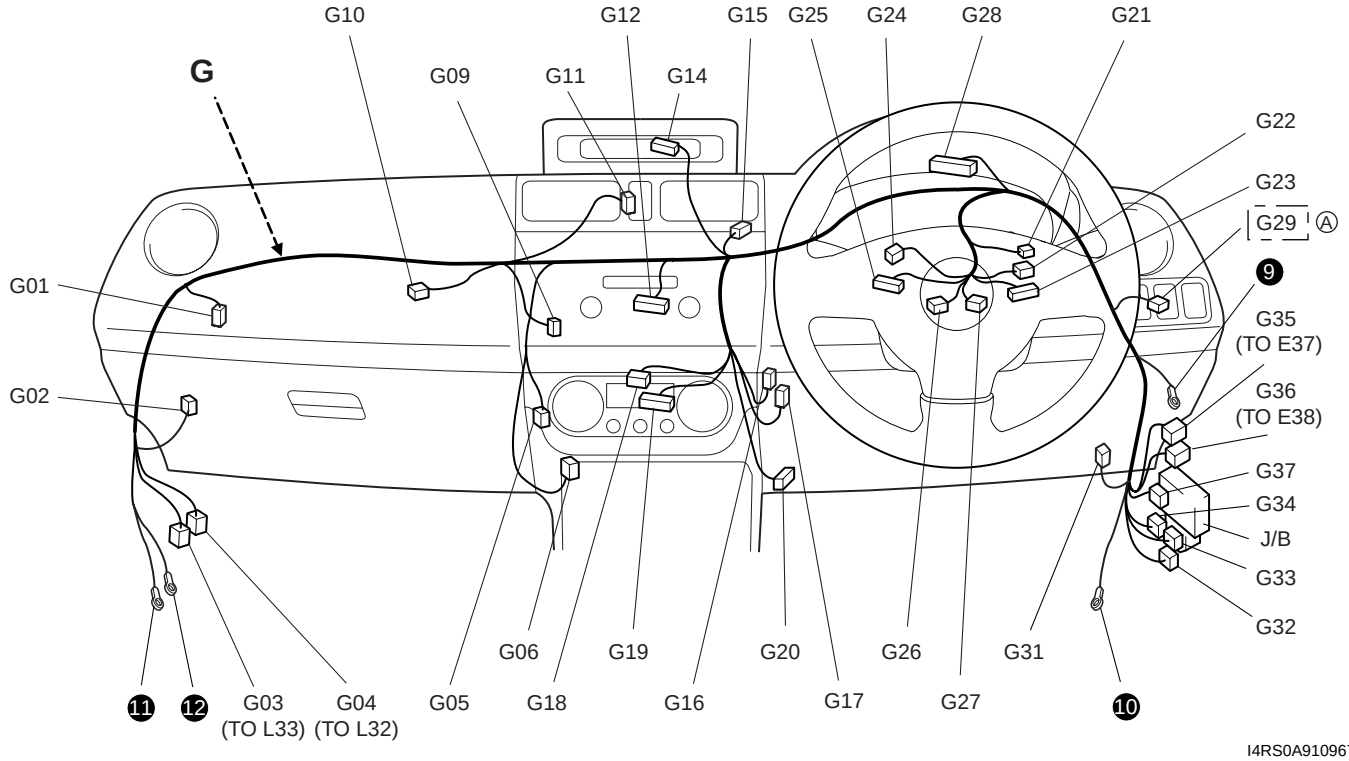
No./Color	Connective position	No./Color	Connective position
E37/GRY	Instrument panel harness (To G35)	E44/YEL	Floor harness (To L03)
E38/N	Instrument panel harness (To G36)	E45/N	Floor harness (To L02)
E39/BRN	J/B	E46/BLU	BCM
E40/N	J/B	E47/N	Brake lamp switch
E41/N	J/B	E48/BLU	Power steering wire (To E50)
E42/N	J/C	E49/BLK	P/S control module
E43/N	J/C		

E: Power steering wire

No./Color	Connective position	No./Color	Connective position
E50/BLU	Main harness (To E48)	E53/BLK	P/S torque sensor
E51/BLU	P/S control module	E54/GRY	P/S motor
E52/BLK	P/S control module		

G: Instrument panel harness

Ⓐ IF EQPD



I4RS0A910967-

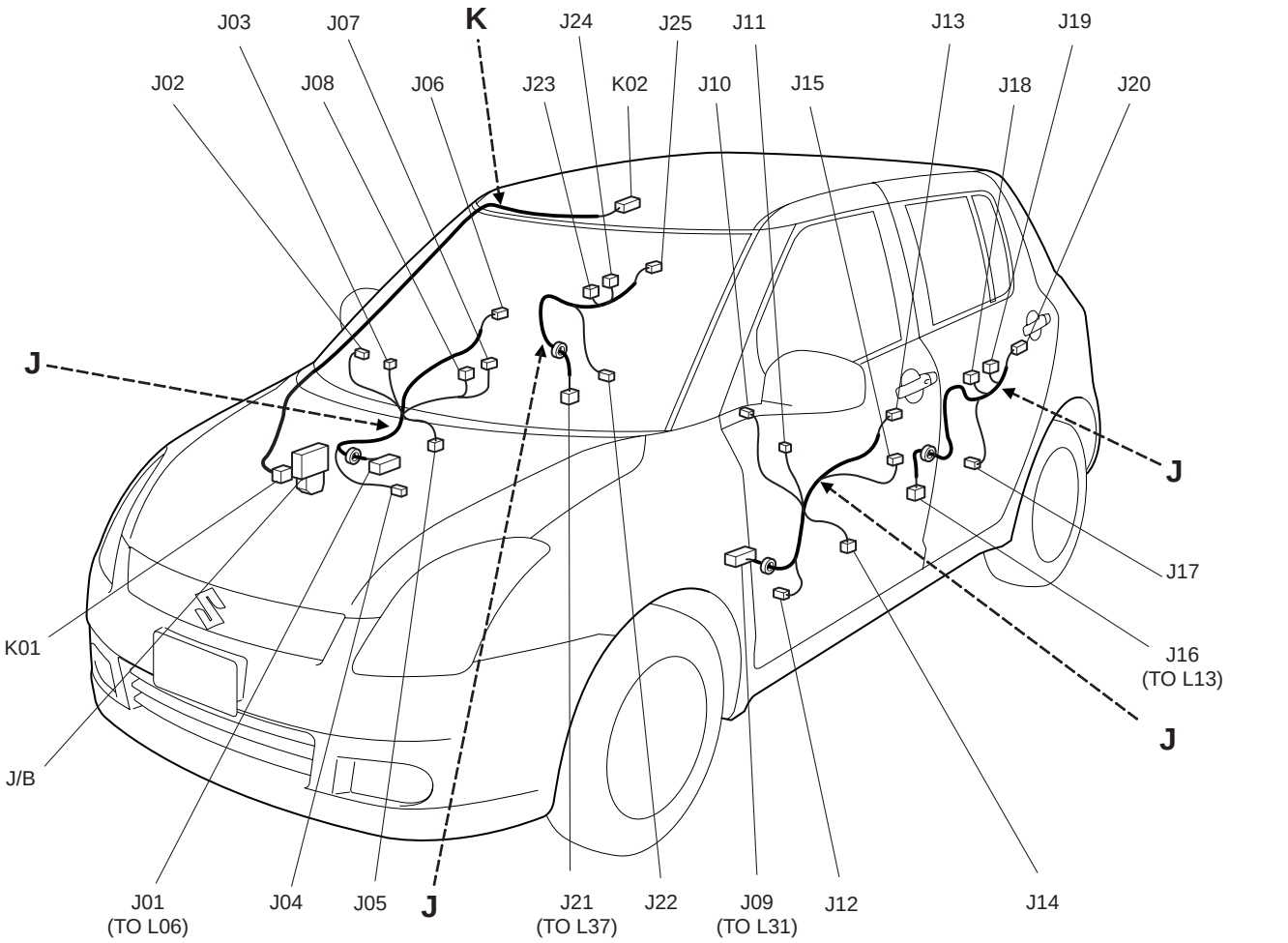
G: Instrument panel harness

No./Color	Connective position	No./Color	Connective position
G01/YEL	Fresh / Recircle actuator	G20/BLK	Data link connector
G02/N	Keyless receiver	G21/N	IG switch
G03/N	Floor harness (To L33)	G22/N	Main switch (Key switch)
G04/YEL	Floor harness (To L34)	G23/BLK	COMB switch
G05/N	Blower fan motor	G24/BLK	ICM
G06/N	Heater resister	G25/N	COMB switch
G09/N	EVAP thermistor	G26/YEL	Driver inflator
G10/BLK	Passenger inflator	G27/N	COMB switch
G11/N	Hazard switch	G28/GRY	COMB meter
G12/BLU	Audio	G29/GRN	Front fog light switch
G13/N	Navigation	G31/N	J/C
G14/GRN	Multi information display	G32/N	J/B
G15/GRY	J/C	G33/N	J/B
G16/BLU	J/C	G34/N	J/B
G17/N	J/C	G35/GRY	Main harness (To E37)
G18/GRN	Mode control switch	G36/N	Main harness (To E38)
G19/BRN	Heater fan switch	G37/BLU	BCM

Door, Roof

S4RS0A910A004

J: Front and rear door wire and rear door joint wire / K: Roof wire



I4RS0A910968-

J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/N	Floor harness (To L06)	J05/GRY	Front power window motor (Driver side)
J02/BLK	Tweeter (Driver side)	J06/N	Front door lock switch (Driver side)
J03/N	Power mirror motor (Driver side)	J07/N	Power mirror switch (Driver side)
J04/N	Front speaker (Driver side)	J08/BLK	Power window main switch

J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J09/N	Floor harness (To L03)	J13/N	Front door lock motor (Passenger side)
J10/BLK	Tweeter (Passenger side)	J14/GRY	Front power window motor (Passenger side)
J11/N	Power mirror motor (Passenger side)	J15/N	Power window sub switch
J12/N	Front speaker (Passenger side)		

J: Rear door wire

No./Color	Connective position	No./Color	Connective position
J16/N	Floor harness (To L13)	J21/N	Floor harness (To L37)
J17/N	Rear speaker (R)	J22/N	Rear speaker (L)
J18/BLK	Rear power window motor (R)	J23/BLK	Rear power window motor (L)
J19/N	Rear power window sub switch (R)	J24/N	Rear power window sub switch (L)
J20/N	Rear door lock motor (R)	J25/N	Rear door lock motor (L)

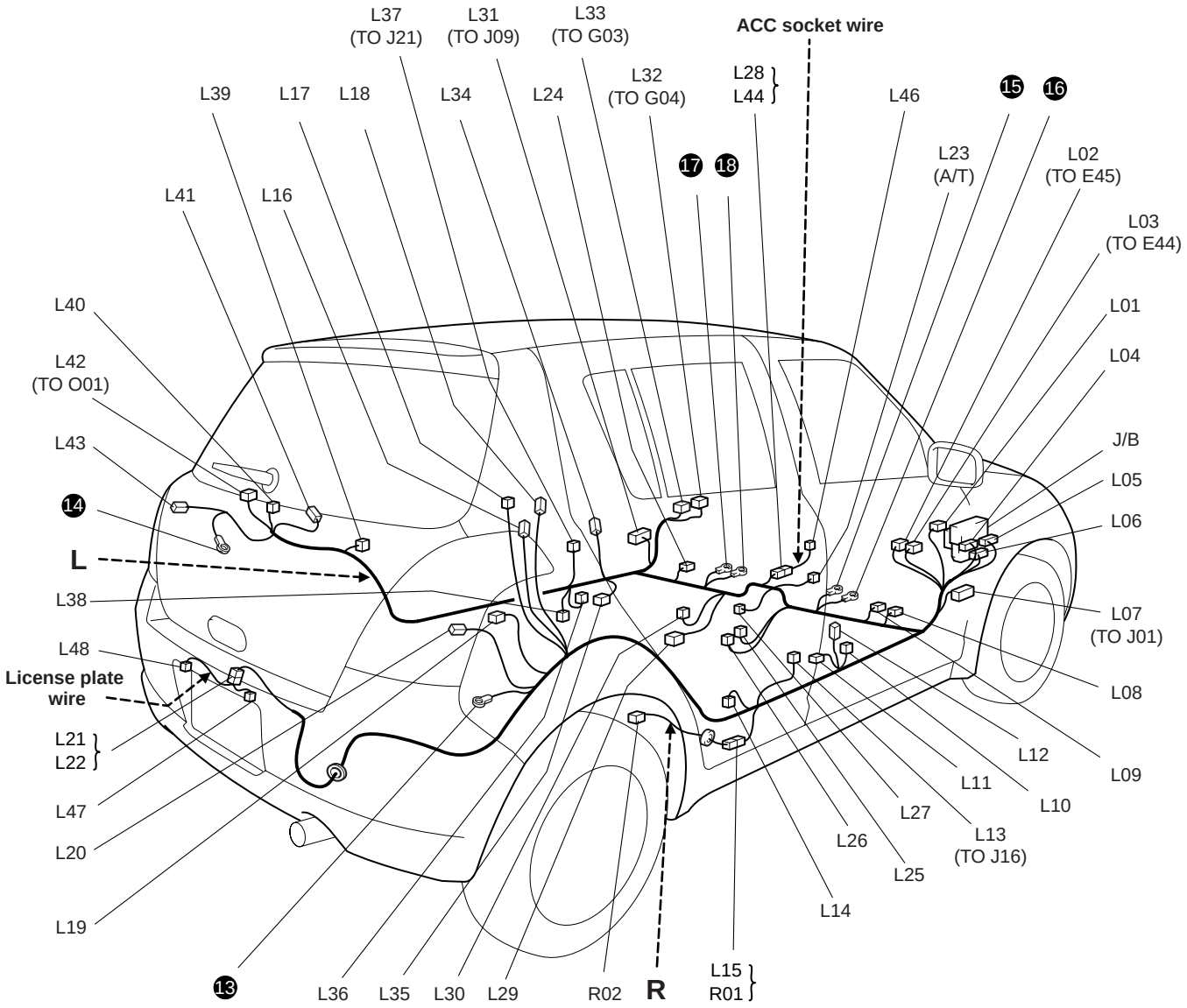
K: Roof wire

No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/GRY	Interior light

Floor

S4RS0A910A005

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire



I4RS0A910969-

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L24/GRY	J/C
L02/N	Main harness (To E44)	L25/YEL	Side air-bag inflator (Driver side)
L03/YEL	Main harness (To E45)	L26/N	Seat belt switch
L04/YEL	J/B	L27/BLK	Parking brake switch
L05/N	J/B	L28/BLU	ACC socket wire (To L44)
L06/N	J/B	L29/PNK	A/B SDM
L07/N	Front door wire (Driver side) (To J01)	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L08/N	J/C	L30/YEL	Side air-bag inflator (Passenger side)
L09/N	J/C	L31/N	Front door wire (Passenger side) (To J09)
L10/BLK	Pretentioner (Driver side)	L32/YEL	Instrument panel harness (To G04)
L11/N	Side air-bag sensor (Driver side)	L33/N	Instrument panel harness (To G03)
L12/N	Front door switch (Driver side)	L34/N	Front door switch (Passenger side)
L13/N	Rear door wire (R) (To J16)	L35/N	Side air- bag sensor (Passenger side)
L14/N	Wheel speed sensor (RR)	L36/BLK	Pretentioner (Passenger side)
L15/GRY	Fuel pump wire (To R01)	L37/N	Rear door wire (L) (To J21)
L16/N	Rear door switch (R)	L38/N	Wheel speed sensor (RL)
L17/N	High mounted stop lamp	L39/N	Antenna amplifier
L18/BLK	Side curtain air-bag (R)	L40/N	Rear door switch (L)
L19/GRY	Luggage compartment light	L41/BLK	Side curtain air-bag (L)
L20/N	Rear combination lamp (R)	L42/N	Rear end door wire (To O01)
L21/N	License plate wire (To L22)	L43/BLK	Rear combination lamp (L)
L23/N (A/T)	A/T shift lever		

L: ACC socket wire

No./Color	Connective position	No./Color	Connective position
L44/BLU	Floor harness (To L28)	L46/N	ACC socket

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

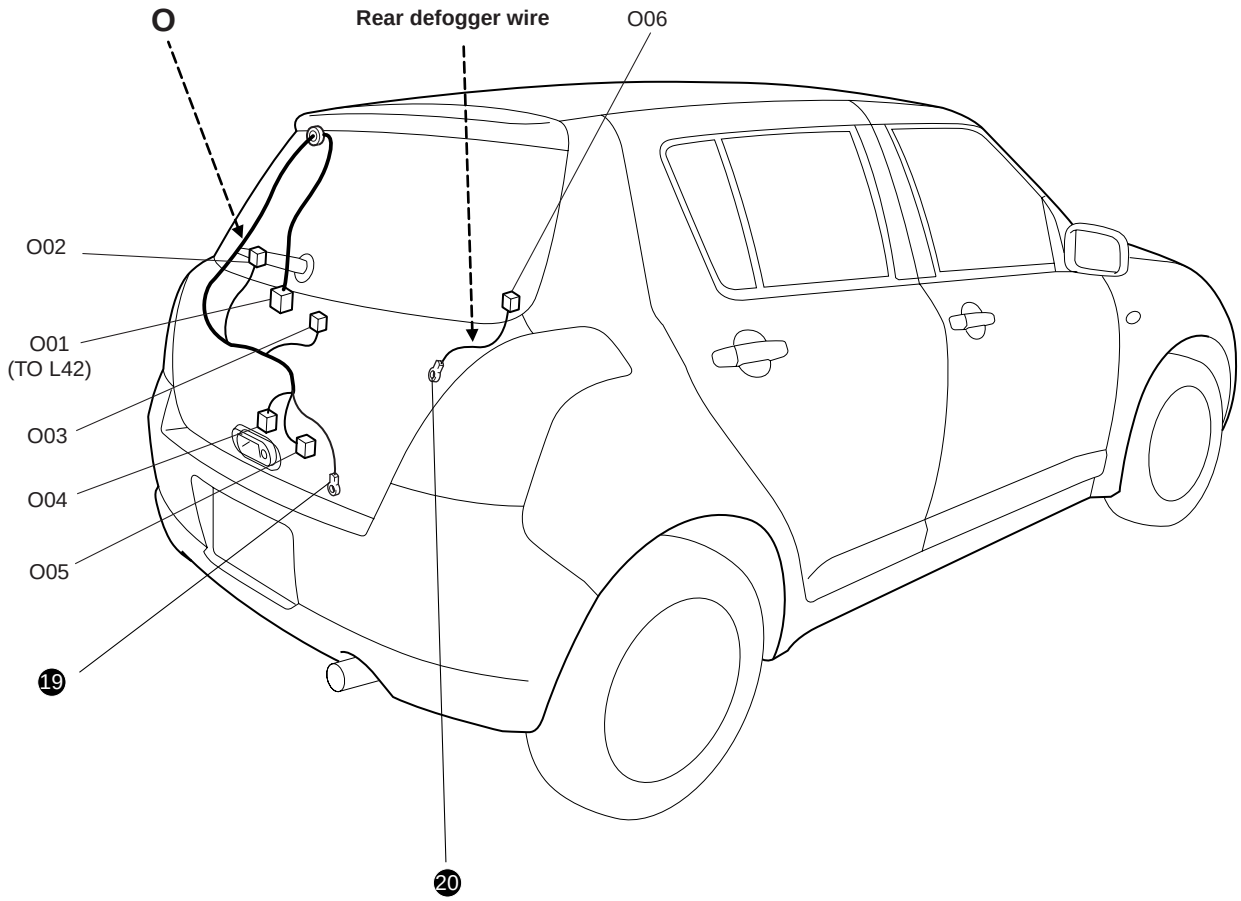
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/BLK	Fuel pump and gauge

Rear

S4RS0A910A006

O: Rear end door harness, Rear defogger wire



I4RS0A910970-

O: Rear end door harness

No./Color	Connective position	No./Color	Connective position
O01/N	Floor harness (To L42)	O04/N	Rear end door lock solenoid
O02/BLK	Rear defogger (+)	O05/GRN	Rear end door lock switch
O03/N	Rear wiper motor		

O: Rear defogger wire

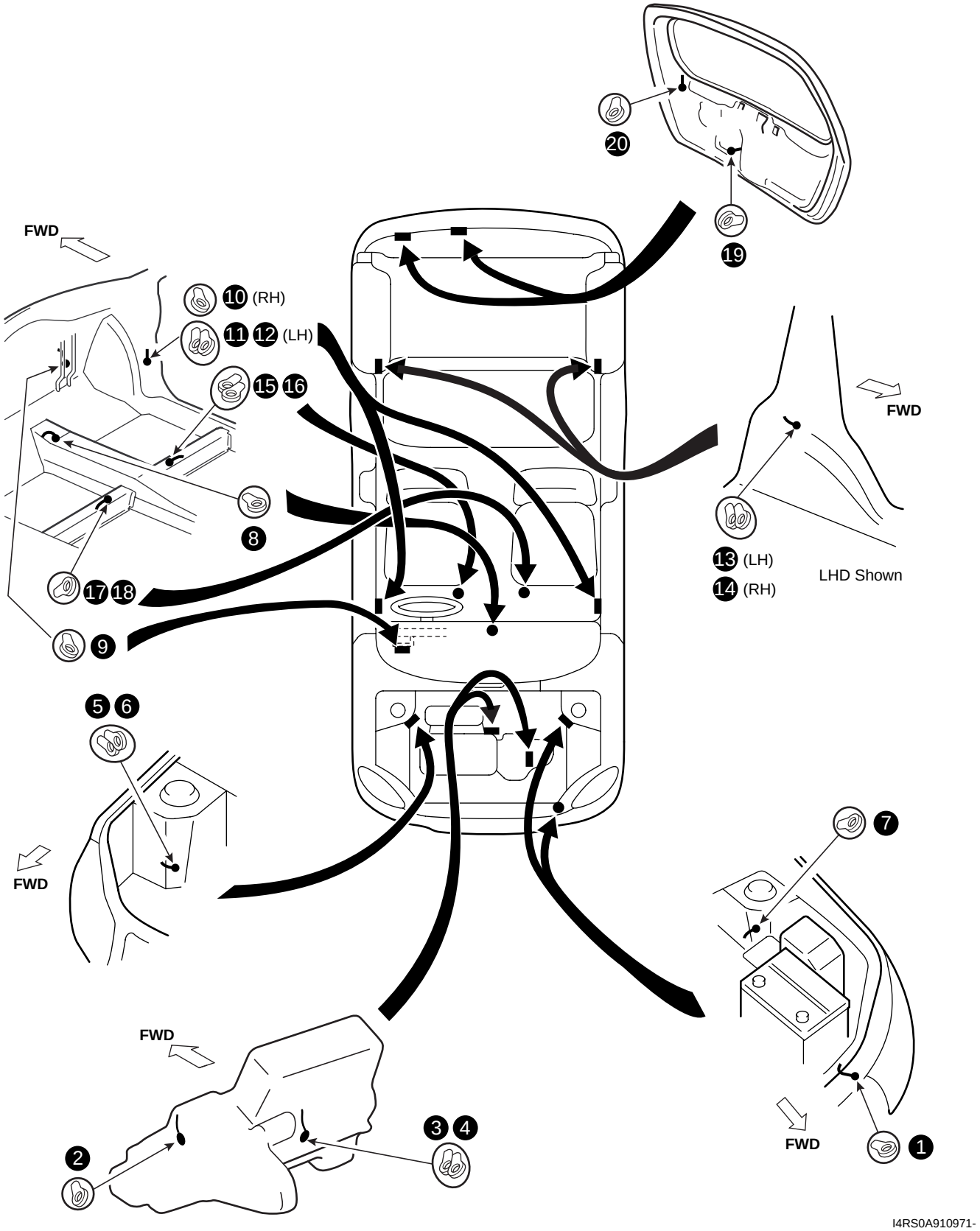
No./Color	Connective position	No./Color	Connective position
O06/BLK	Rear defogger (–)		

Ground Point

Ground (earth) Point

S4RS0A910C001

Refer to “Connector Layout Diagram: ”.



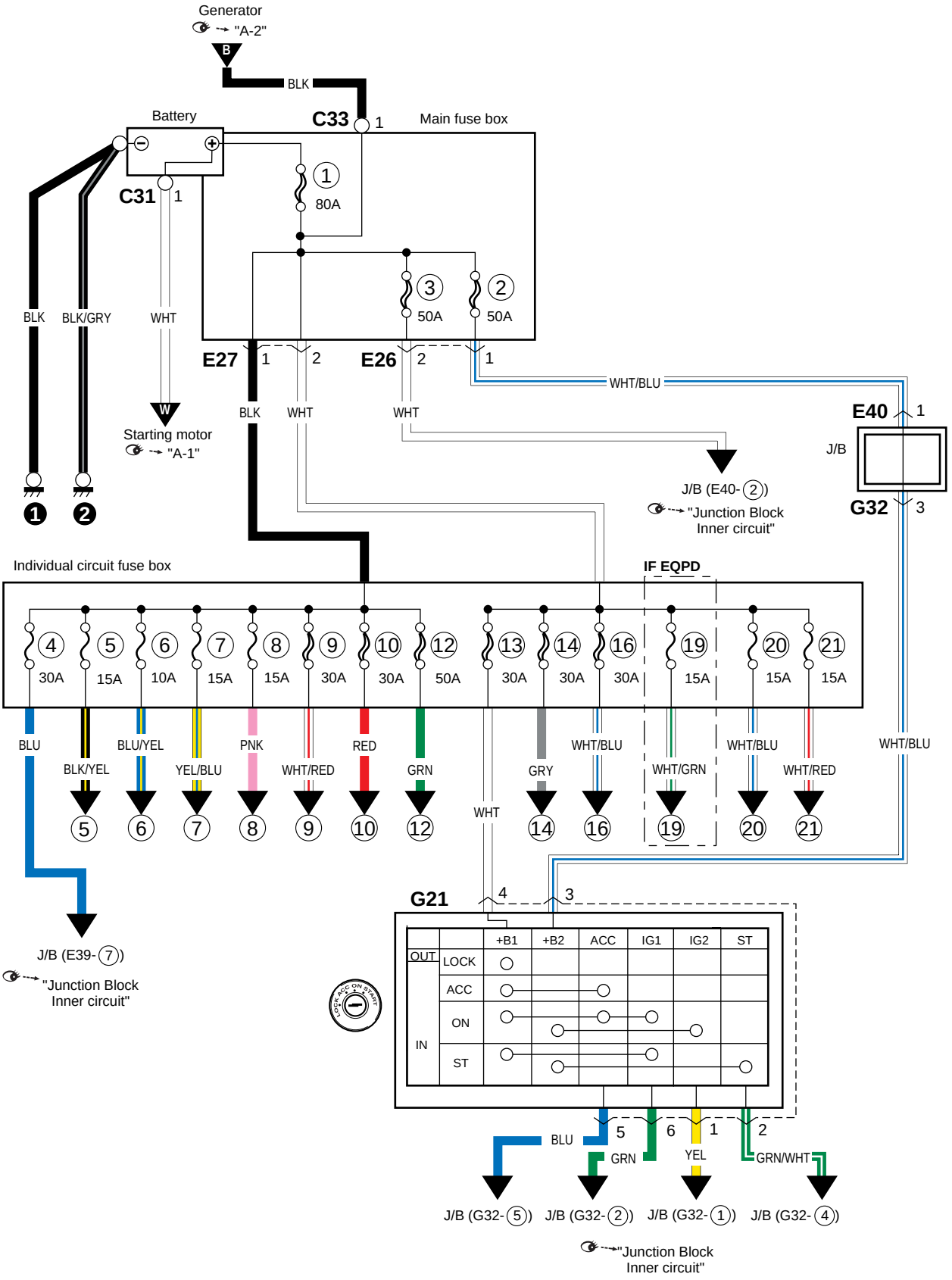
I4RS0A910971-

Power Supply Diagram

Power Supply Diagram

S4RS0A910D001

Refer to “Fuses and the Protected Parts: ”.
Refer to “Fuses in Main Fuse Box: ”.
Refer to “Individual Circuit Fuse Box No. 1: ”.
Refer to “Individual Circuit Fuse Box No. 2 (In J/B): ”.
Refer to “Junction Block (J/B) Connector / Fuse Layout: ”.
Refer to “Junction Block Inner Circuit (Overview): ”.
Refer to “Junction Block Inner Circuit (Detail): ”.



I4RS0A910904-

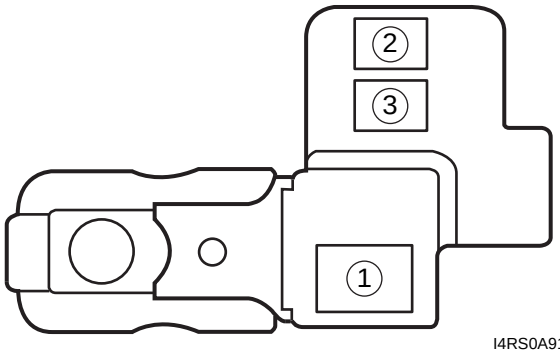
Fuses and the Protected Parts

S4RS0A910D002

The chart below describes what parts each fuse protects.

Fuses in Main Fuse Box

S4RS0A910D003

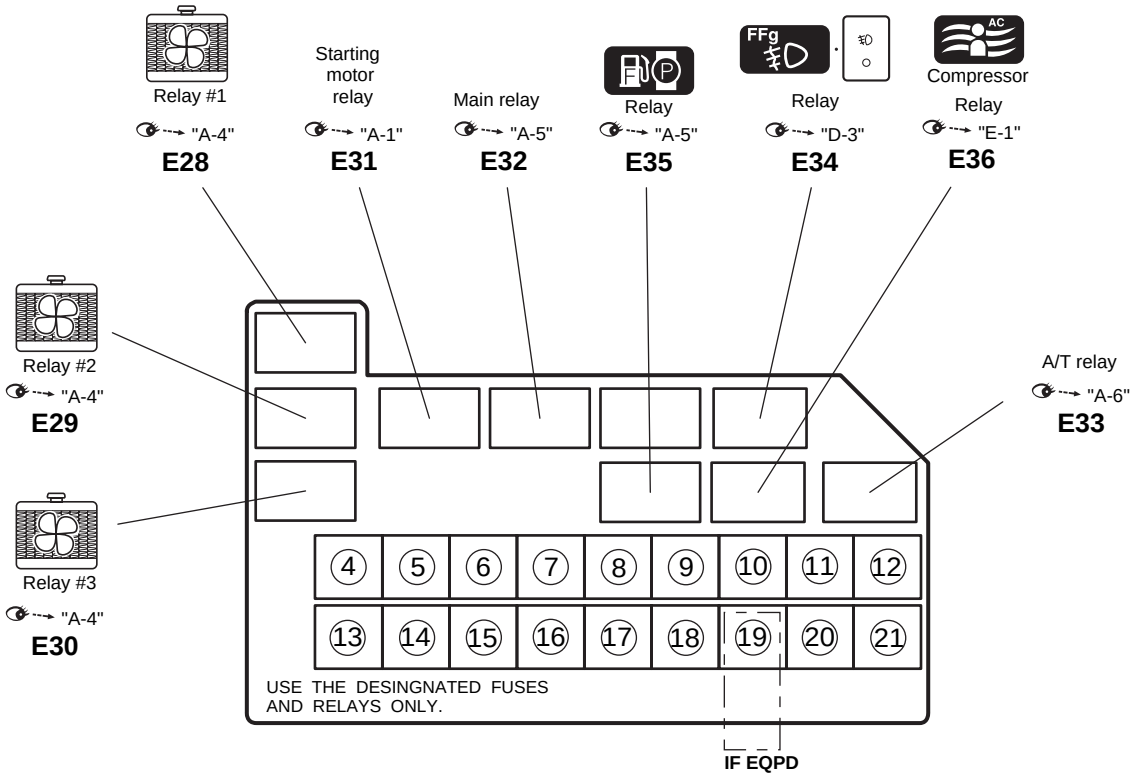


I4RS0A910905-

No.	Fuse	Protected circuit
①	80 A	All electric circuit
		Battery
		Generator
②	50 A	LAMP
③	50 A	IG switch
		Supplementary fuse box No.2 (In J/B)

Individual Circuit Fuse Box No. 1

S4RS0A910D004



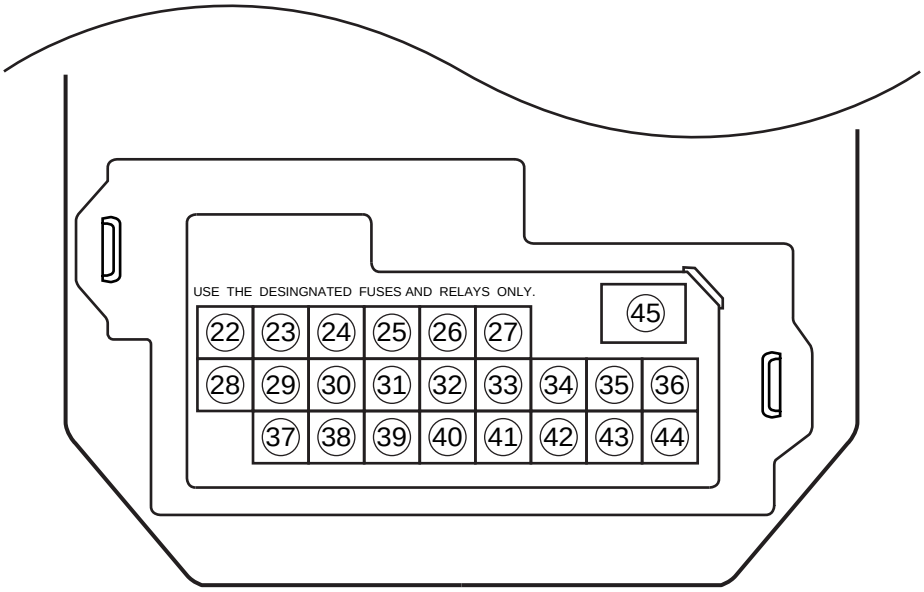
I4RS0A910906-

No.	Fuse	Description on the cover	Protected circuit
④	30 A	HTR FAN	Heater relay
⑤	15 A	FI	Main relay
⑥	10 A	A/C CPRSR	A/C compressor relay
⑦	15 A	AT ETM	A/T relay
⑧	15 A	STOP LAMP	Brake light switch
⑨	30 A	ABS MOT	ABS control module
⑩	30 A	ST MOT	Starting motor relay
⑪	50 A	MTA	BLANK
⑫	50 A	EPS	Power steering control module

No.	Fuse	Description on the cover	Protected circuit
⑬	30 A	IG ACC	IG switch
⑭	30 A	RDTR FAN	Radiator fan relay #1
			Radiator fan relay #2
⑮	BLANK	BLANK	BLANK
⑯	30 A	ABS SOL	ABS control module
⑰	BLANK	BLANK	BLANK
⑱	15 A	THR MOT	BLANK
⑲	15 A	FR FOG	Front fog light relay
⑳	15 A	H/L L	Headlight (L)
㉑	15 A	H/L R	Headlight (R)

Individual Circuit Fuse Box No. 2 (In J/B)

S4RS0A910D005



I4RS0A910907-

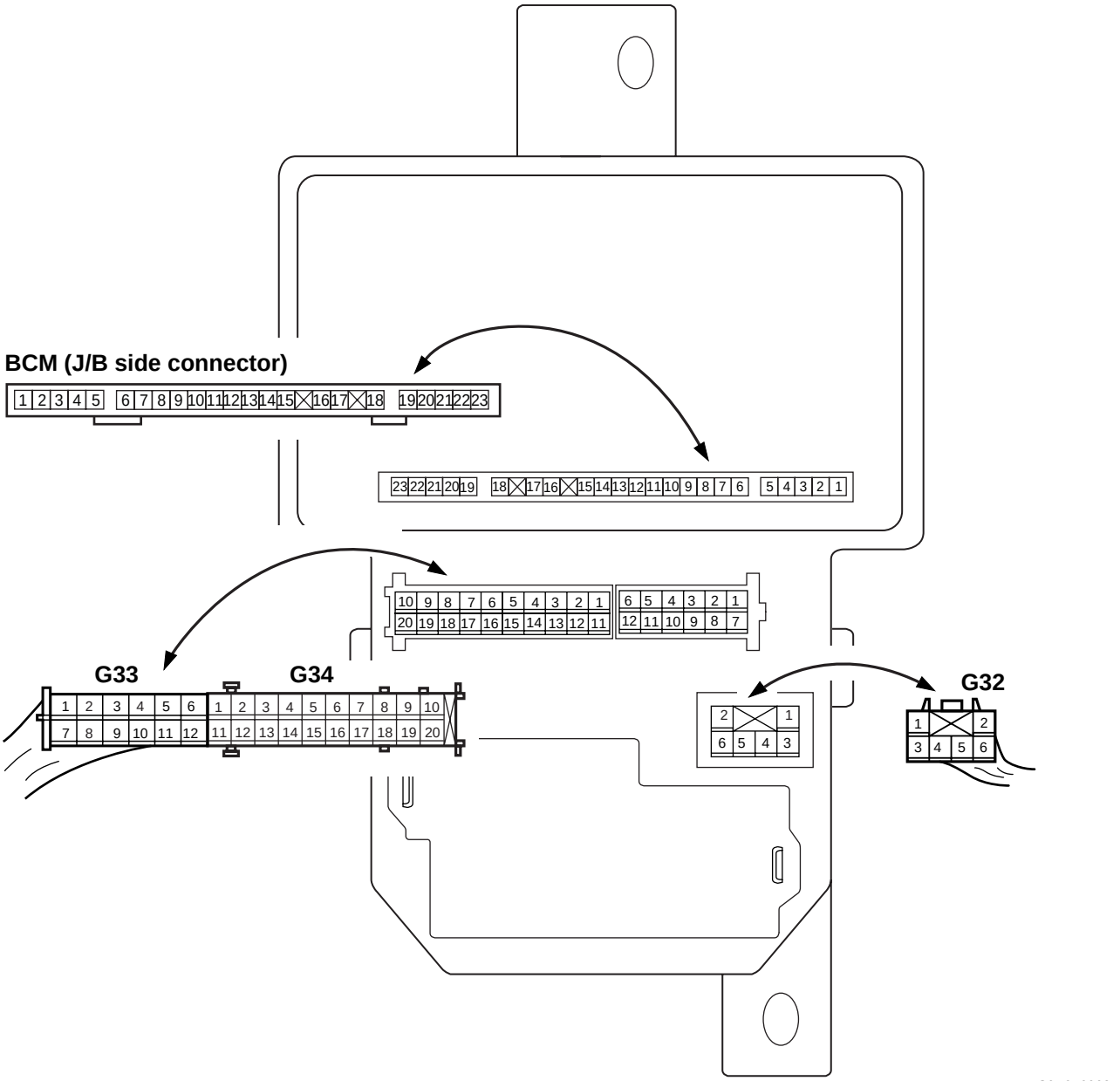
No.	Fuse	Description on the cover	Protected circuit
㉒	BLANK	BLANK	BLANK
㉓	15 A	IG COIL	ECM
			Fuel pump relay
			Generator
			Heated oxygen relay #1
			Heated oxygen relay #2
			ICM
			IG coil #1
			IG coil #2
㉔	10 A	BACK	Back-up light switch (M/T)
			Fresh / Recircle actuator
			Mode control switch
			A/C Panel (Auto / Manual)
			Transaxle range sensor (A/T)
㉕	10 A	METER	BCM
			COMB meter
			Flasher relay
㉖	15 A	ACC 1	BCM
			Power mirror
㉗	15 A	ACC 2	ACC socket or Cigar lighter
			Audio
			Multi information display

No.	Fuse	Description on the cover	Protected circuit
㉘	15 A	WIPER	COMB switch
			Rear washer motor
			Rear wiper motor
			Rear wiper relay
			Windshield washer motor
			Windshield wiper motor
㉙	10 A	IG1 SIG	A/T relay (A/T)
			Power steering control module
㉚	15 A	A/BAG	A/B SDM
㉛	10 A	ABS	ABS control module
㉜	10 A	TAIL	COMB switch
㉝	BLANK	BLANK	BLANK
㉞	20 A	D/L	BCM
㉟	10 A	IMMOBI	BLANK
㊱	10 A	ST SIG	Starting motor relay
㊲	15 A	SEAT HTR	BLANK
㊳	10 A	IG2 SIG	Heater relay
㊴	15 A	RR FOG	BLANK
㊵	15 A	RADIO	Audio
			BCM
			COMB meter
			DLC
			ECM
			Interior light
			Luggage compartment light
			Main switch (Key switch)
			Multi information display
			TCM
㊶	25 A	RR DEF	Rear defogger relay
㊷	15 A	HAZ-HORN	Horn relay
			Flasher relay
㊸	10 A	MTA	BLANK
㊹	20 A	P/WT	BLANK
㊺	30 A	P/W	Front power window main switch
			Front power window sub switch
			Rear power window sub switch (R)
			Rear power window sub switch (L)

Junction Block (J/B) Connector / Fuse Layout

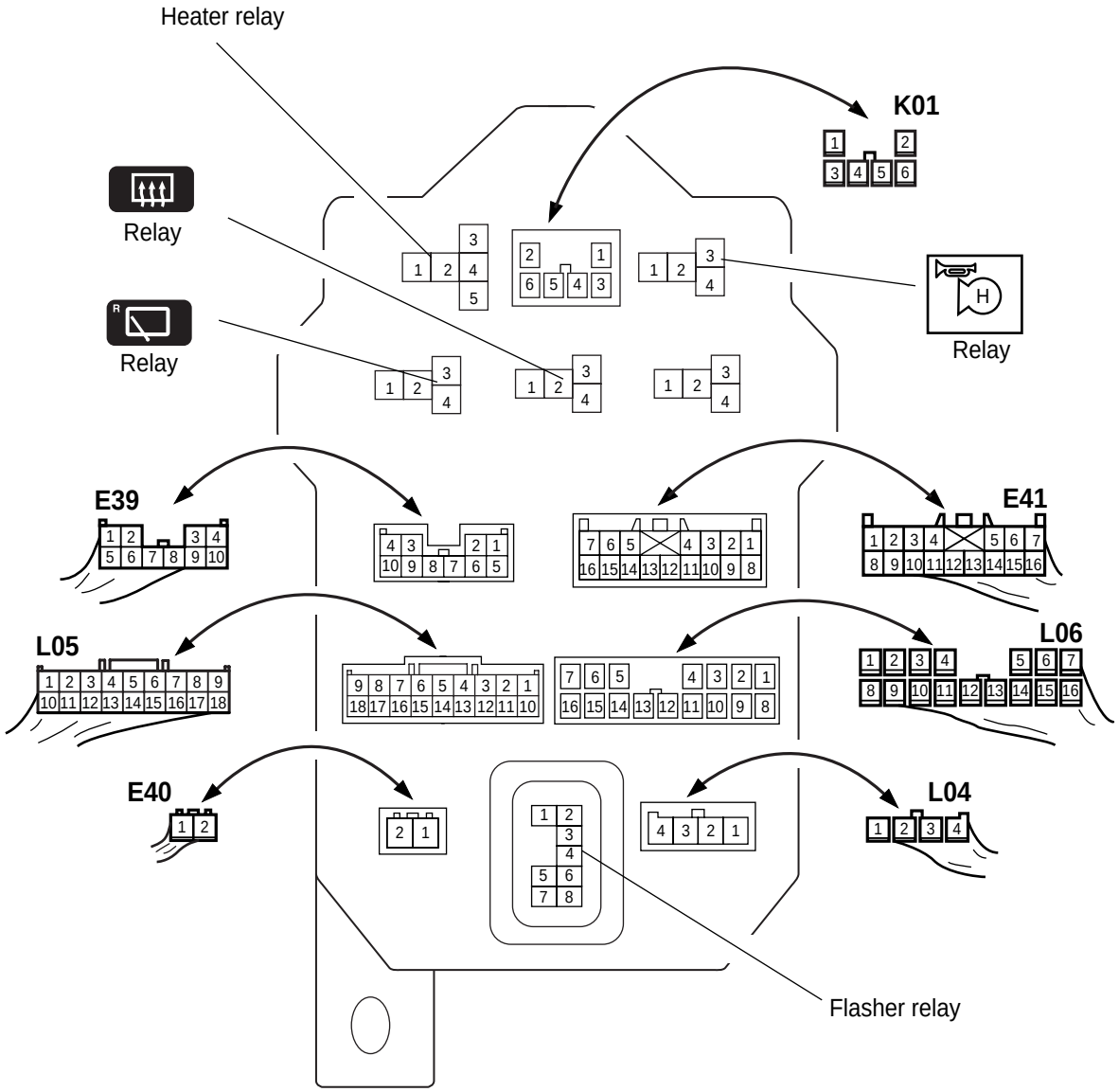
S4RS0A910D006

BCM side



I4RS0A910908-

Fuse side

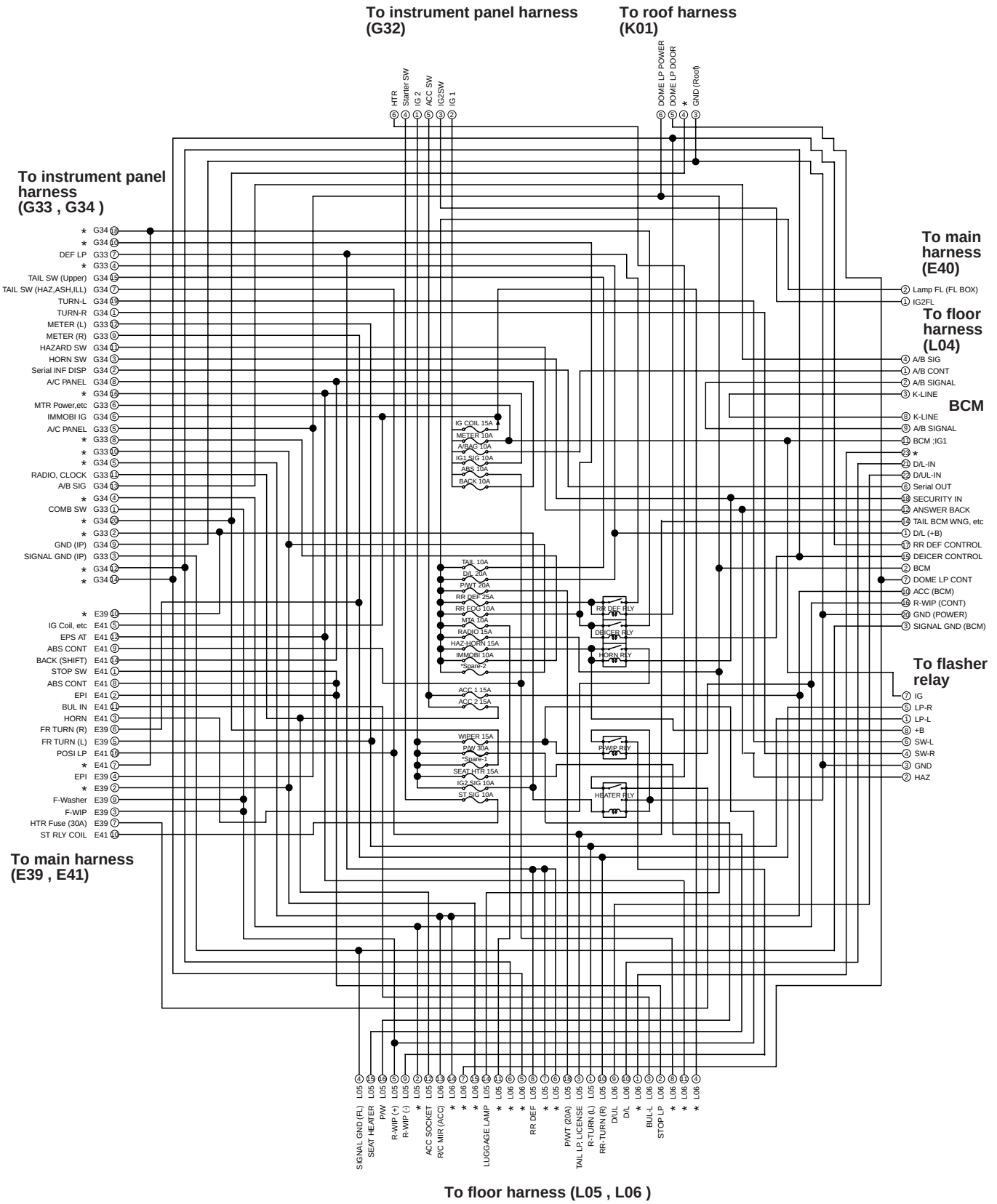


I4RS0A910909-

Junction Block Inner Circuit (Overview)

S4RS0A910D007

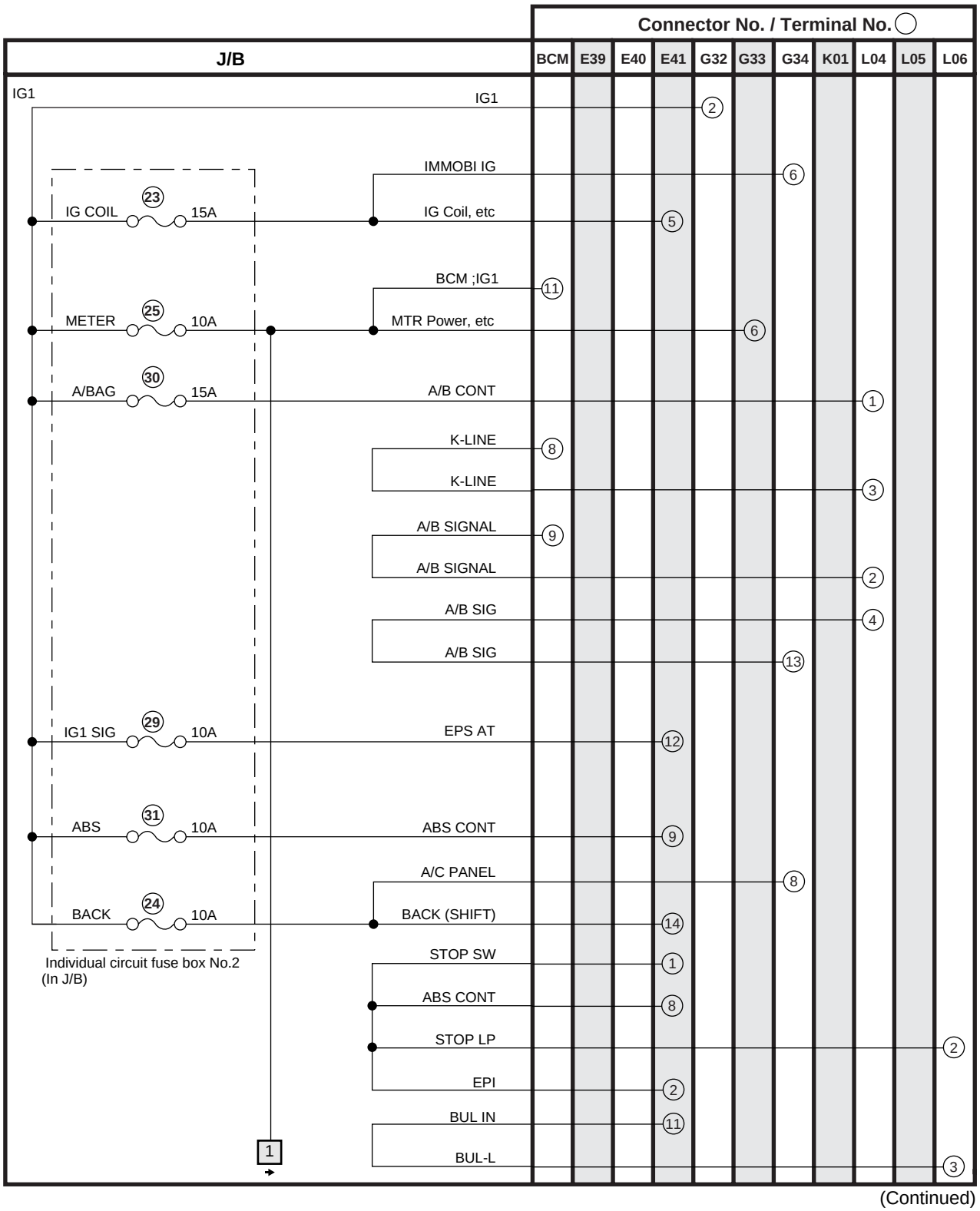
* : Not used



I4RS0A910972-

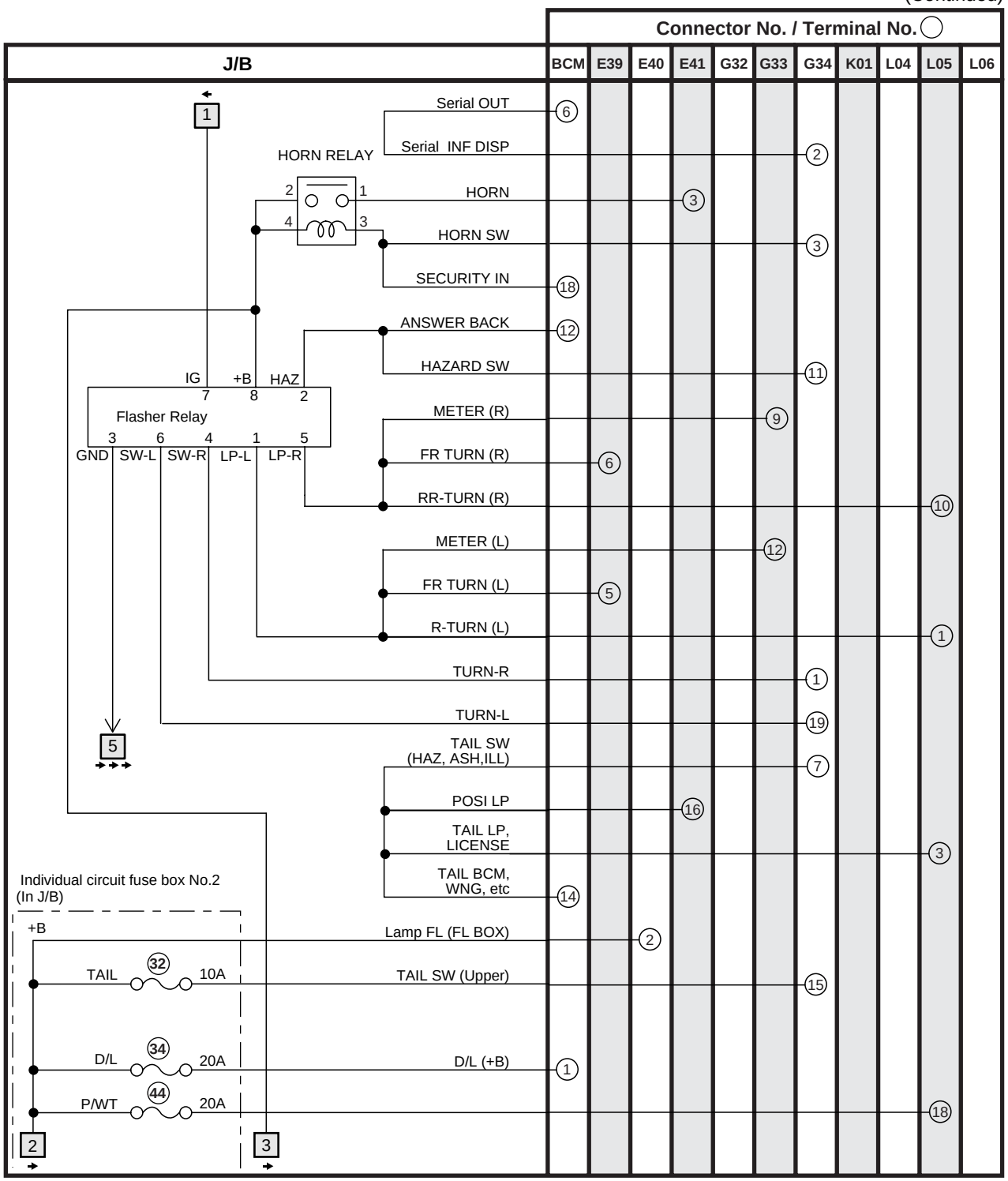
Junction Block Inner Circuit (Detail)

S4RS0A910D008

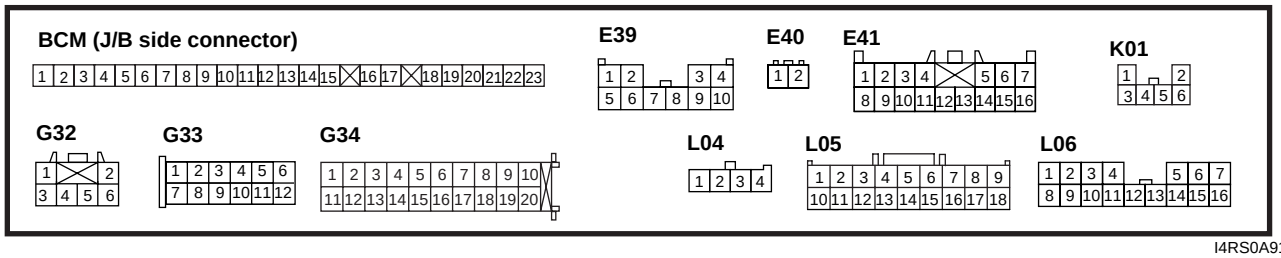


I4RS0A910910-

(Continued)

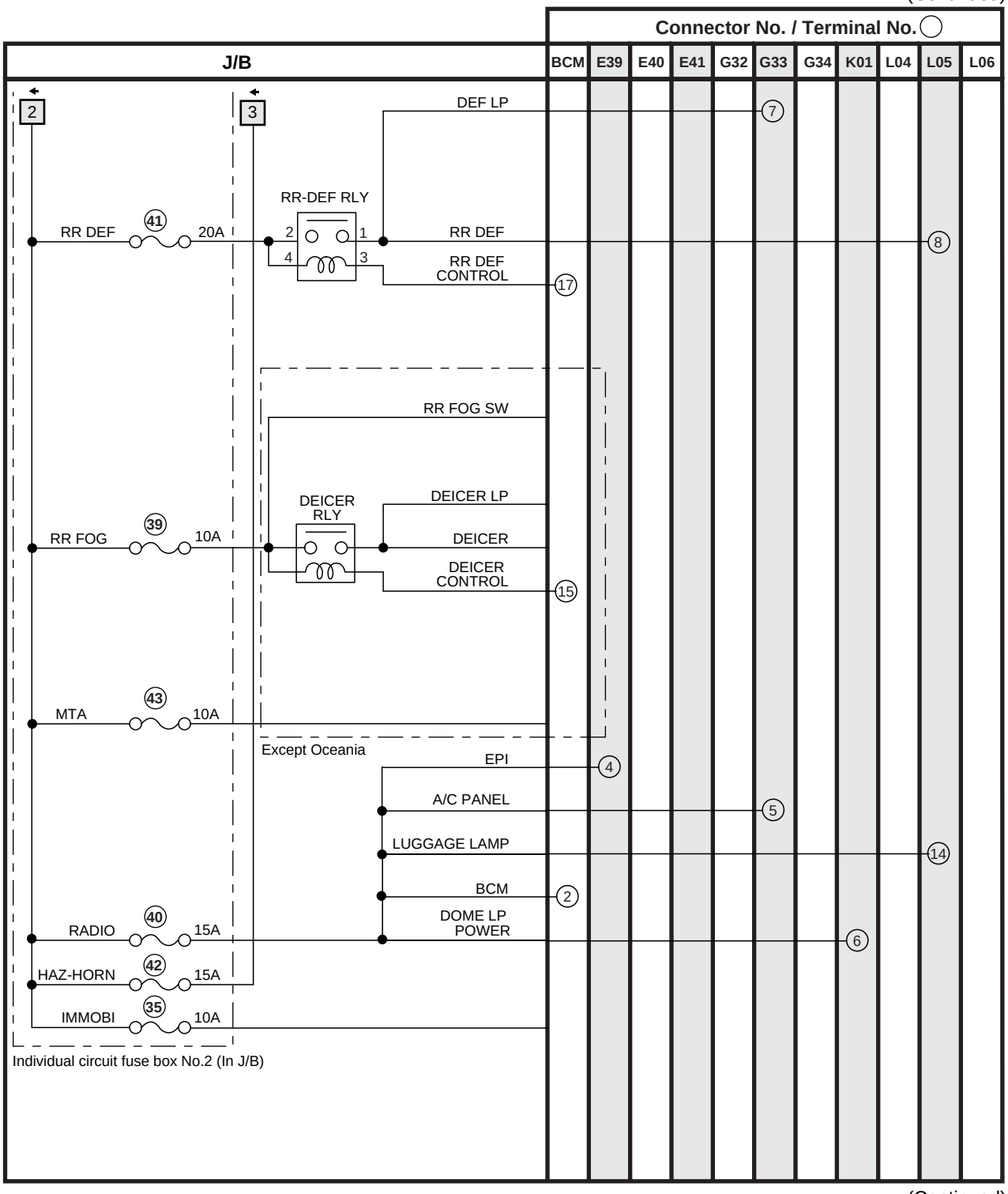


(Continued)

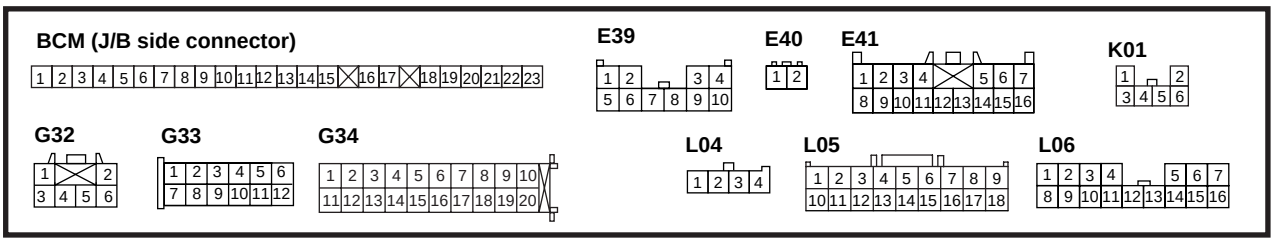


I4RS0A910911-

(Continued)

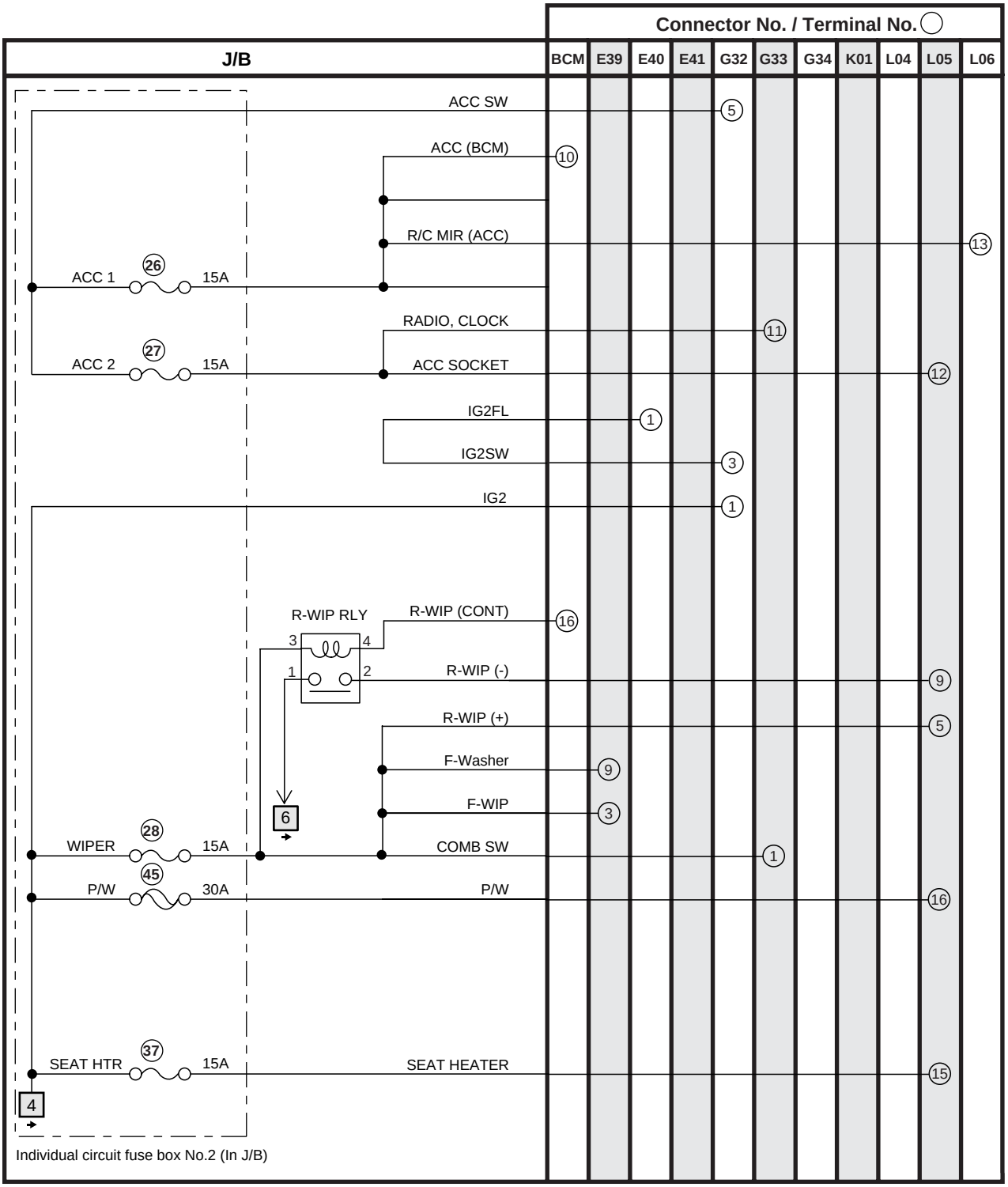


(Continued)

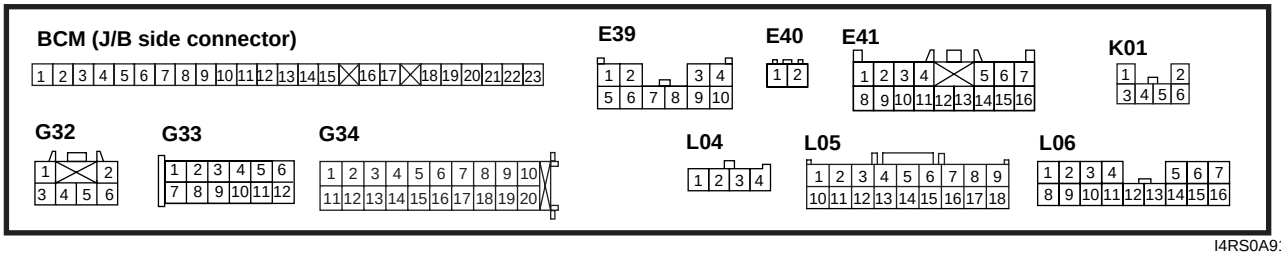


I4RS0A910912-

(Continued)

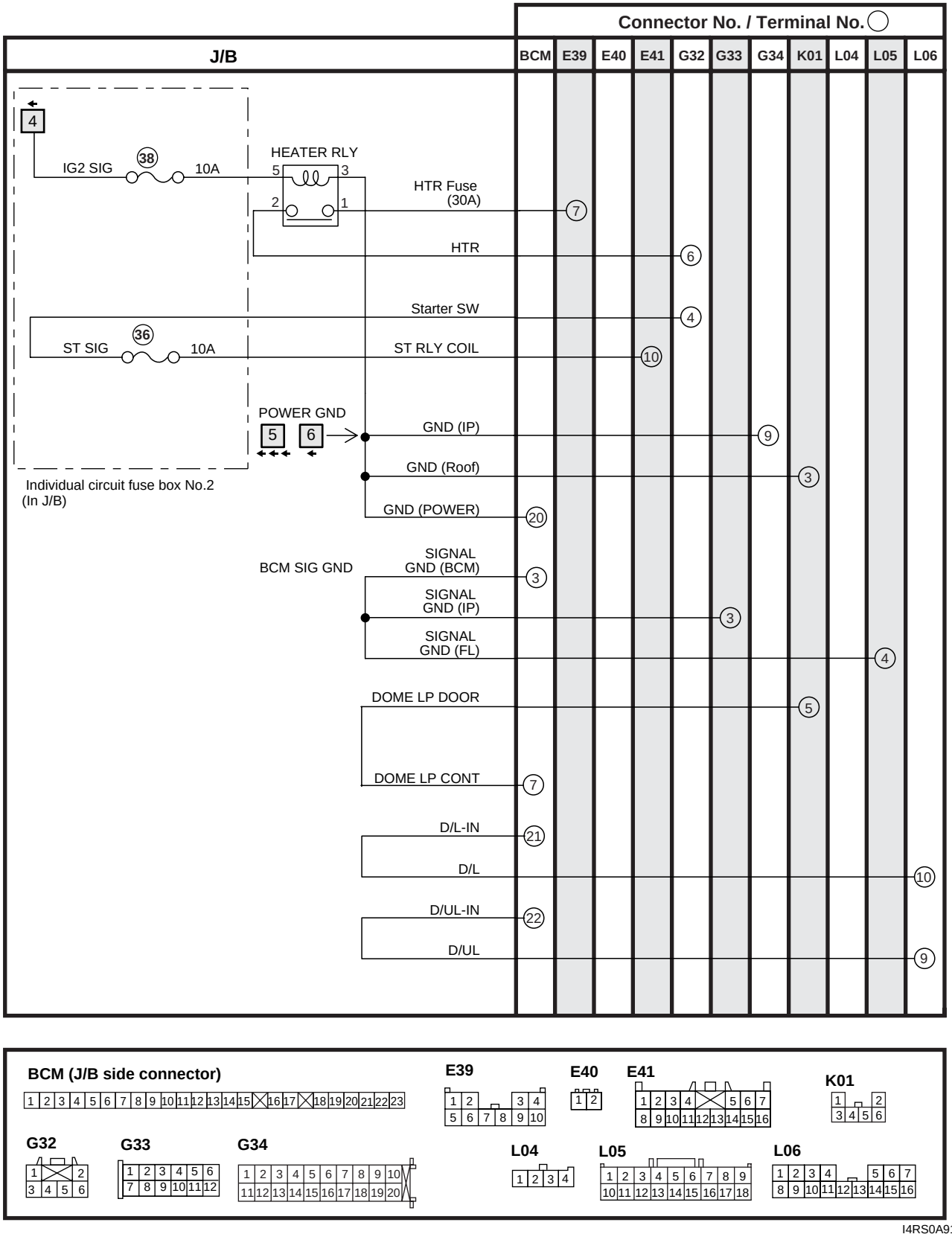


(Continued)



I4RS0A910913-

(Continued)



I4RS0A910914-

System Circuit Diagram

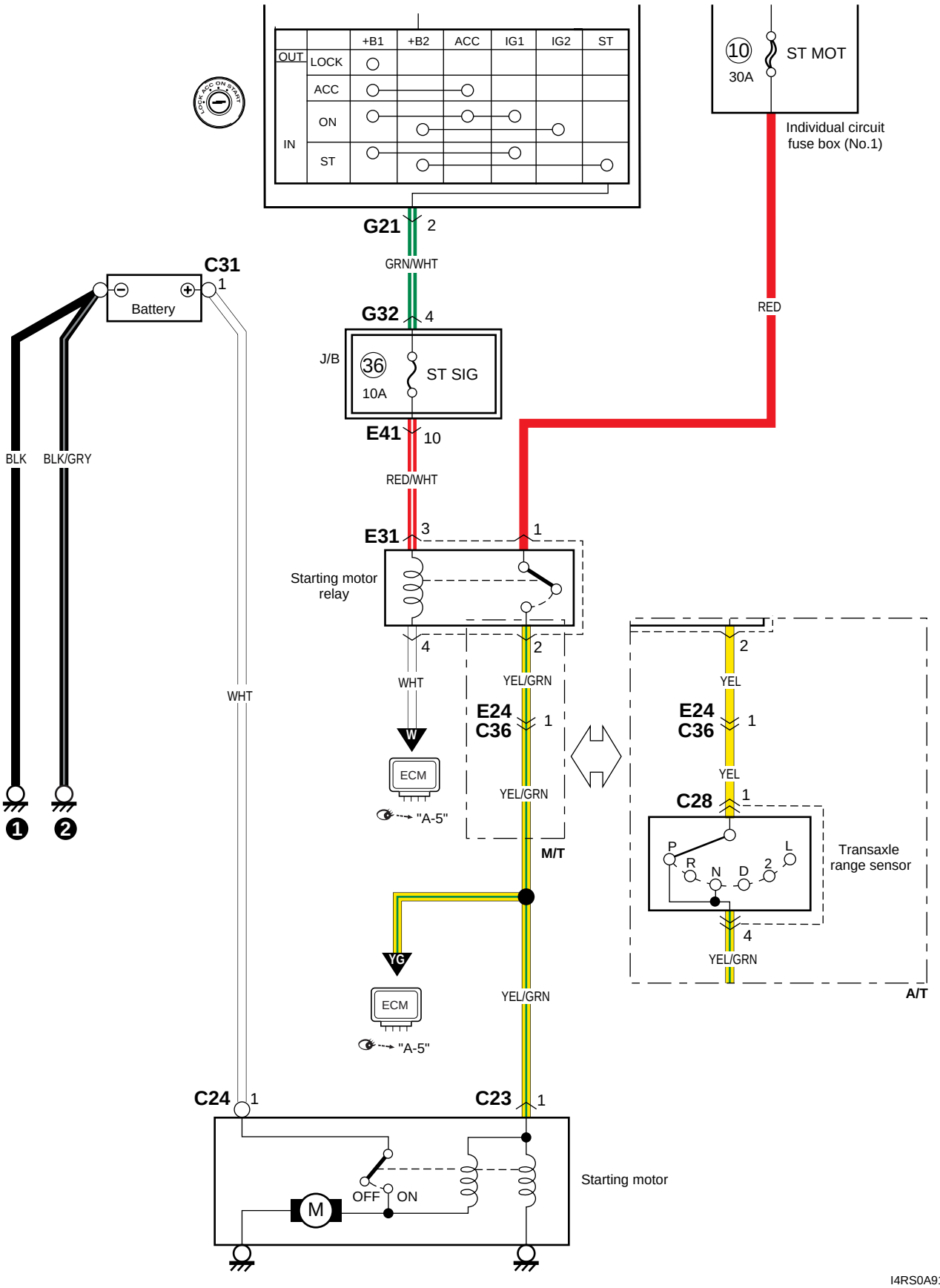
System Circuit Diagram

S4RS0A910E001

Refer to “A-1 Cranking System Circuit Diagram: ”.
Refer to “A-2 Charging System Circuit Diagram: ”.
Refer to “A-3 Ignition System Circuit Diagram: ”.
Refer to “A-4 Cooling System Circuit Diagram: ”.
Refer to “A-5 Engine and A/C Control System Circuit Diagram: ”.
Refer to “A-6 A/T Control System Circuit Diagram: ”.
Refer to “A-7 Immobilizer System Circuit Diagram: ”.
Refer to “A-8 Body Control System Circuit Diagram: ”.
Refer to “B-1 Windshield Wiper and Washer Circuit Diagram: ”.
Refer to “B-2 Rear Wiper and Washer Circuit Diagram: ”.
Refer to “B-3 Rear Defogger Circuit Diagram: ”.
Refer to “B-4 Power Window Circuit Diagram: ”.
Refer to “B-5 Power Door Lock Circuit Diagram: ”.
Refer to “B-6 Power Mirror Circuit Diagram: ”.
Refer to “B-7 Horn Circuit Diagram: ”.
Refer to “C-1 Combination Meter Circuit Diagram (Meter): ”.
Refer to “C-2 Combination Meter Circuit Diagram (Indicator): ”.
Refer to “C-3 Combination Meter Circuit Diagram (Warning Light): ”.
Refer to “D-1 Headlight System Circuit Diagram: ”.
Refer to “D-2 Position, Tail and Licence Plate Light System Circuit Diagram: ”.
Refer to “D-3 Front Fog Light System Circuit Diagram: ”.
Refer to “D-4 Illumination Light System Circuit Diagram: ”.
Refer to “D-5 Interior Light System Circuit Diagram: ”.
Refer to “D-6 Turn Signal and Hazard Warning Light System Circuit Diagram: ”.
Refer to “D-7 Brake Light System Circuit Diagram: ”.
Refer to “D-8 Back-Up Light System Circuit Diagram: ”.
Refer to “E-1 Heater System Circuit Diagram: ”.
Refer to “F-1 Air-Bag System Circuit Diagram: ”.
Refer to “F-2 Anti-Lock Brake System Circuit Diagram: ”.
Refer to “F-3 Power Steering System Circuit Diagram: ”.
Refer to “G-1 Audio System Circuit Diagram: ”.
Refer to “G-2 Multi Information Display / Accessory Socket System Circuit Diagram: ”.

A-1 Cranking System Circuit Diagram

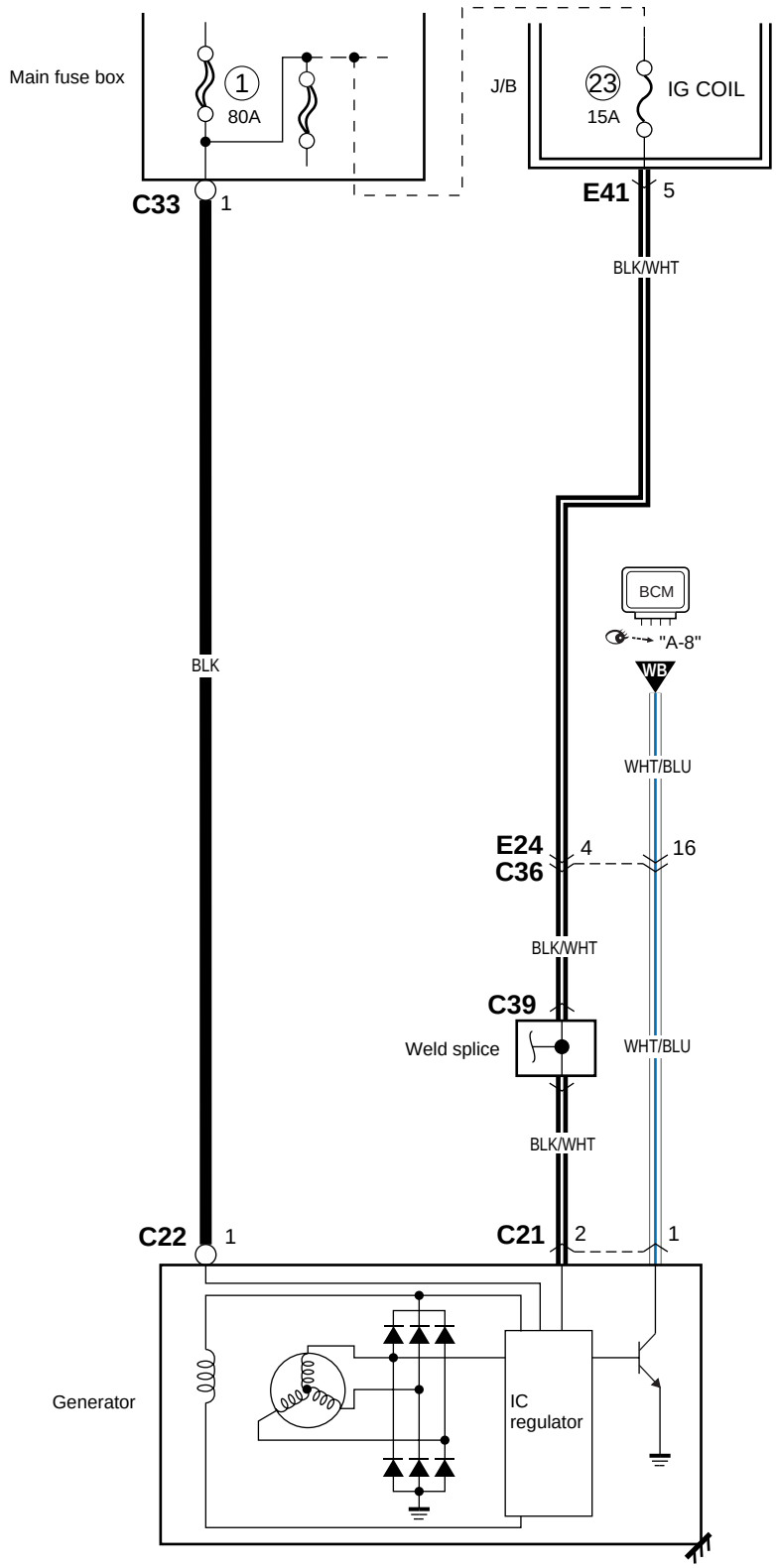
S4RS0A910E002



I4RS0A910915-

A-2 Charging System Circuit Diagram

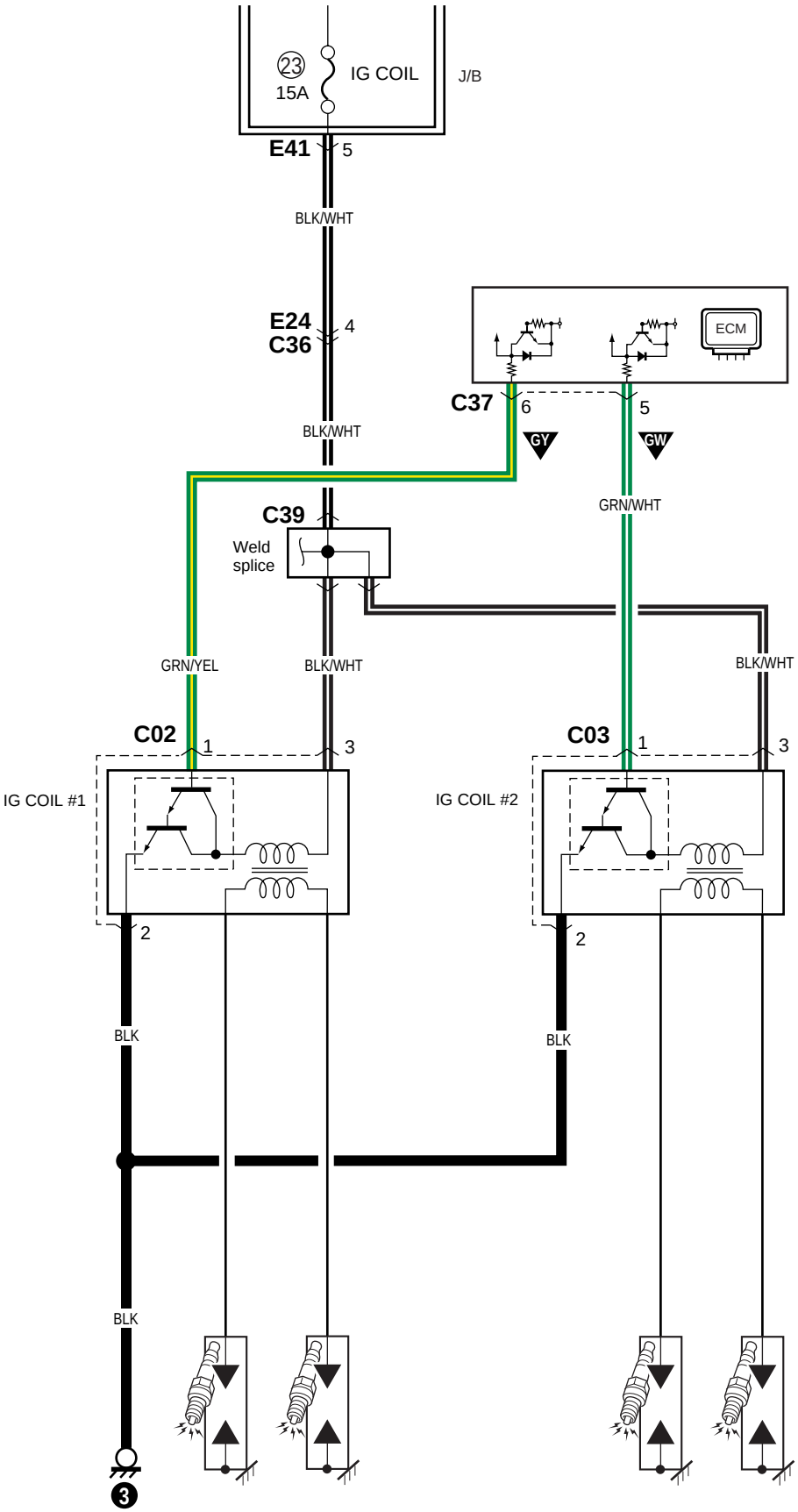
S4RS0A910E003



I4RS0A910916-

A-3 Ignition System Circuit Diagram

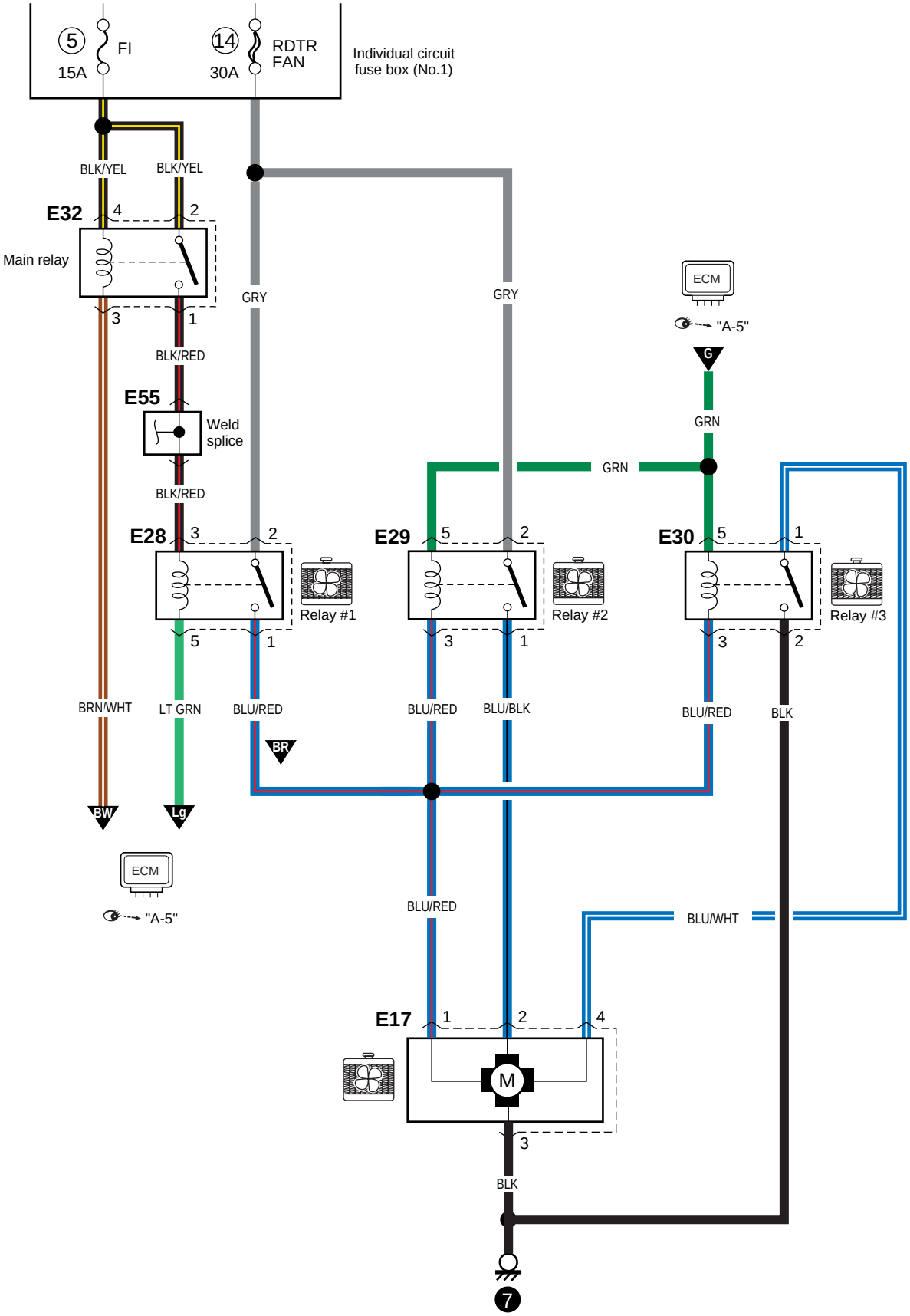
S4RS0A910E004



I4RS0A910917-

A-4 Cooling System Circuit Diagram

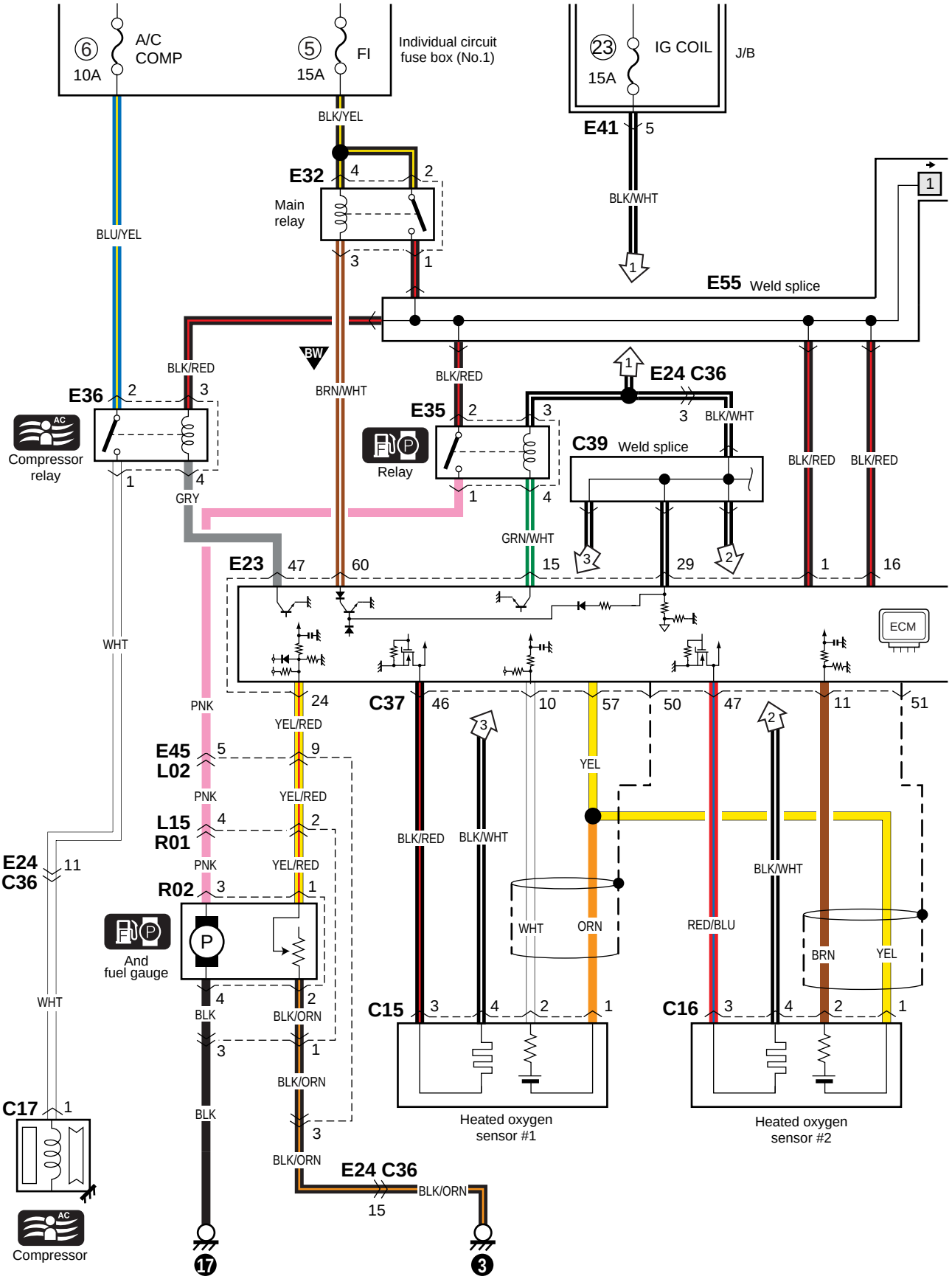
S4RS0A910E005



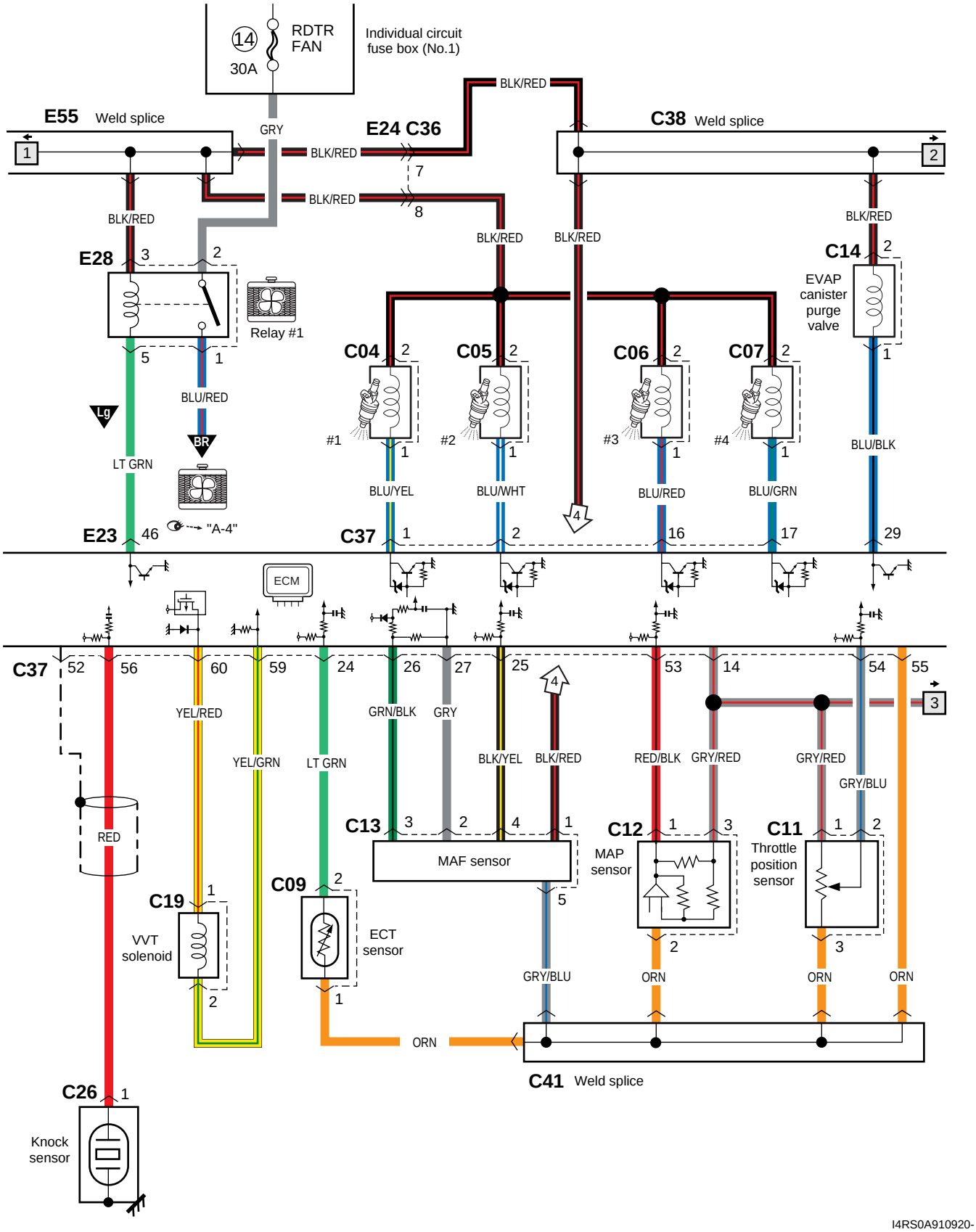
I4RS0A910918-

A-5 Engine and A/C Control System Circuit Diagram

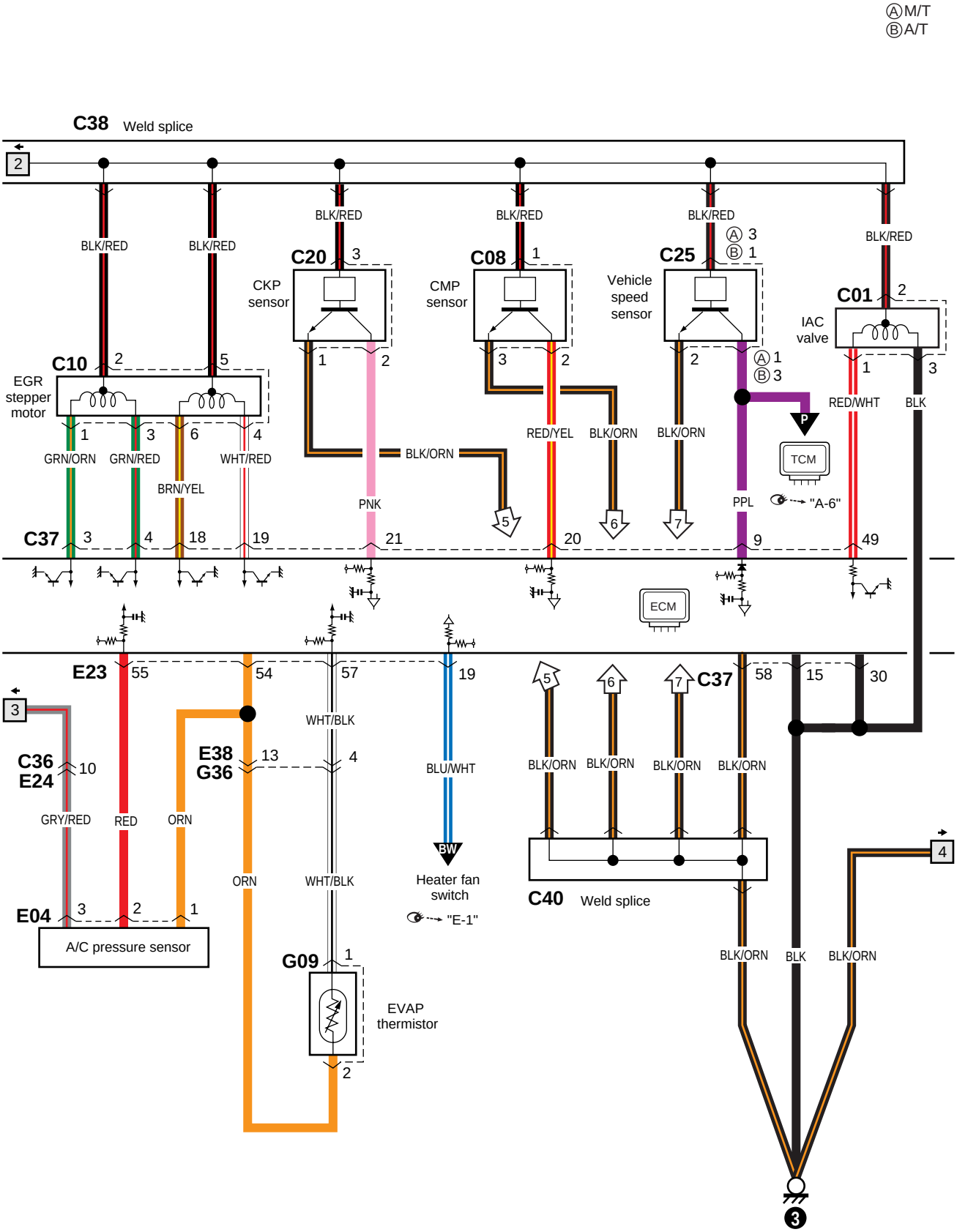
S4RS0A910E006

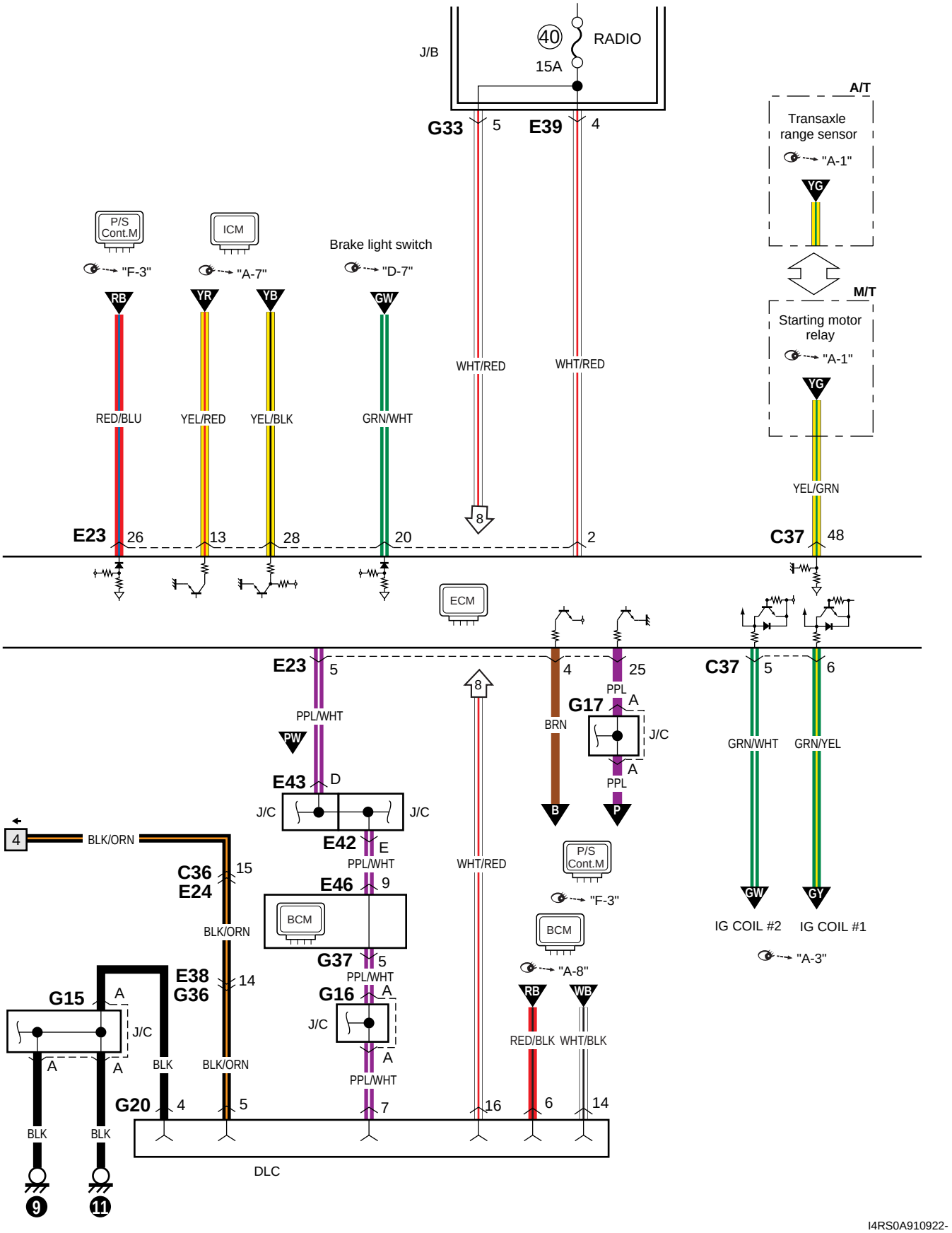


I4RS0A910919-

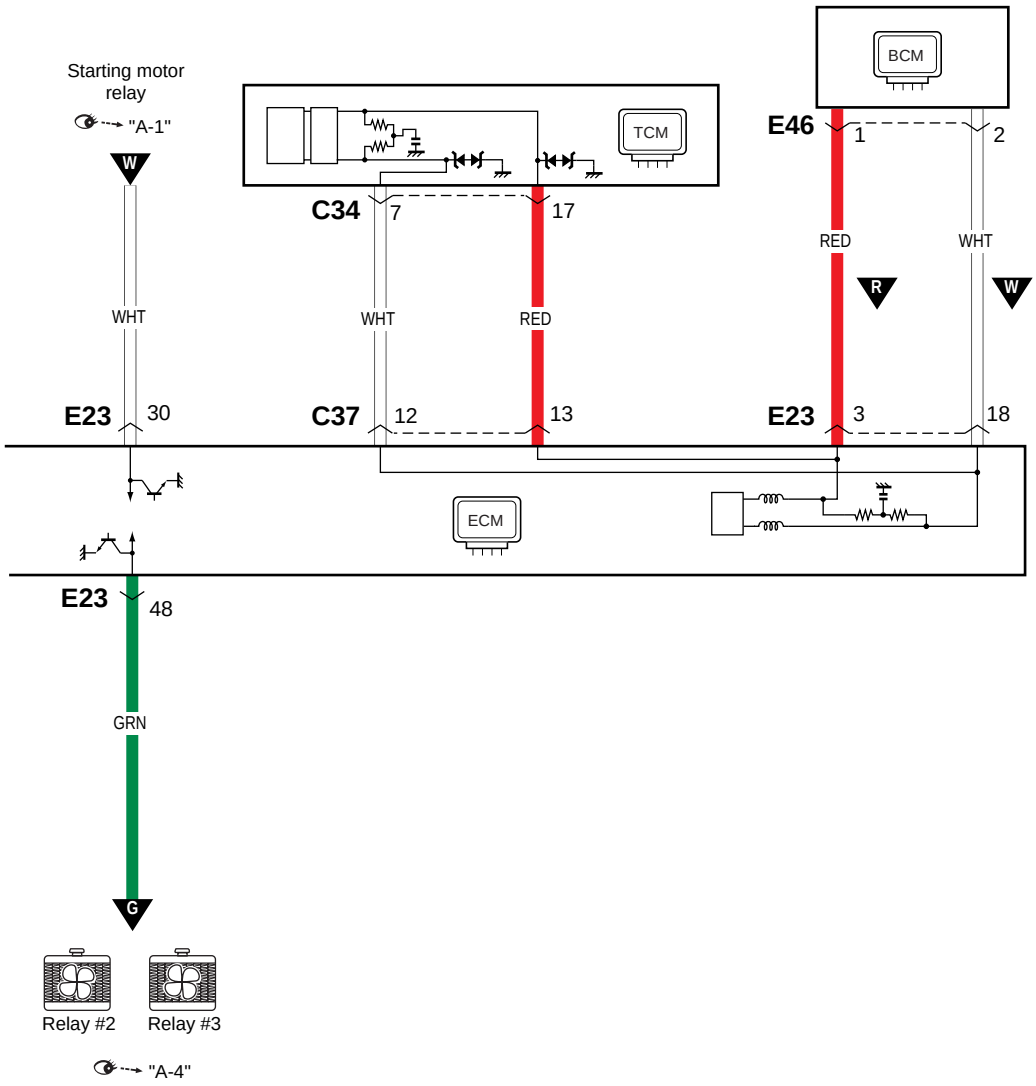


I4RS0A910920-


Ⓐ M/T
Ⓑ A/T
C38 Weld splice
2
BLK/RED
BLK/RED
BLK/RED
BLK/RED
BLK/RED
C20
3
CKP sensor
1
2
C08
1
CMP sensor
3
2
C25
Ⓐ 3
Ⓑ 1
Vehicle speed sensor
2
Ⓐ 1
Ⓑ 3
C01
2
IAC valve
1
3
C10
2
5
EGR stepper motor
1
3
6
4
GRN/ORN
GRN/RED
BRN/YEL
WHT/RED
BLK/ORN
PNK
RED/YEL
BLK/ORN
BLK/ORN
P
PPL
TCM
"A-6"
RED/WHT
BLK
C37
3
4
18
19
21
5
20
6
7
9
49
ECM
E23
55
54
57
19
WHT/BLK
BLU/WHT
BW
Heater fan switch
"E-1"
3
C36
E24
10
GRY/RED
RED
ORN
E38
G36
13
4
ORN
WHT/BLK
E04
3
2
1
A/C pressure sensor
G09
1
2
EVAP thermistor
5
6
7
C37
58
15
30
BLK/ORN
BLK/ORN
BLK/ORN
BLK/ORN
C40 Weld splice
4
BLK/ORN
BLK
BLK/ORN
3
I4RS0A910921-



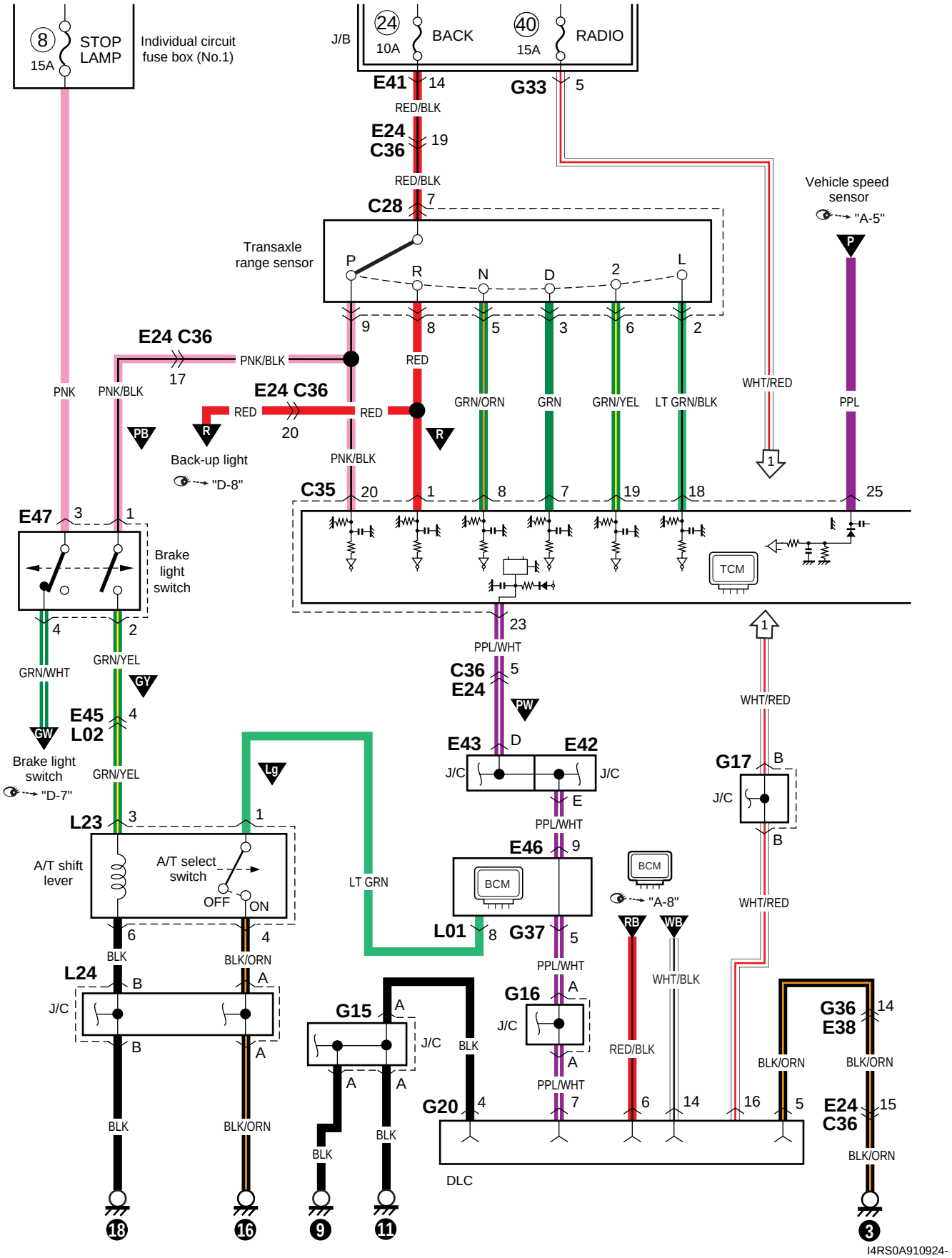
I4RS0A910922-

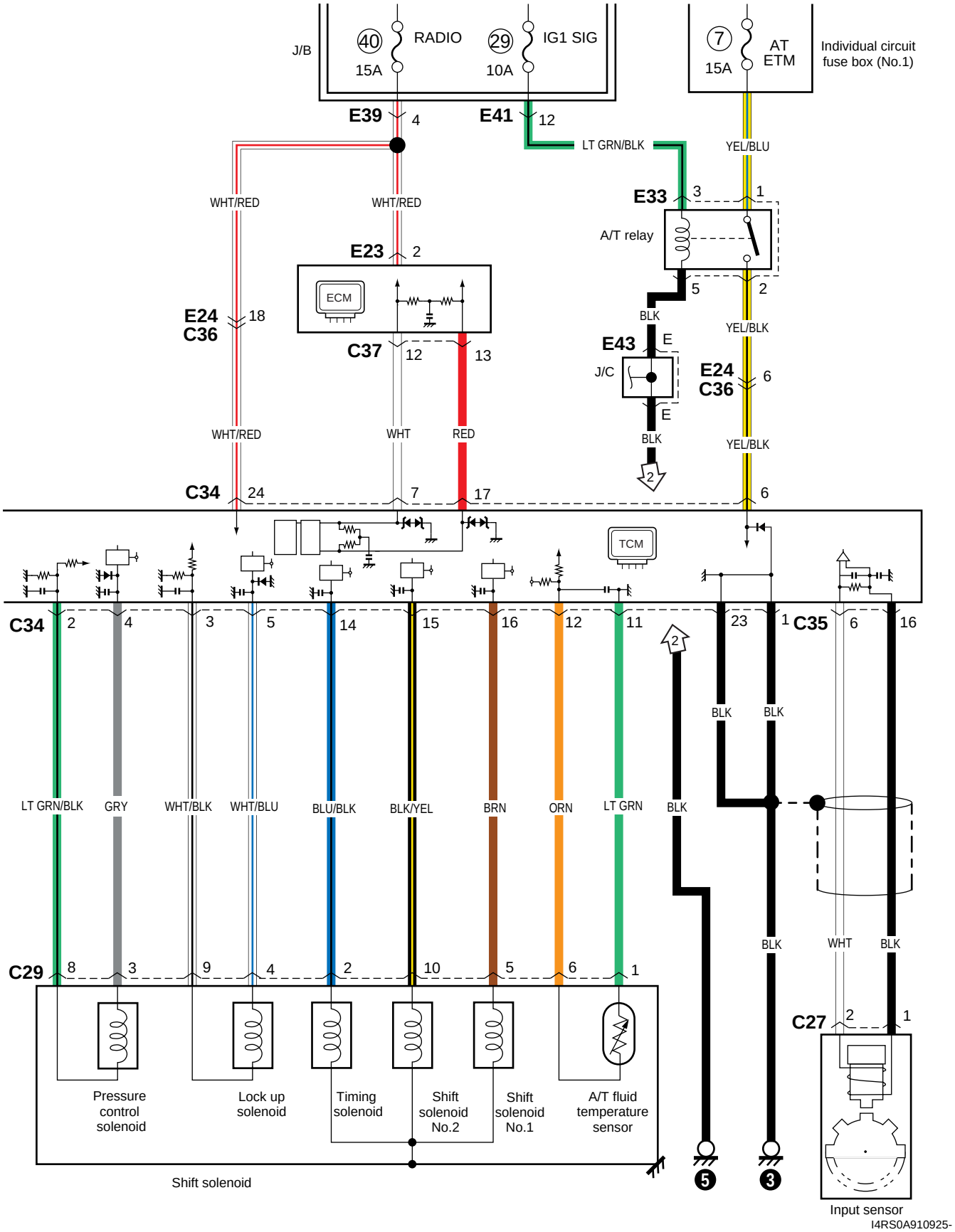


I4RS0A910923-

A-6 A/T Control System Circuit Diagram

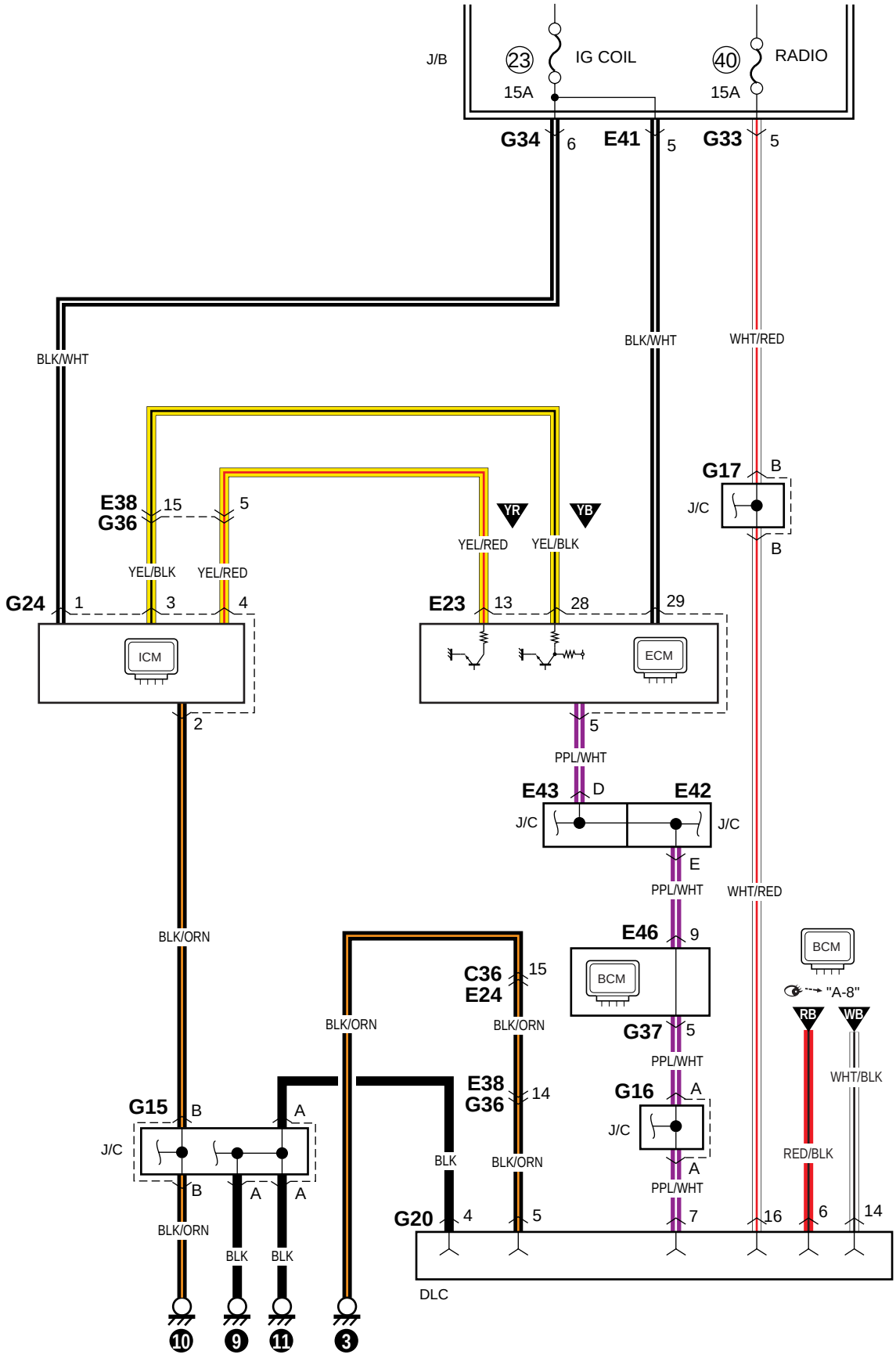
S4RS0A910E007




J/B
40
RADIO
15A
29
IG1 SIG
10A
7
AT
ETM
15A
Individual circuit
fuse box (No.1)
E39
4
E41
12
LT GRN/BLK
YEL/BLU
WHT/RED
WHT/RED
E33
3
1
A/T relay
E23
2
ECM
E24
C36
18
C37
12
13
5
2
BLK
YEL/BLK
E43
E
J/C
E24
C36
6
E
BLK
YEL/BLK
WHT/RED
WHT
RED
2
C34
24
7
17
6
TCM
C34
2
4
3
5
14
15
16
12
11
2
23
1
C35
6
16
LT GRN/BLK
GRY
WHT/BLK
WHT/BLU
BLU/BLK
BLK/YEL
BRN
ORN
LT GRN
BLK
BLK
BLK
BLK
WHT
BLK
C29
8
3
9
4
2
10
5
6
1
C27
2
1
Pressure
control
solenoid
Lock up
solenoid
Timing
solenoid
Shift
solenoid
No.2
Shift
solenoid
No.1
A/T fluid
temperature
sensor
Shift solenoid
5
3
Input sensor
I4RS0A910925-

A-7 Immobilizer System Circuit Diagram

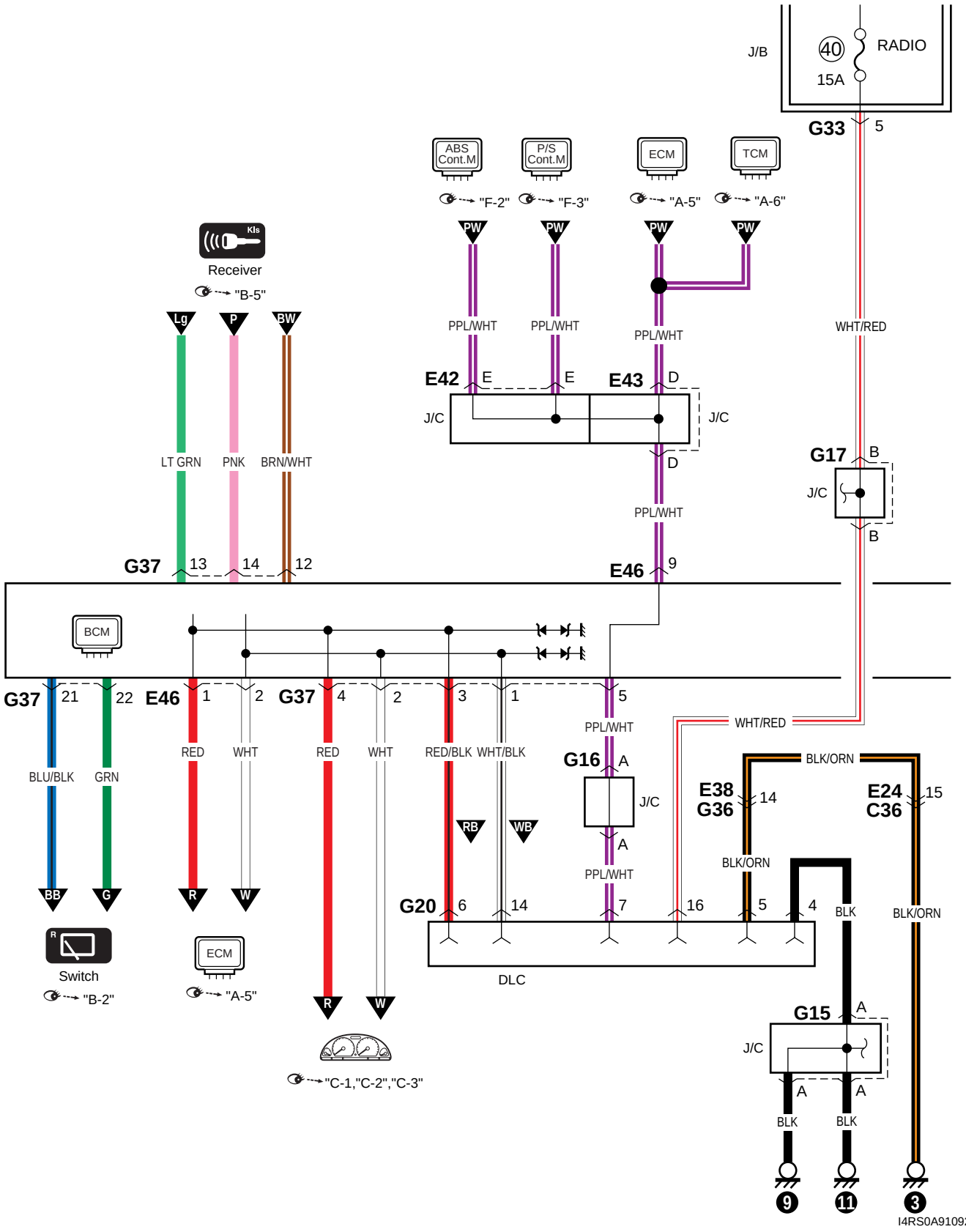
S4RS0A910E008

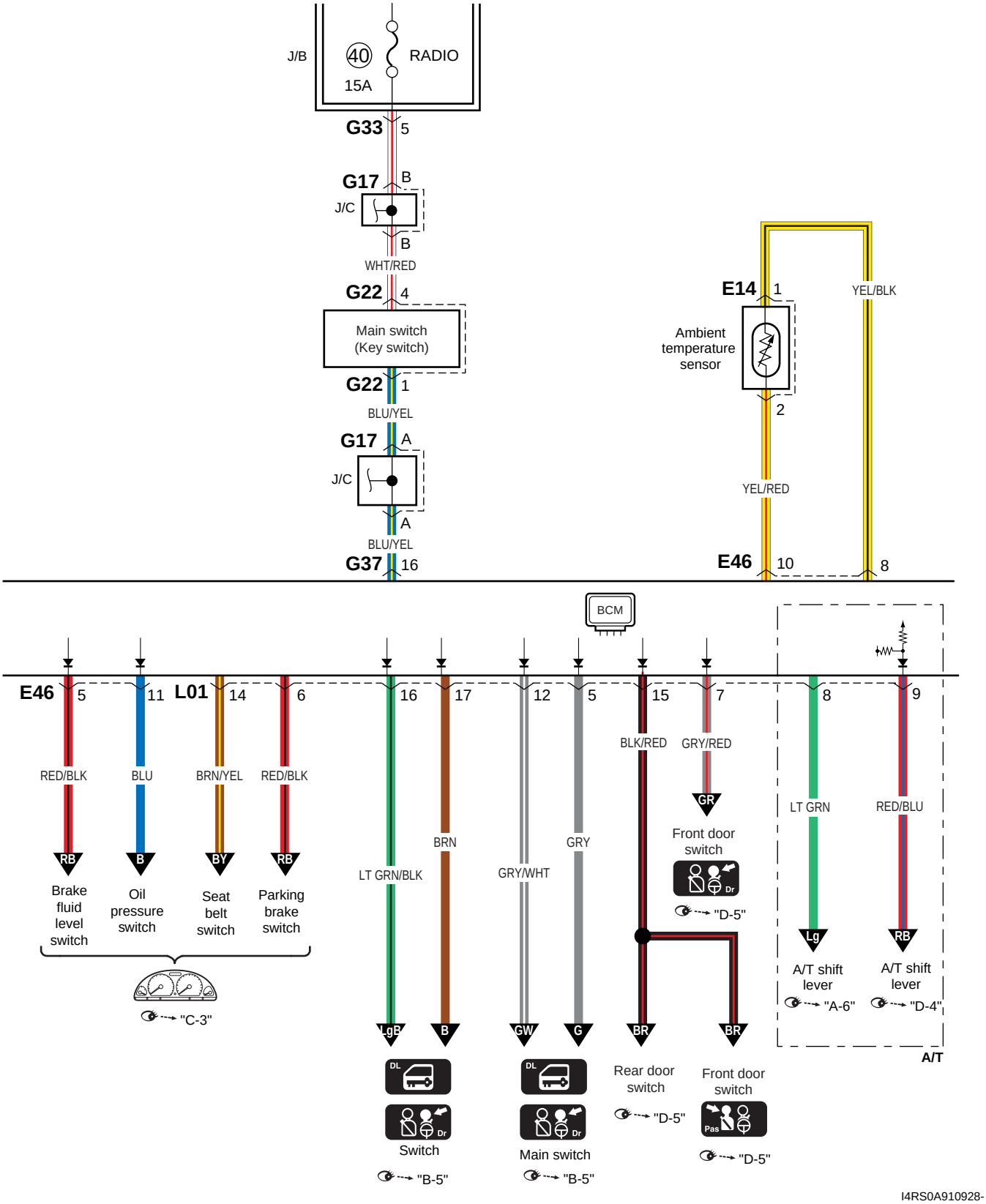


I4RS0A910926-

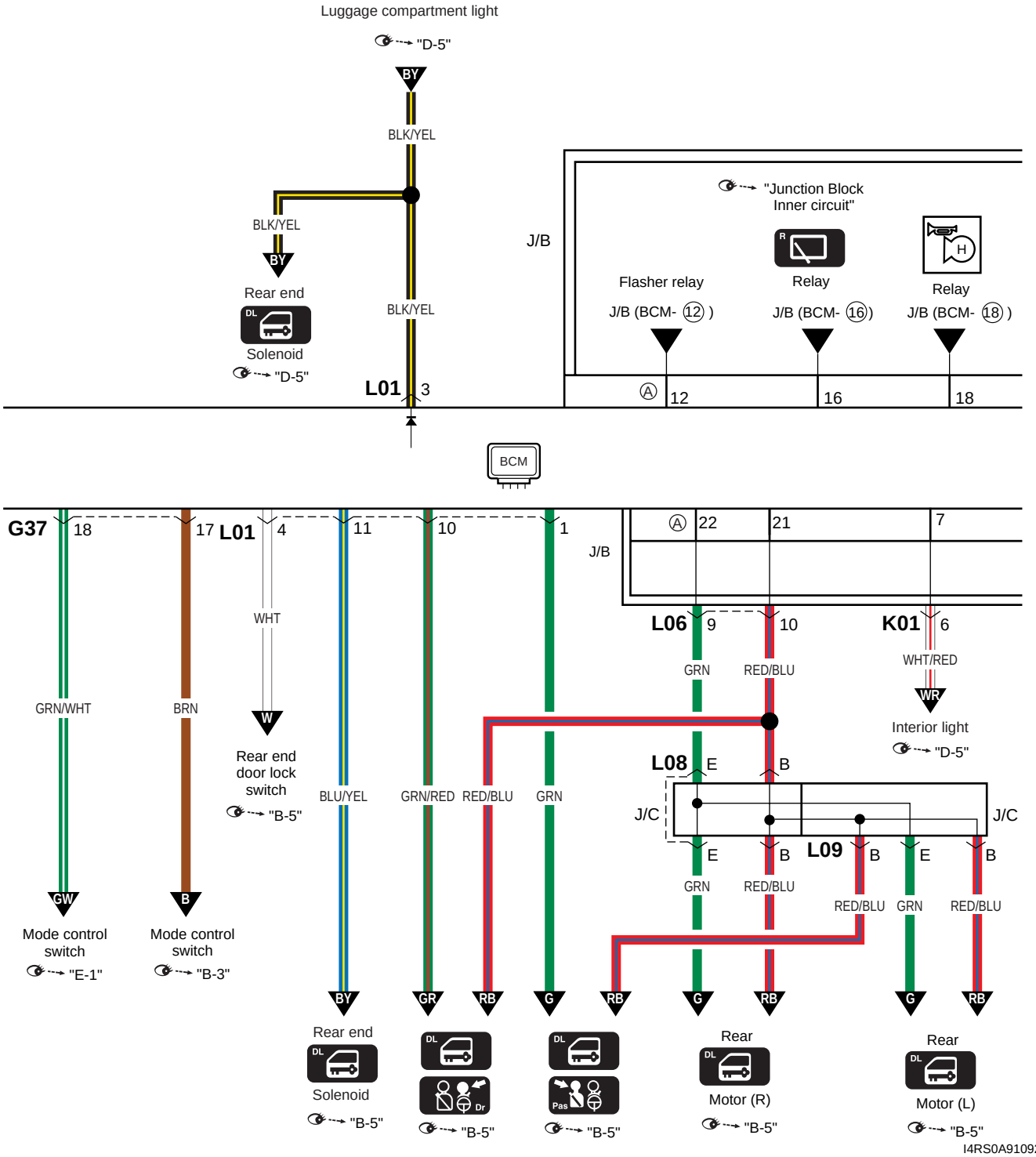
A-8 Body Control System Circuit Diagram

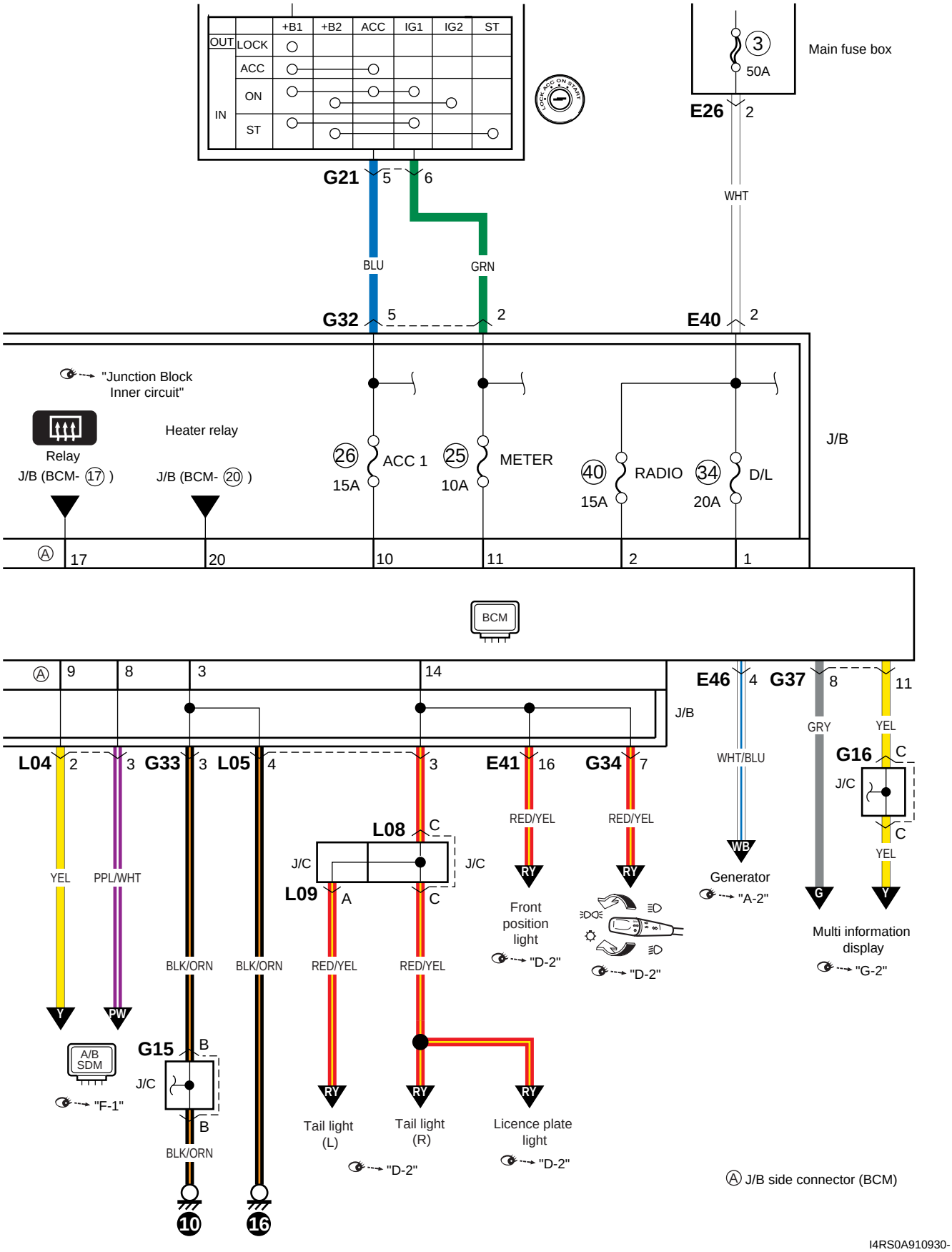
S4RS0A910E009




J/B
40
15A
RADIO
G33
5
G17
B
J/C
B
WHT/RED
G22
4
Main switch
(Key switch)
G22
1
BLU/YEL
G17
A
J/C
A
BLU/YEL
G37
16
E14
1
YEL/BLK
Ambient
temperature
sensor
2
YEL/RED
E46
10
8
BCM
E46
5
11
L01
14
6
16
17
12
5
15
7
8
9
RED/BLK
BLU
BRN/YEL
RED/BLK
LT GRN/BLK
BRN
GRY/WHT
GRY
BLK/RED
GRY/RED
LT GRN
RED/BLU
RB
B
BY
RB
LgB
B
GW
G
BR
GR
Lg
RB
Brake
fluid
level
switch
Oil
pressure
switch
Seat
belt
switch
Parking
brake
switch
"C-3"
Front door
switch
Dr
"D-5"
A/T shift
lever
"A-6"
A/T shift
lever
"D-4"
A/T
DL
Dr
Switch
"B-5"
DL
Dr
Main switch
"B-5"
Rear door
switch
"D-5"
Front door
switch
Pas
"D-5"
I4RS0A910928-

Ⓐ J/B side connector (BCM)

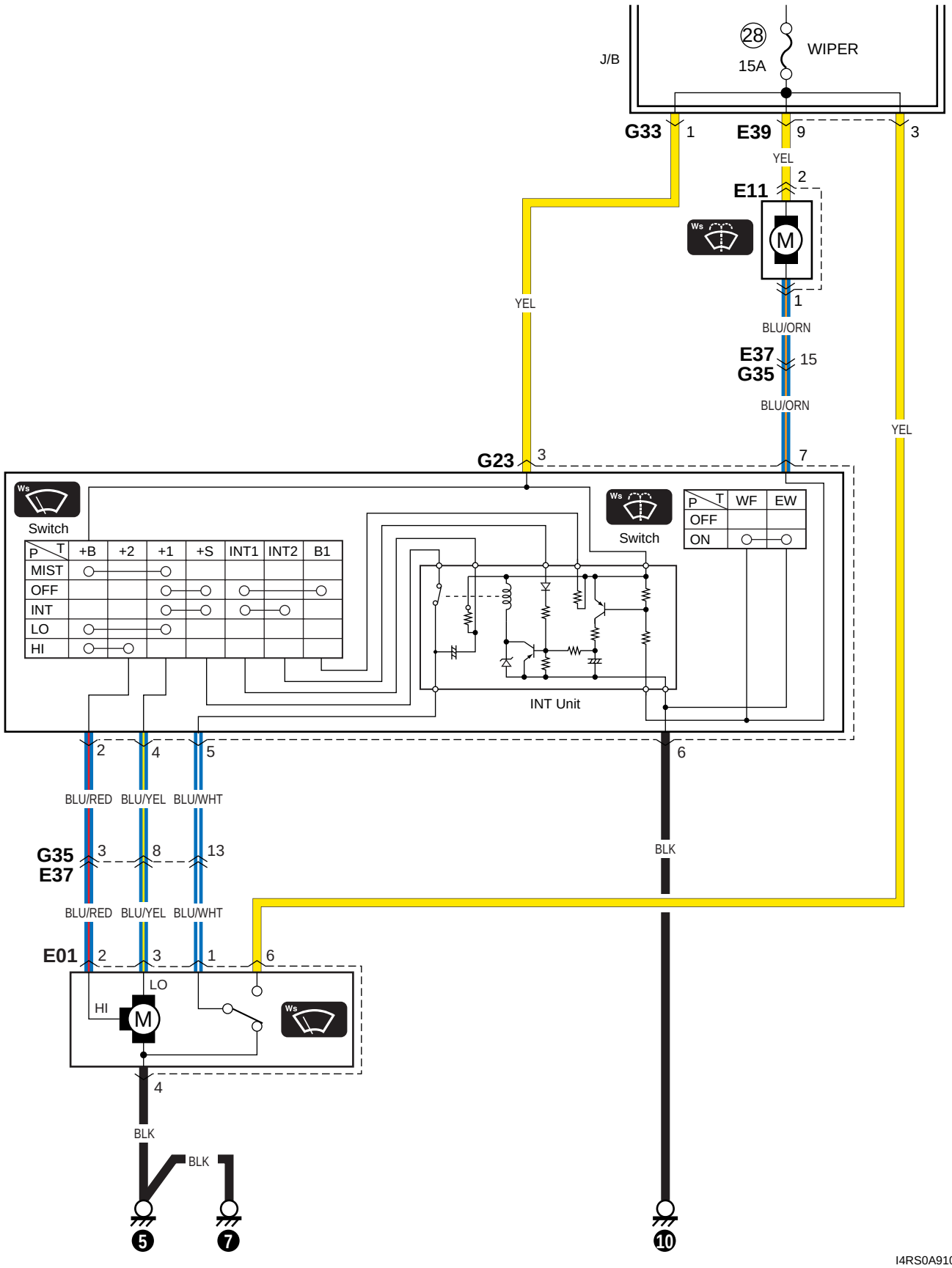




I4RS0A910930-

B-1 Windshield Wiper and Washer Circuit Diagram

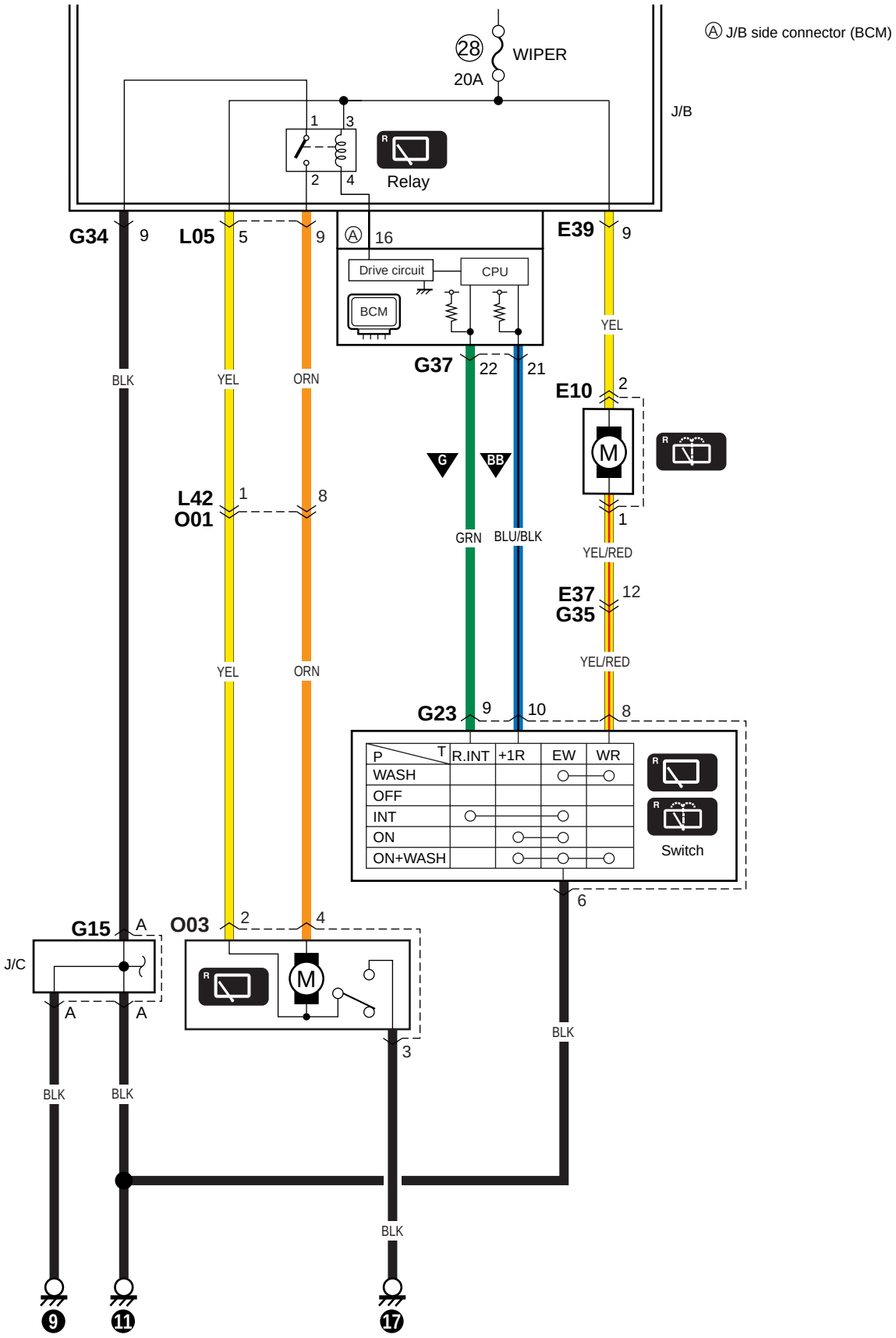
S4RS0A910E010



I4RS0A910931-

B-2 Rear Wiper and Washer Circuit Diagram

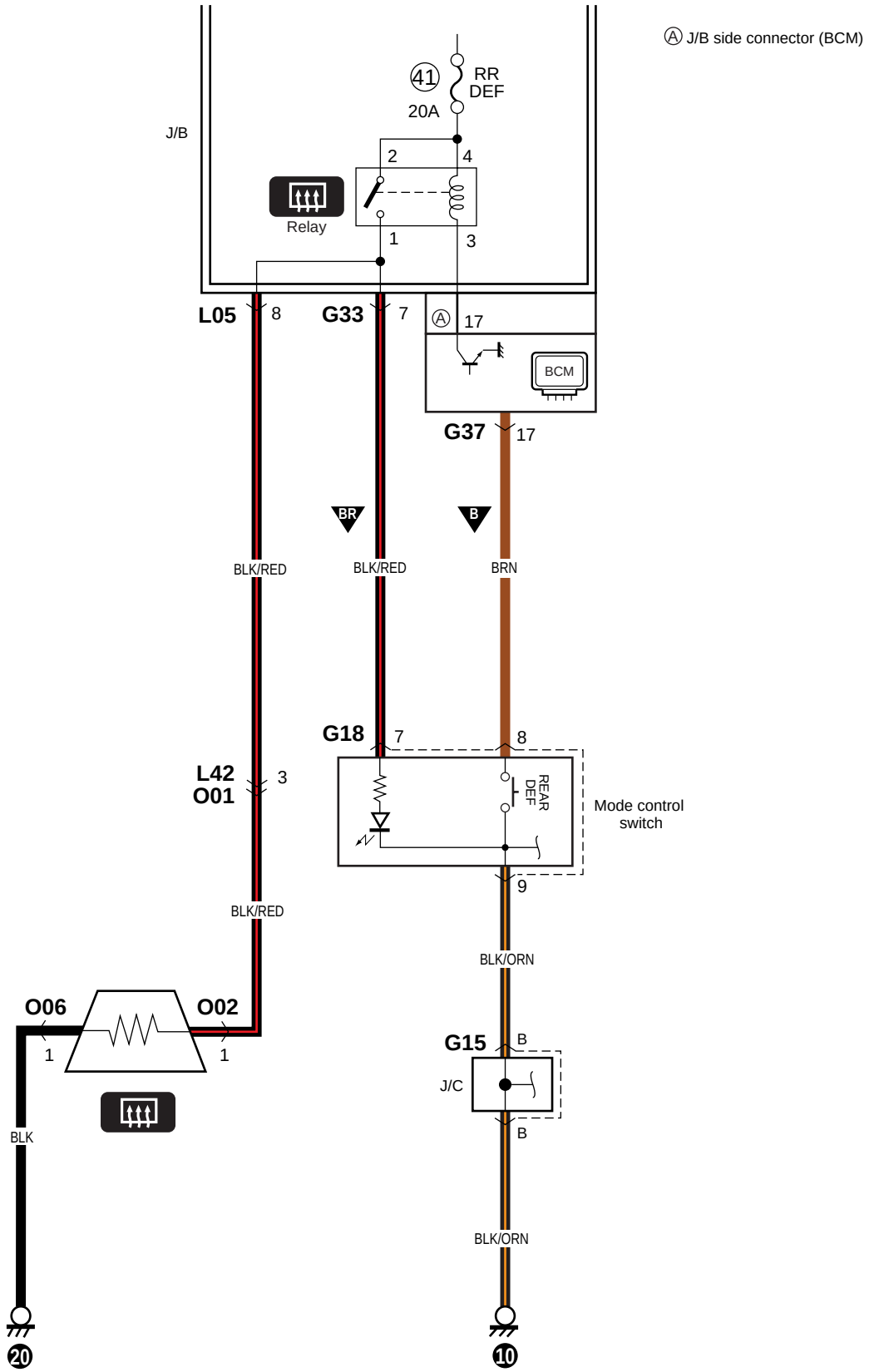
S4RS0A910E011



I4RS0A910932-

B-3 Rear Defogger Circuit Diagram

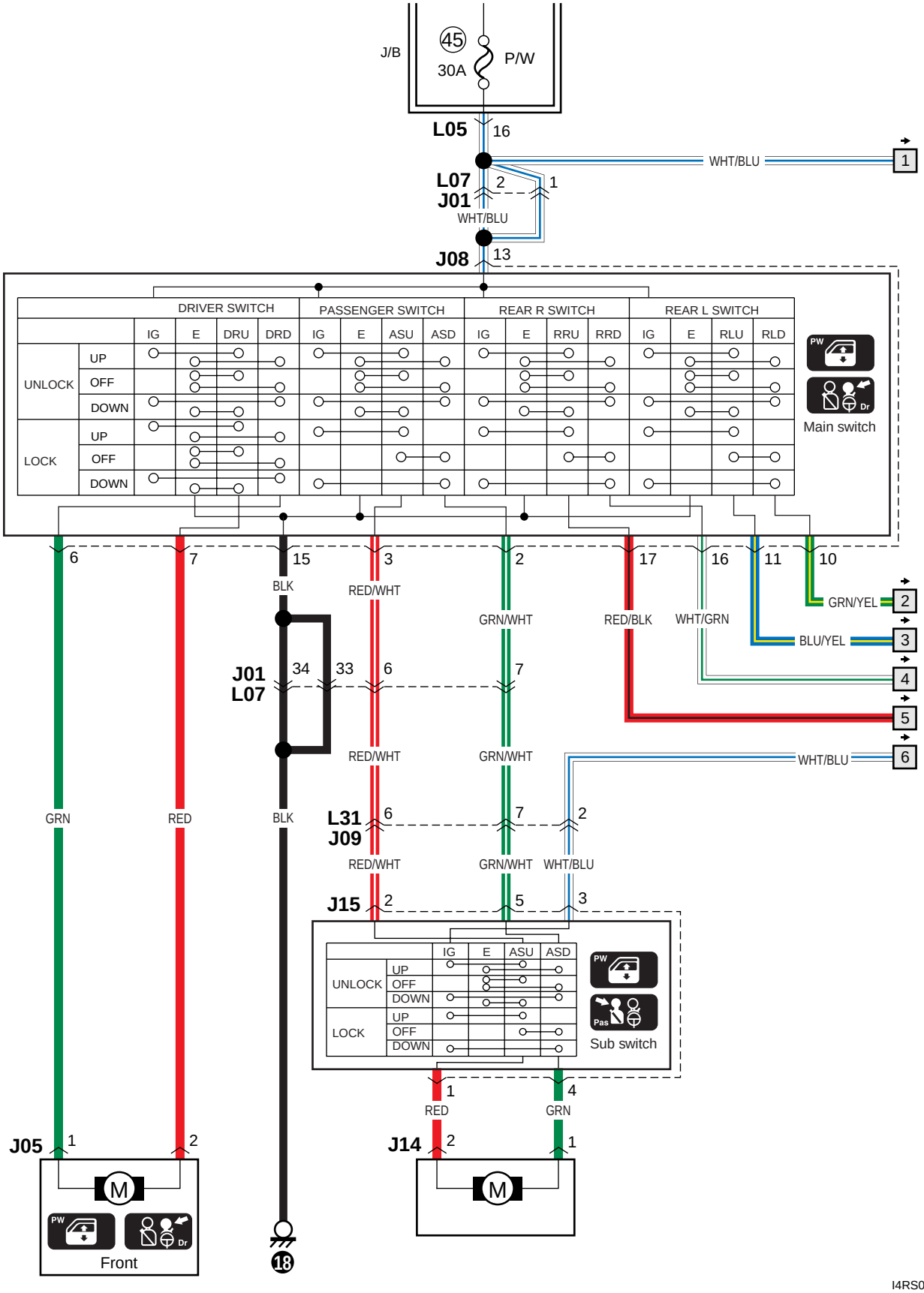
S4RS0A910E012



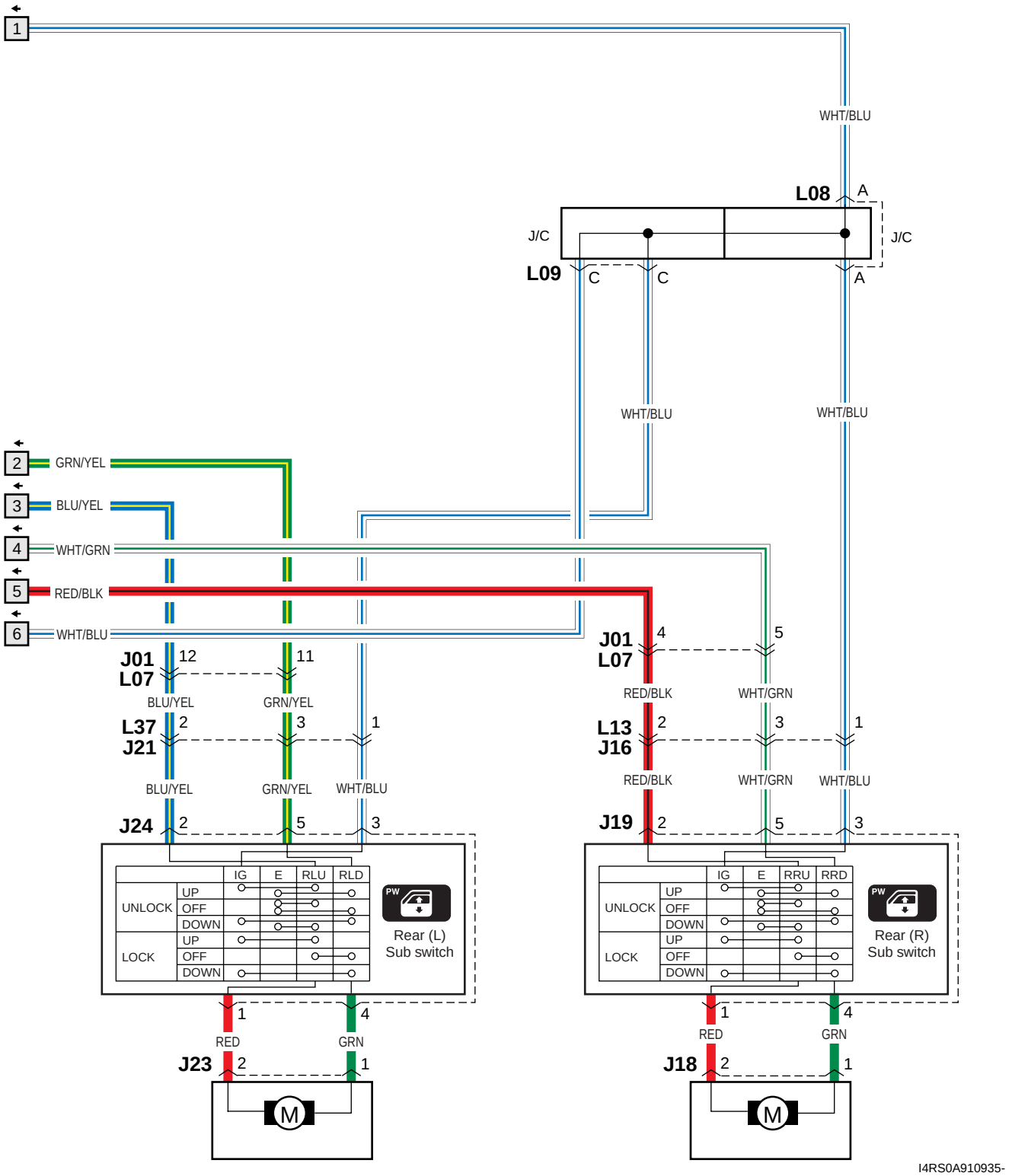
I4RS0A910933-

B-4 Power Window Circuit Diagram

S4RS0A910E013

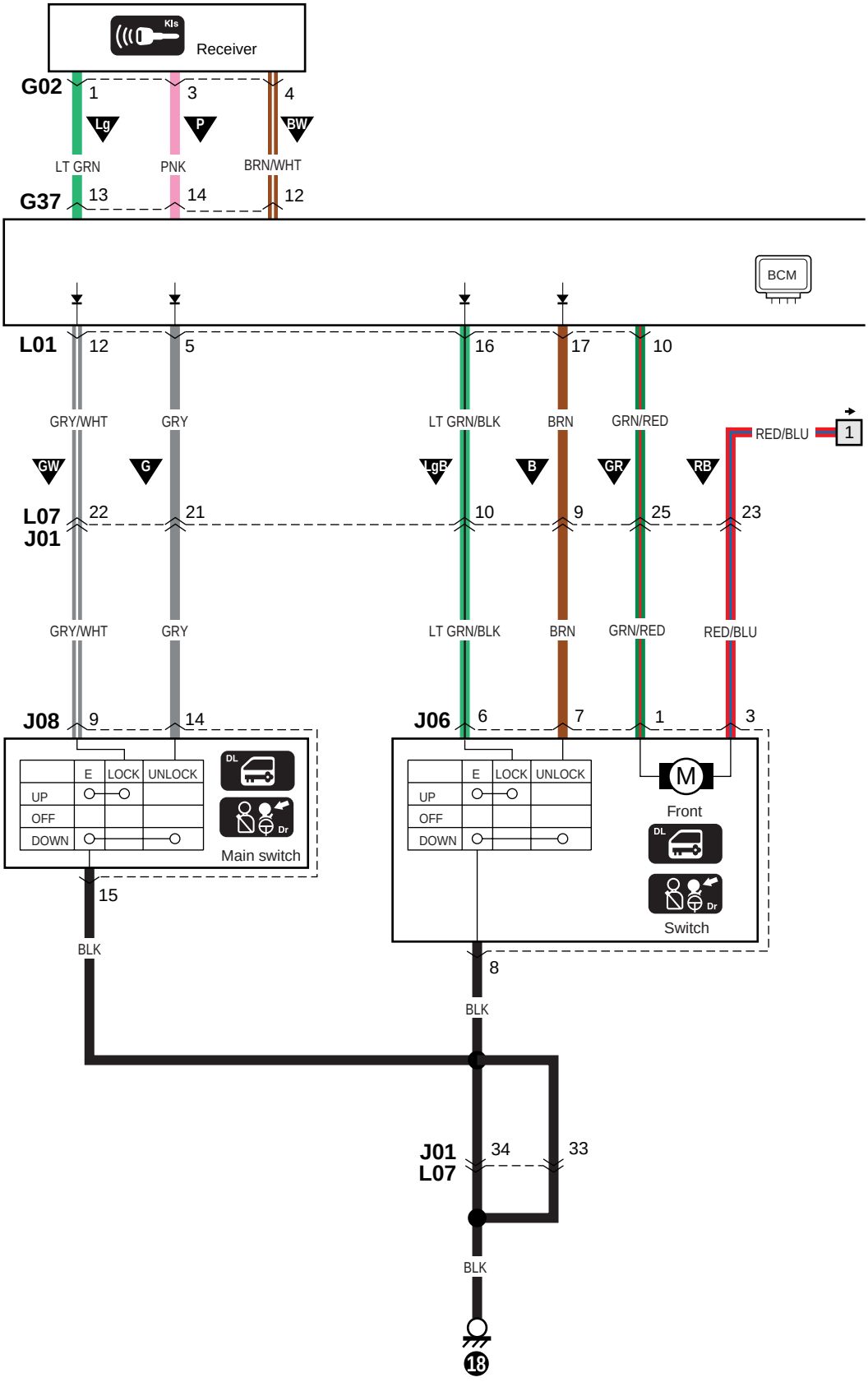


I4RS0A910934-

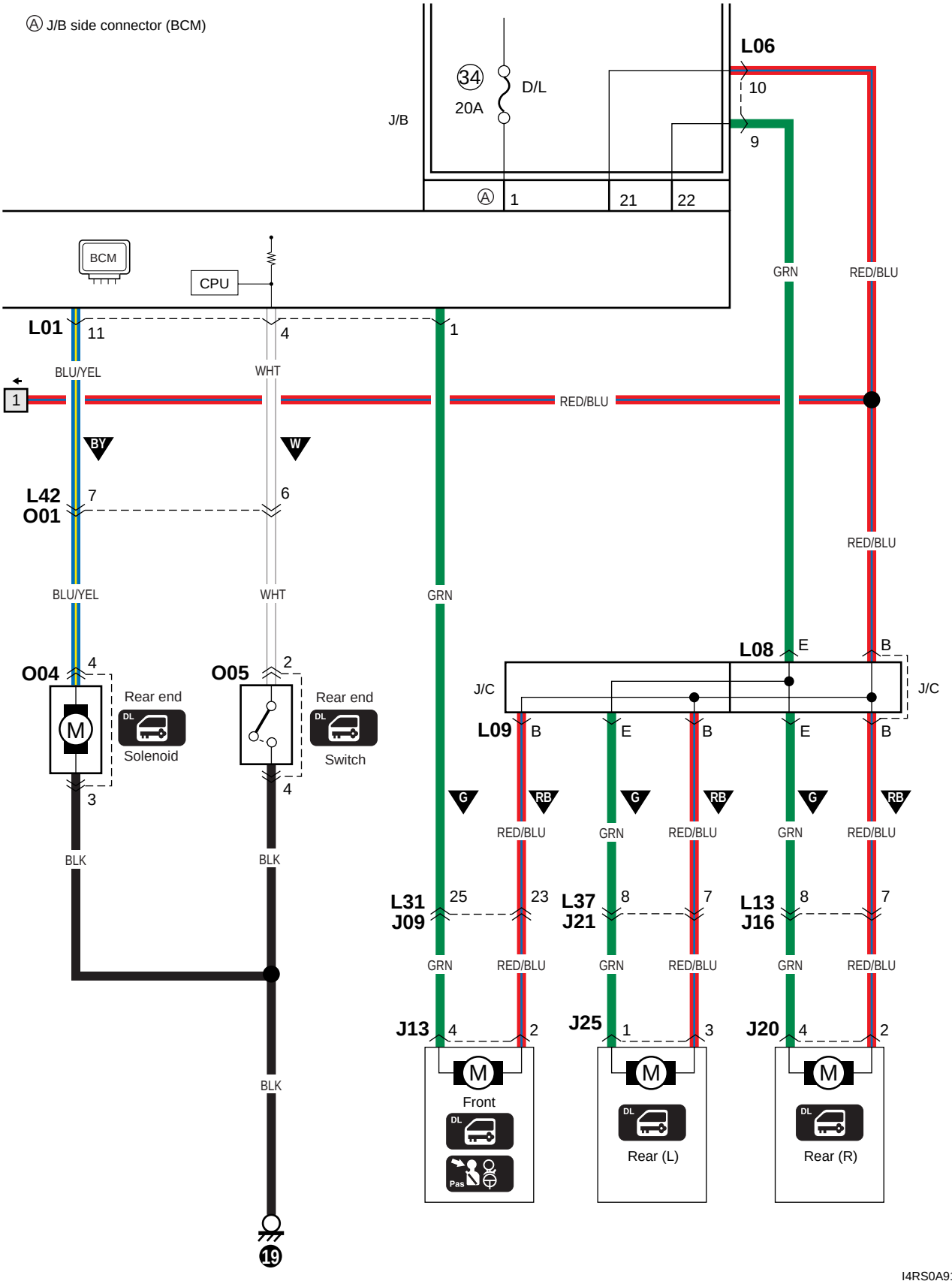

1
2 GRN/YEL
3 BLU/YEL
4 WHT/GRN
5 RED/BLK
6 WHT/BLU
WHT/BLU
L08 A
J/C
J/C
L09 C C A
WHT/BLU
WHT/BLU
J01 L07 12 11
BLU/YEL GRN/YEL
L37 J21 2 3 1
BLU/YEL GRN/YEL WHT/BLU
J24 2 5 3
J01 L07 4 5
RED/BLK WHT/GRN
L13 J16 2 3 1
RED/BLK WHT/GRN WHT/BLU
J19 2 5 3
IG E RLU RLD
UNLOCK UP OFF DOWN
LOCK UP OFF DOWN
PW
Rear (L) Sub switch
IG E RRU RRD
UNLOCK UP OFF DOWN
LOCK UP OFF DOWN
PW
Rear (R) Sub switch
1 4
RED GRN
J23 2 1
1 4
RED GRN
J18 2 1
M
M
I4RS0A910935-

B-5 Power Door Lock Circuit Diagram

S4RS0A910E014



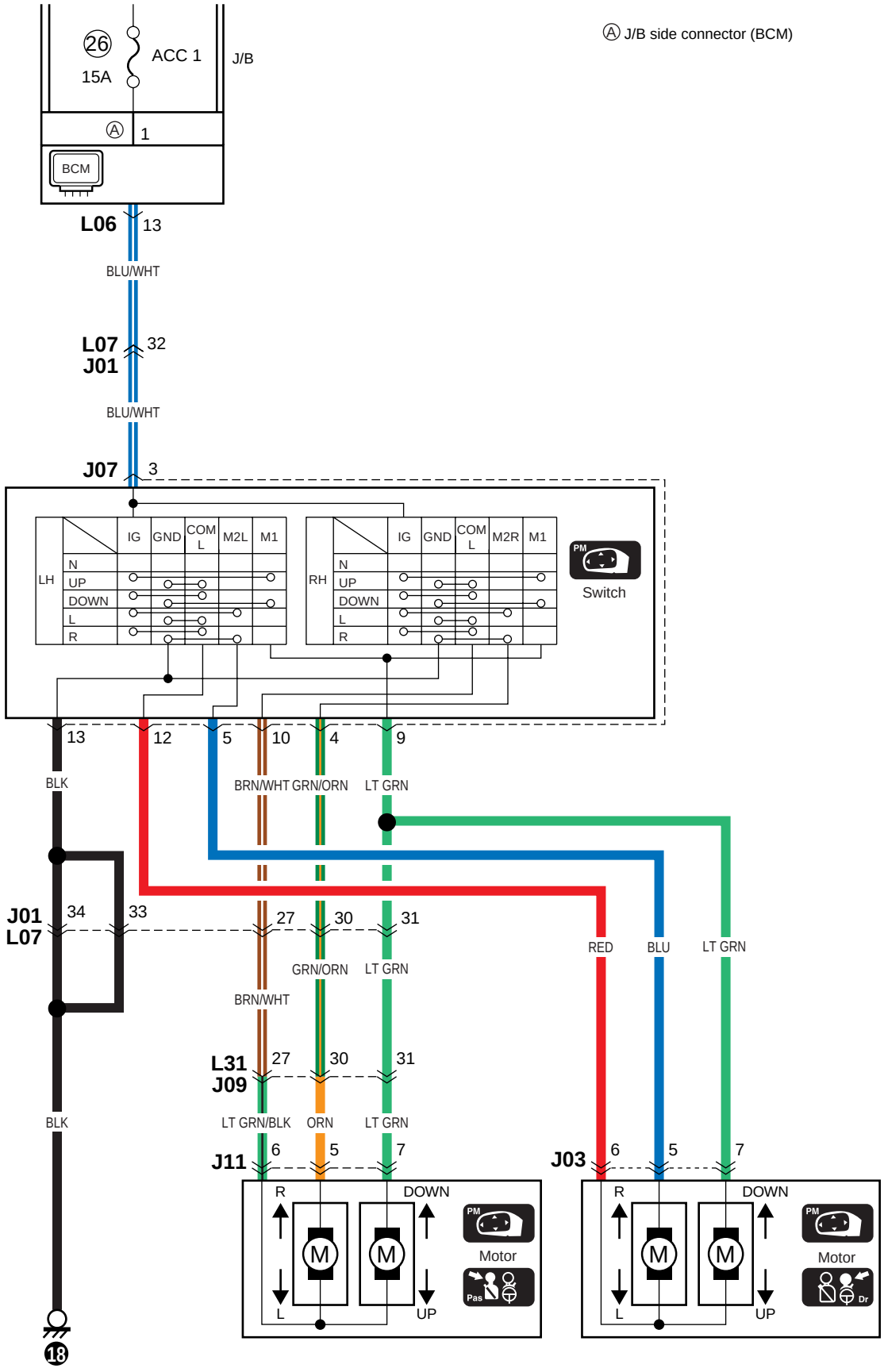
I4RS0A910936-



I4RS0A910937-

B-6 Power Mirror Circuit Diagram

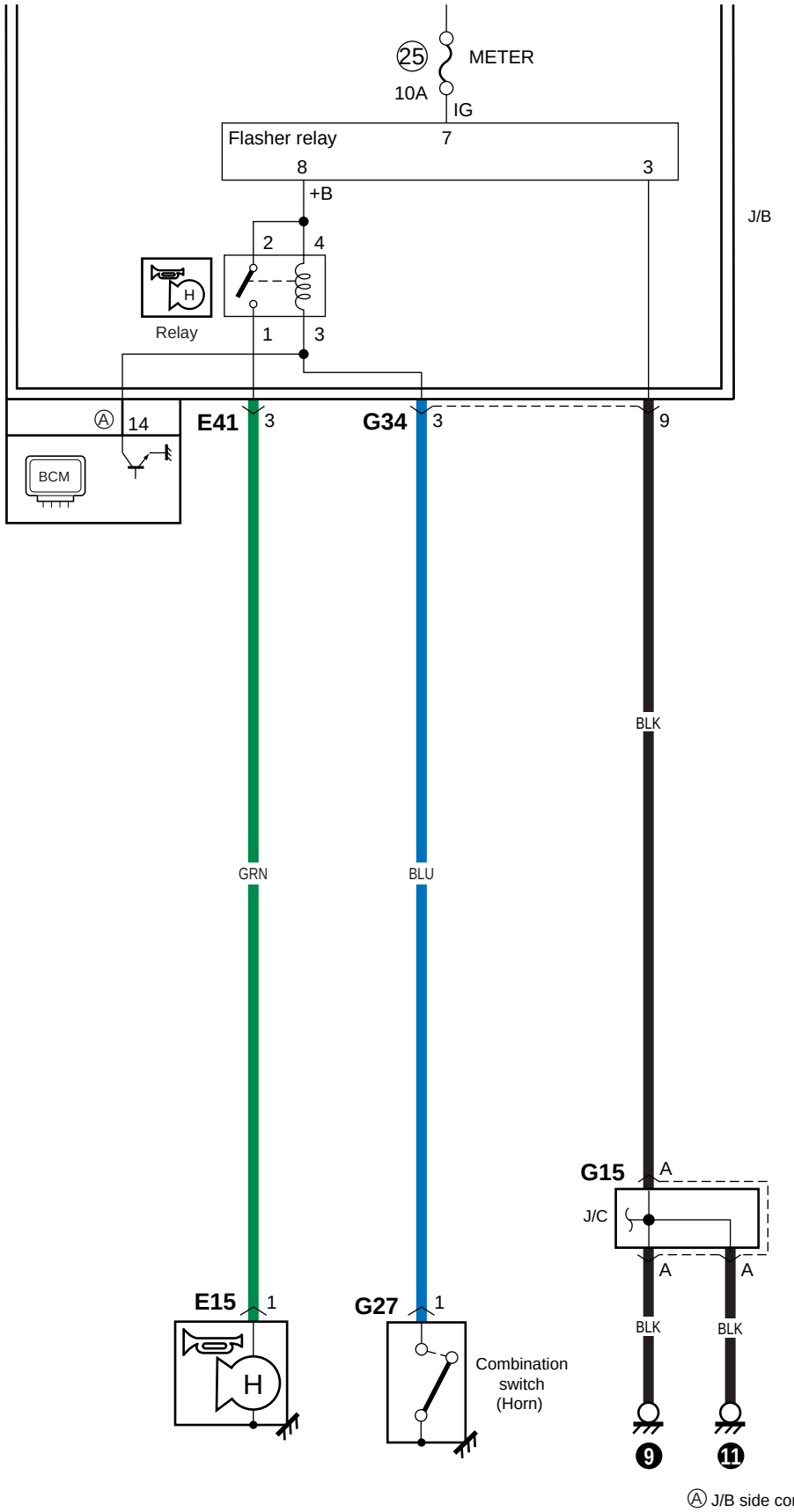
S4RS0A910E015



I4RS0A910938-

B-7 Horn Circuit Diagram

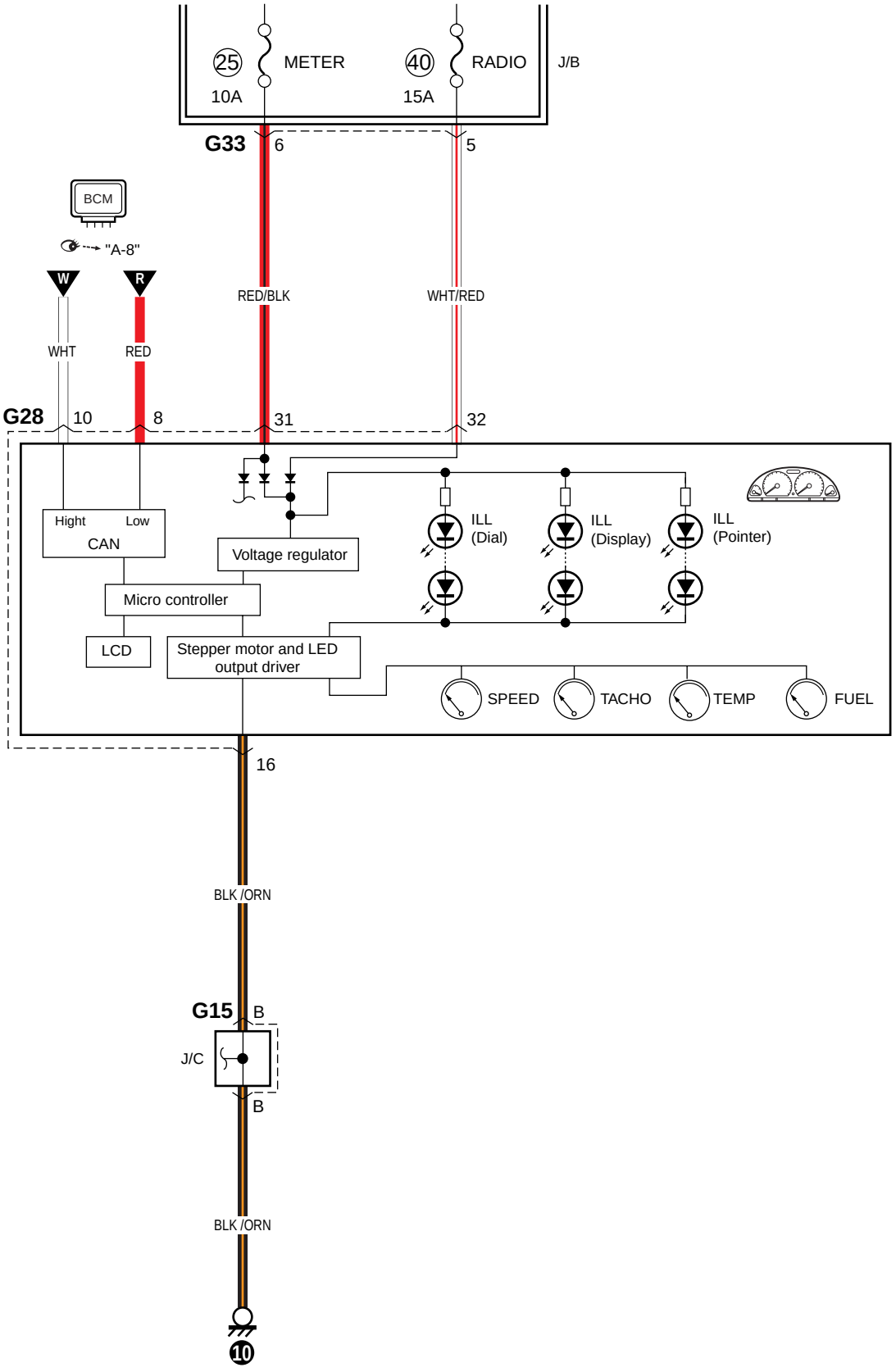
S4RS0A910E016



I4RS0A910939-

C-1 Combination Meter Circuit Diagram (Meter)

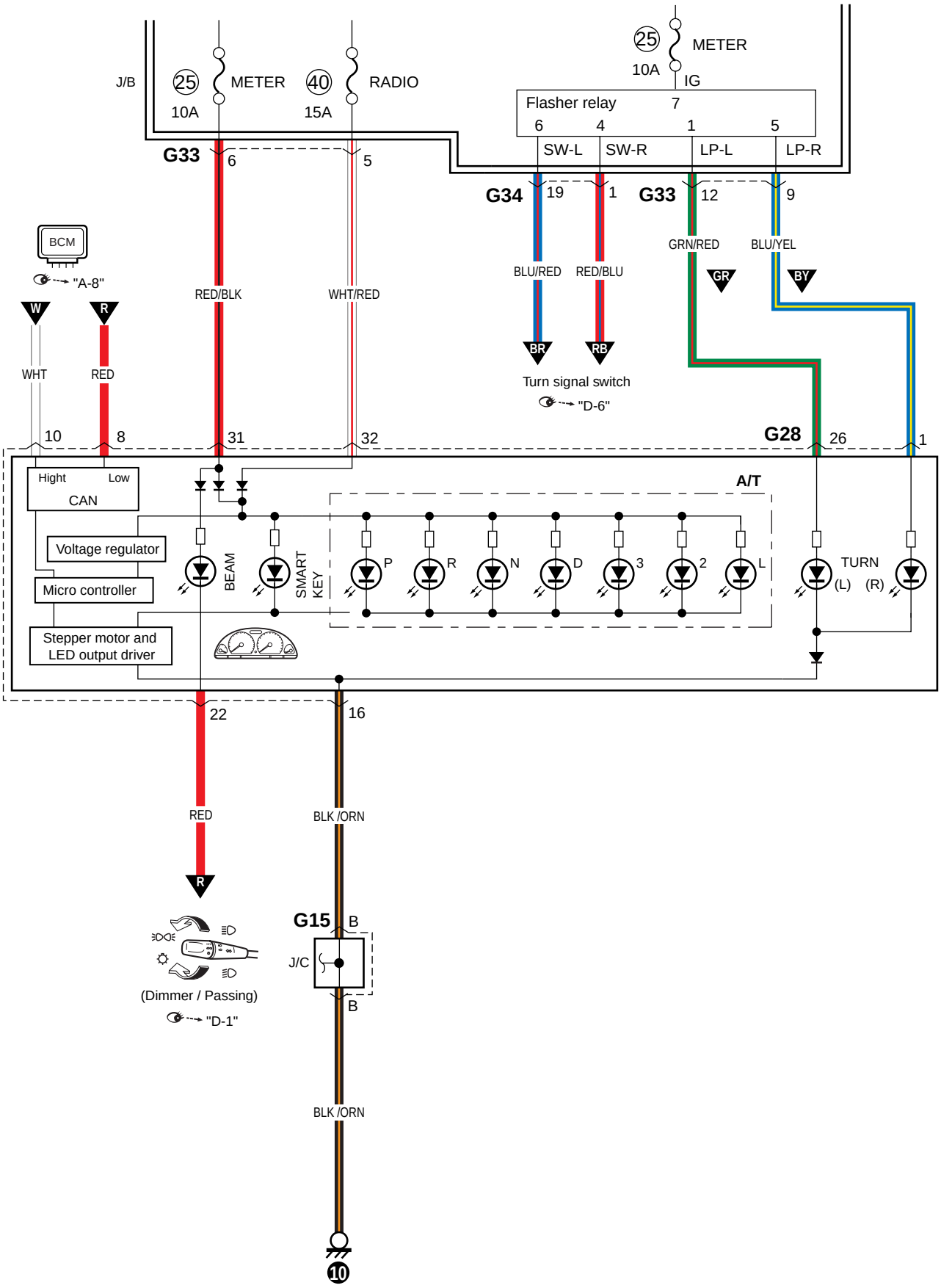
S4RS0A910E017



I4RS0A910940-

C-2 Combination Meter Circuit Diagram (Indicator)

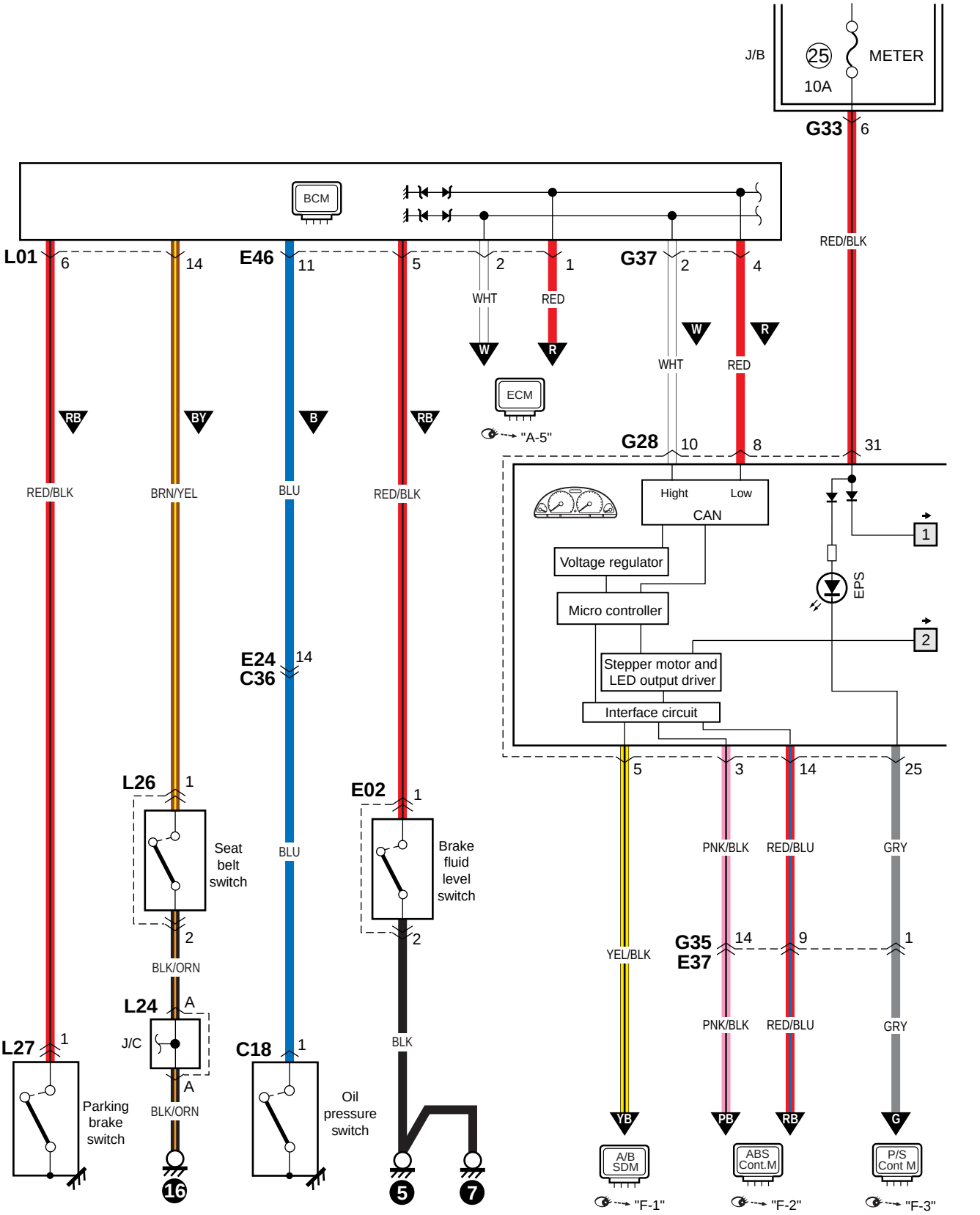
S4RS0A910E018



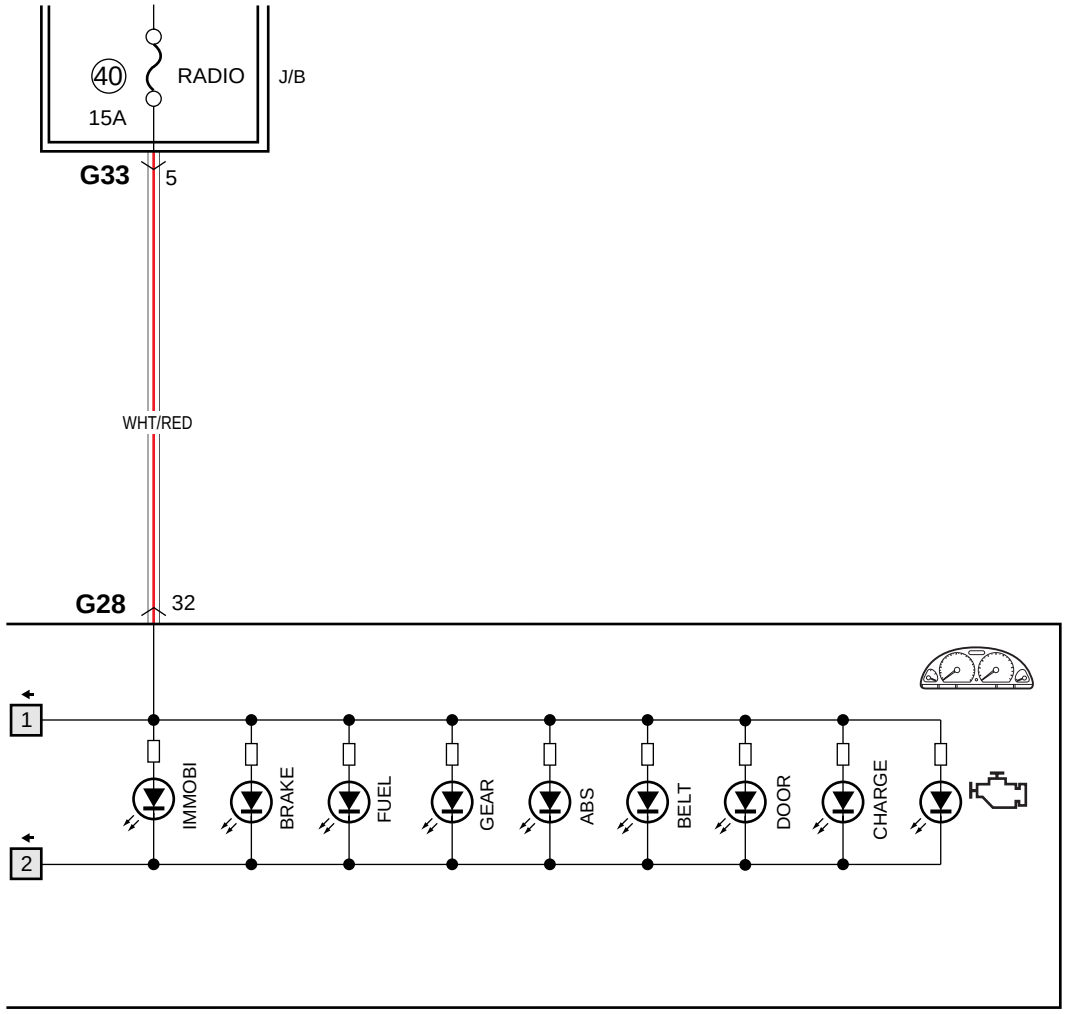
I4RS0A910941-

C-3 Combination Meter Circuit Diagram (Warning Light)

S4RS0A910E019



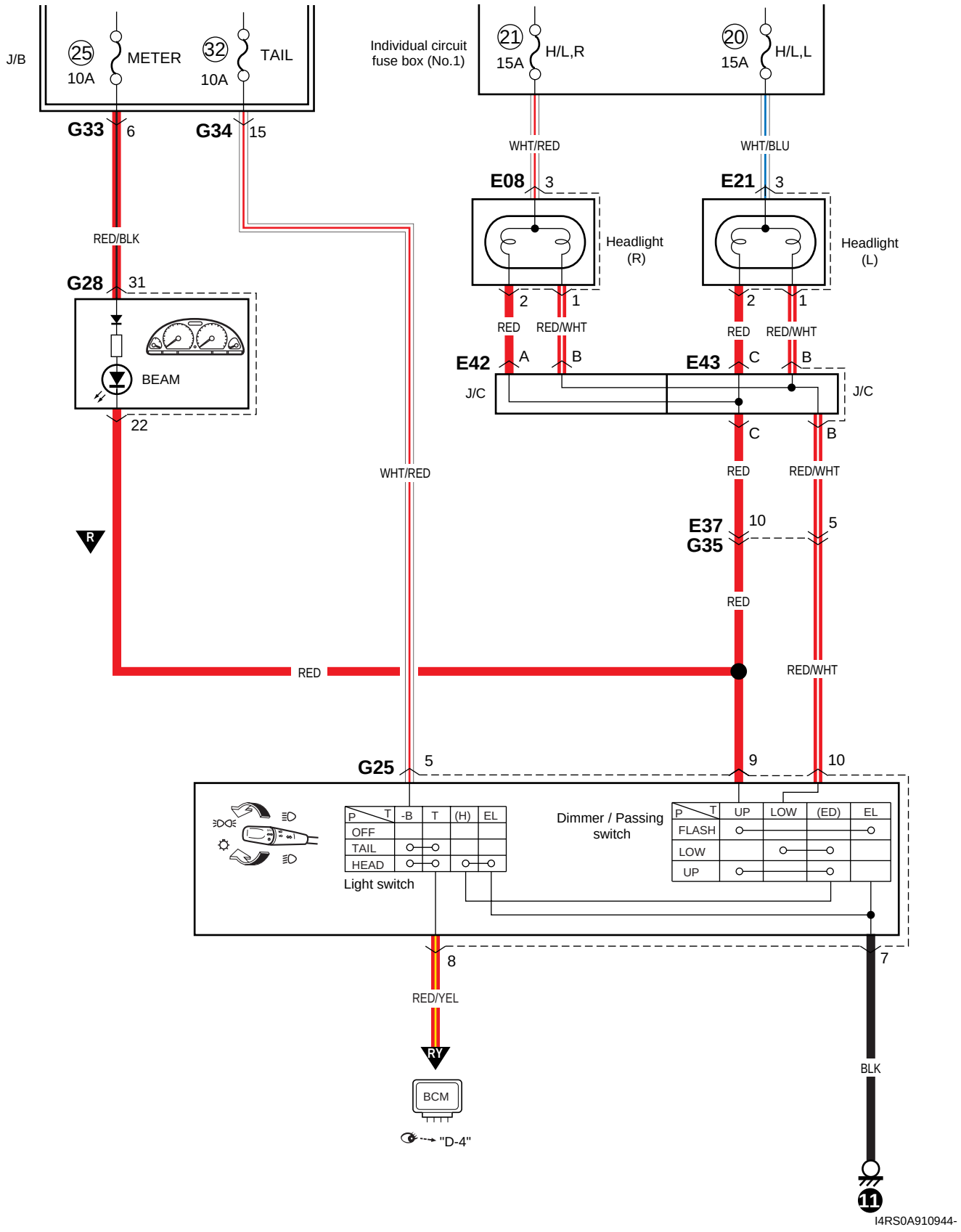
I4RS0A910942-



I4RS0A910943-

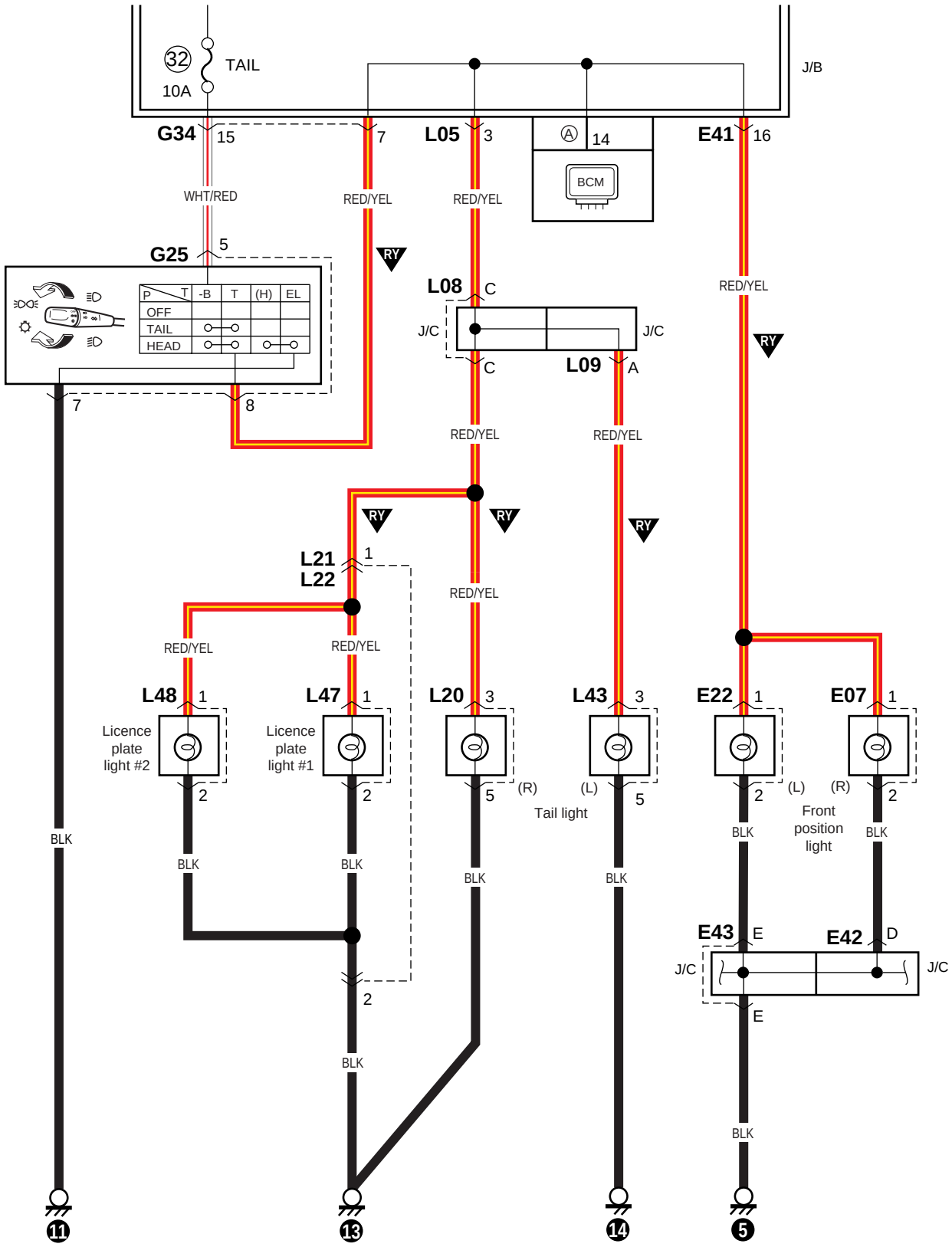
D-1 Headlight System Circuit Diagram

S4RS0A910E020



D-2 Position, Tail and Licence Plate Light System Circuit Diagram

S4RS0A910E021

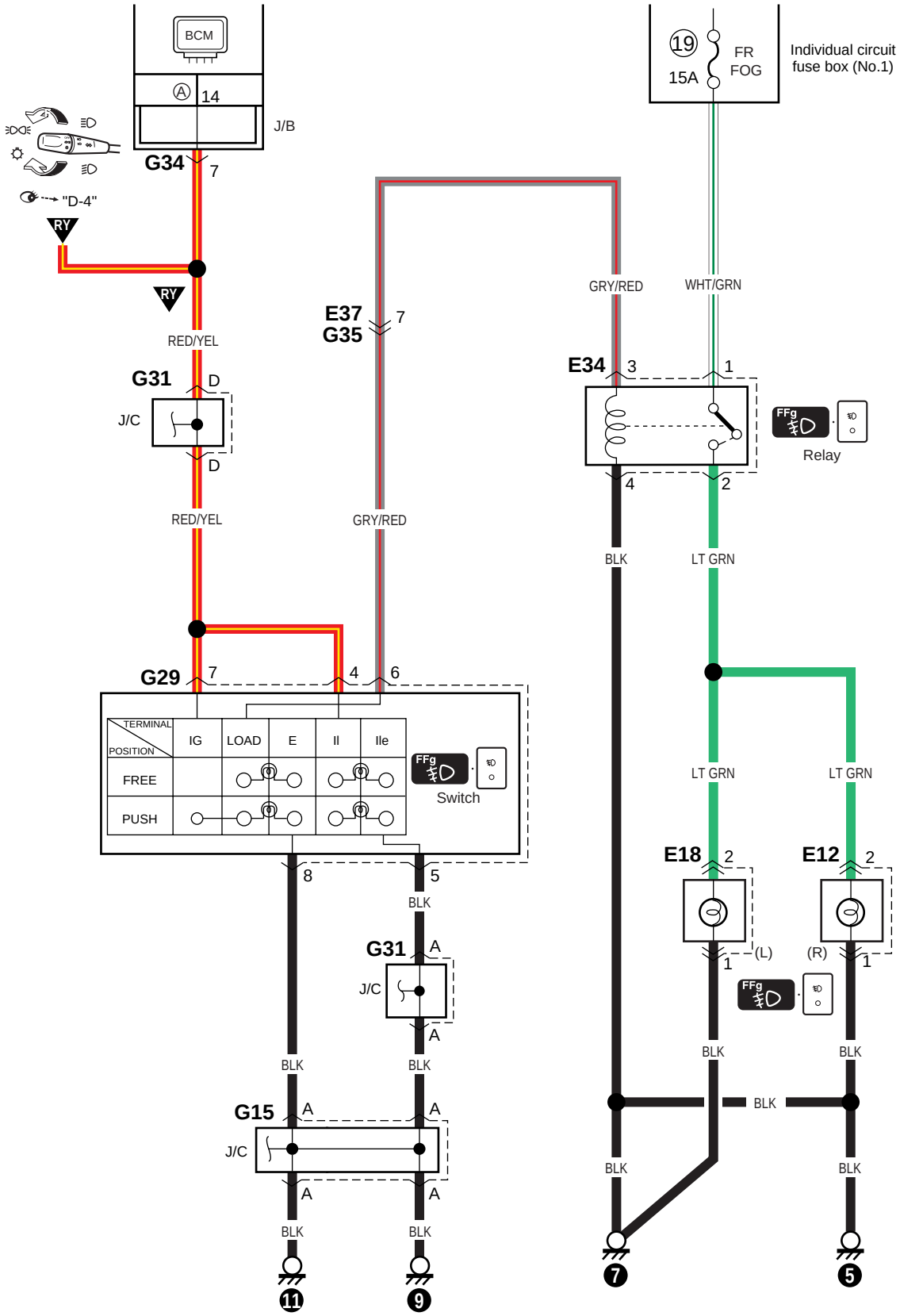


Ⓐ J/B side connector (BCM)

I4RS0A910945-

D-3 Front Fog Light System Circuit Diagram

S4RS0A910E022

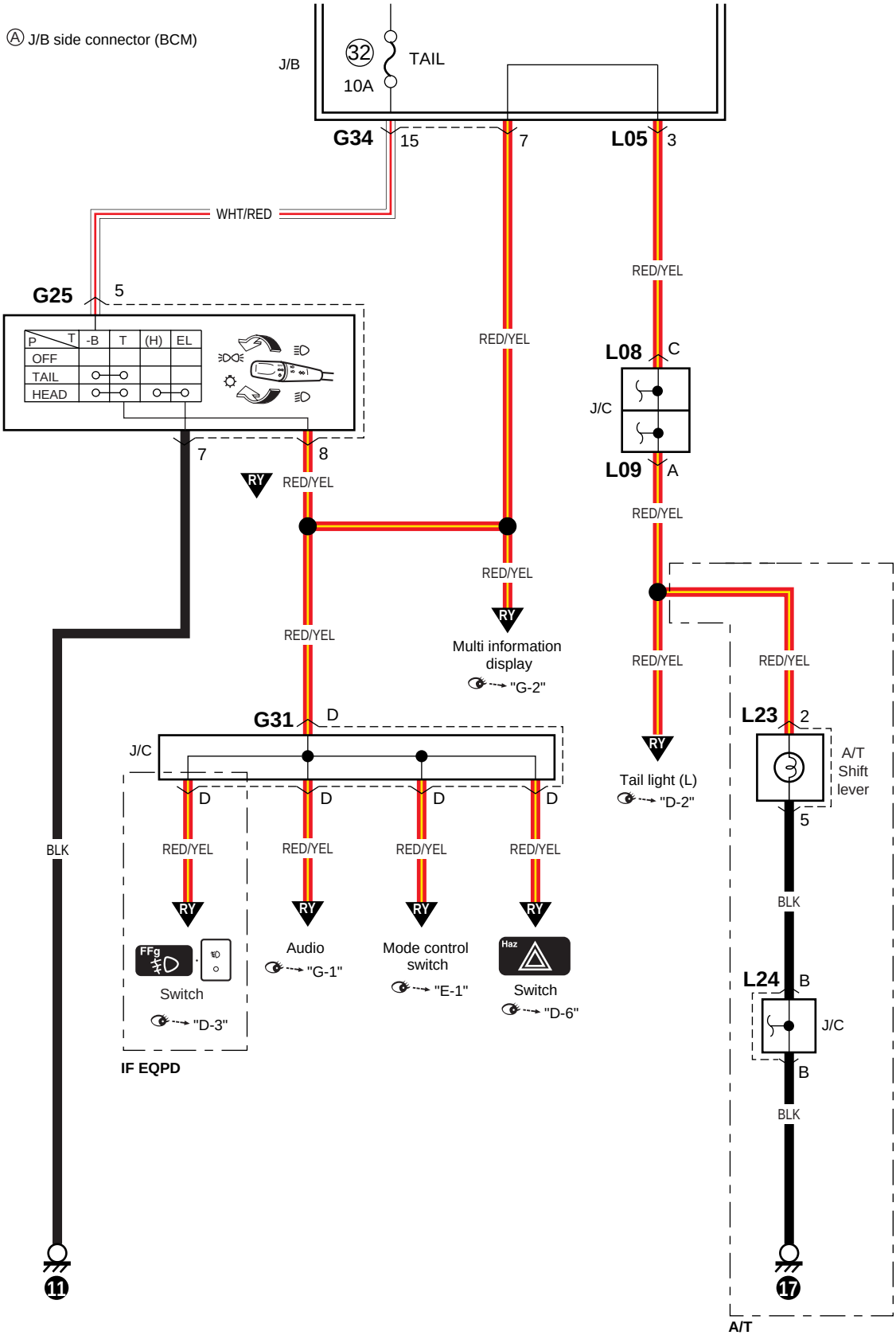


Ⓐ J/B side connector (BCM)

I4RS0A910946-

D-4 Illumination Light System Circuit Diagram

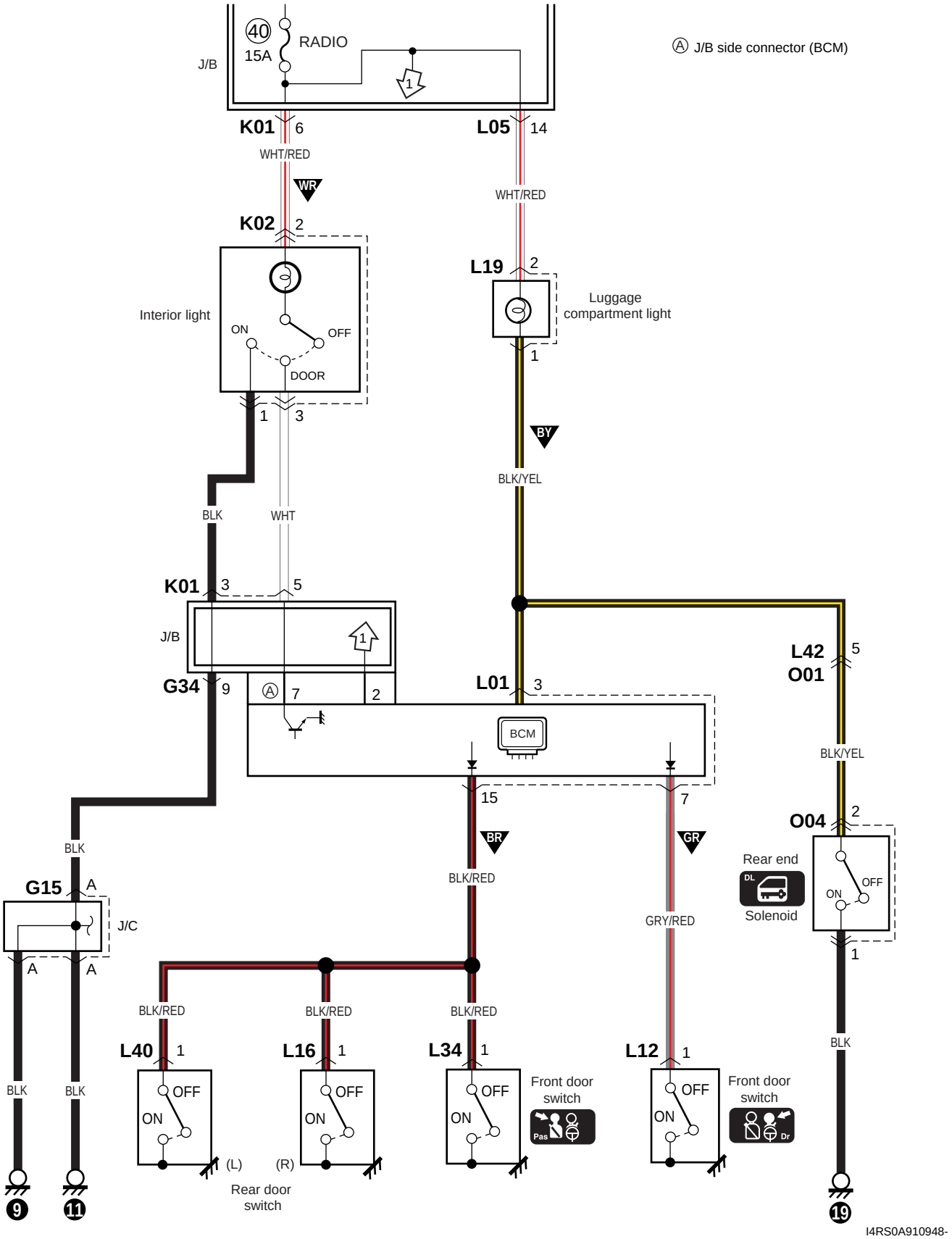
S4RS0A910E023



I4RS0A910947-

D-5 Interior Light System Circuit Diagram

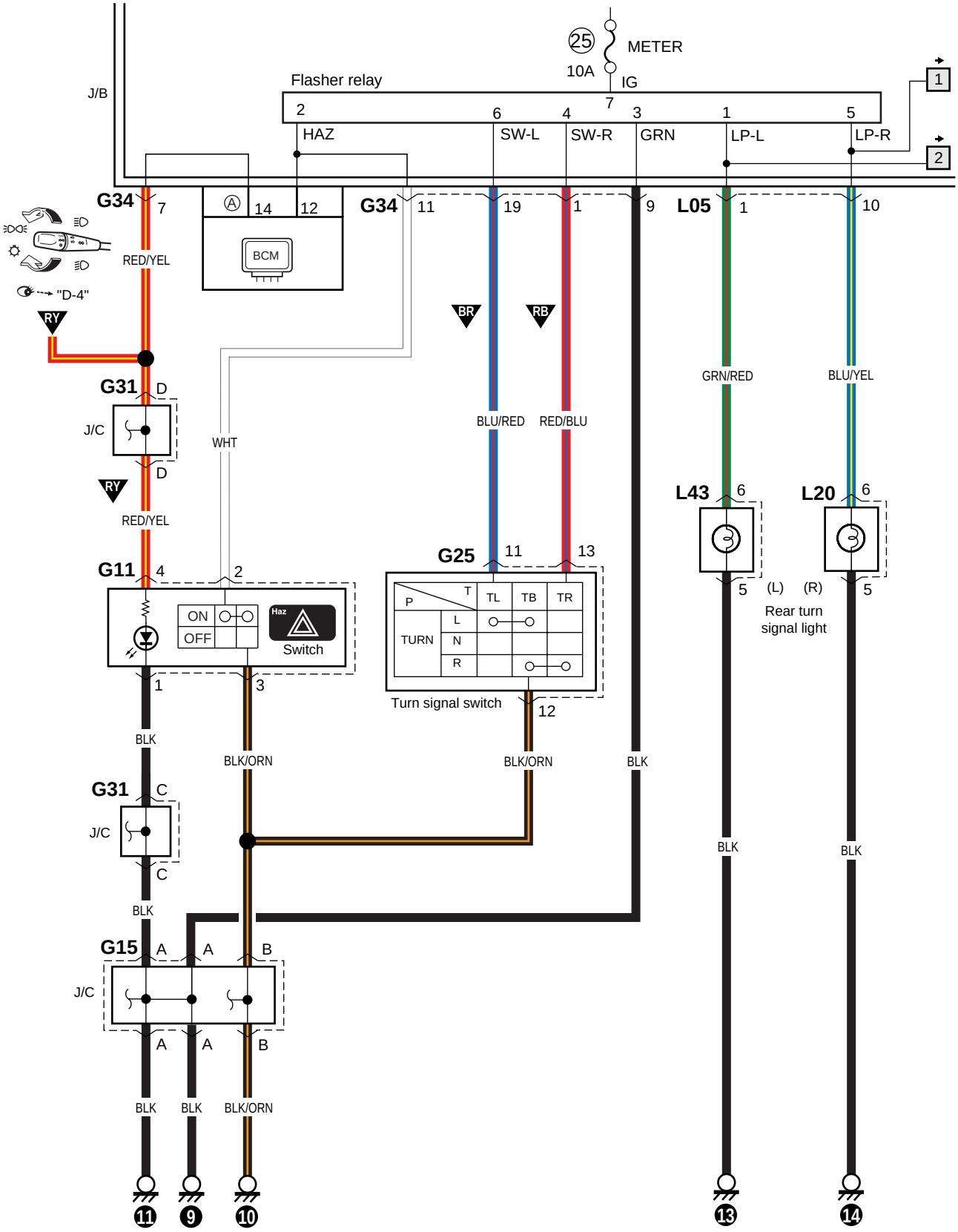
S4RS0A910E024



I4RS0A910948-

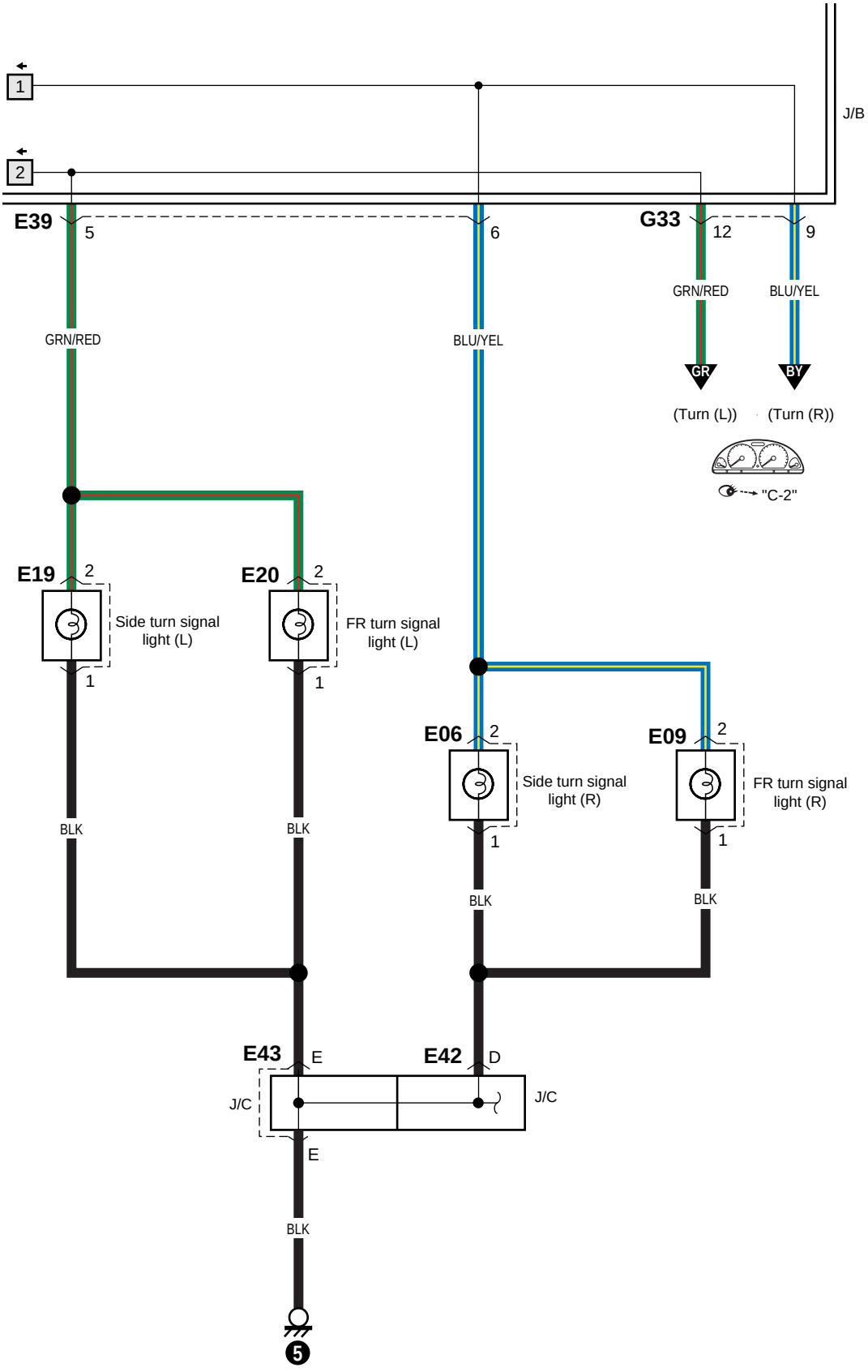
D-6 Turn Signal and Hazard Warning Light System Circuit Diagram

S4RS0A910E025



Ⓐ J/B side connector (BCM)

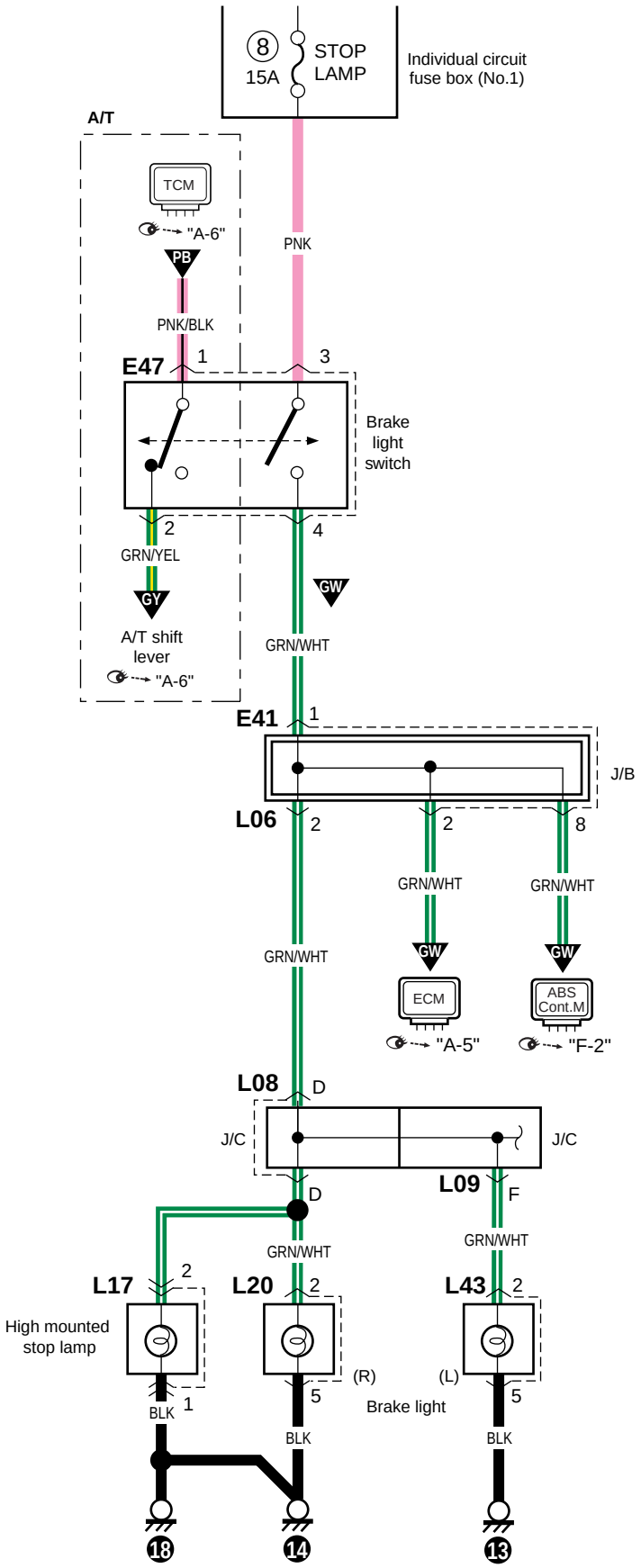
I4RS0A910949-



I4RS0A910950-

D-7 Brake Light System Circuit Diagram

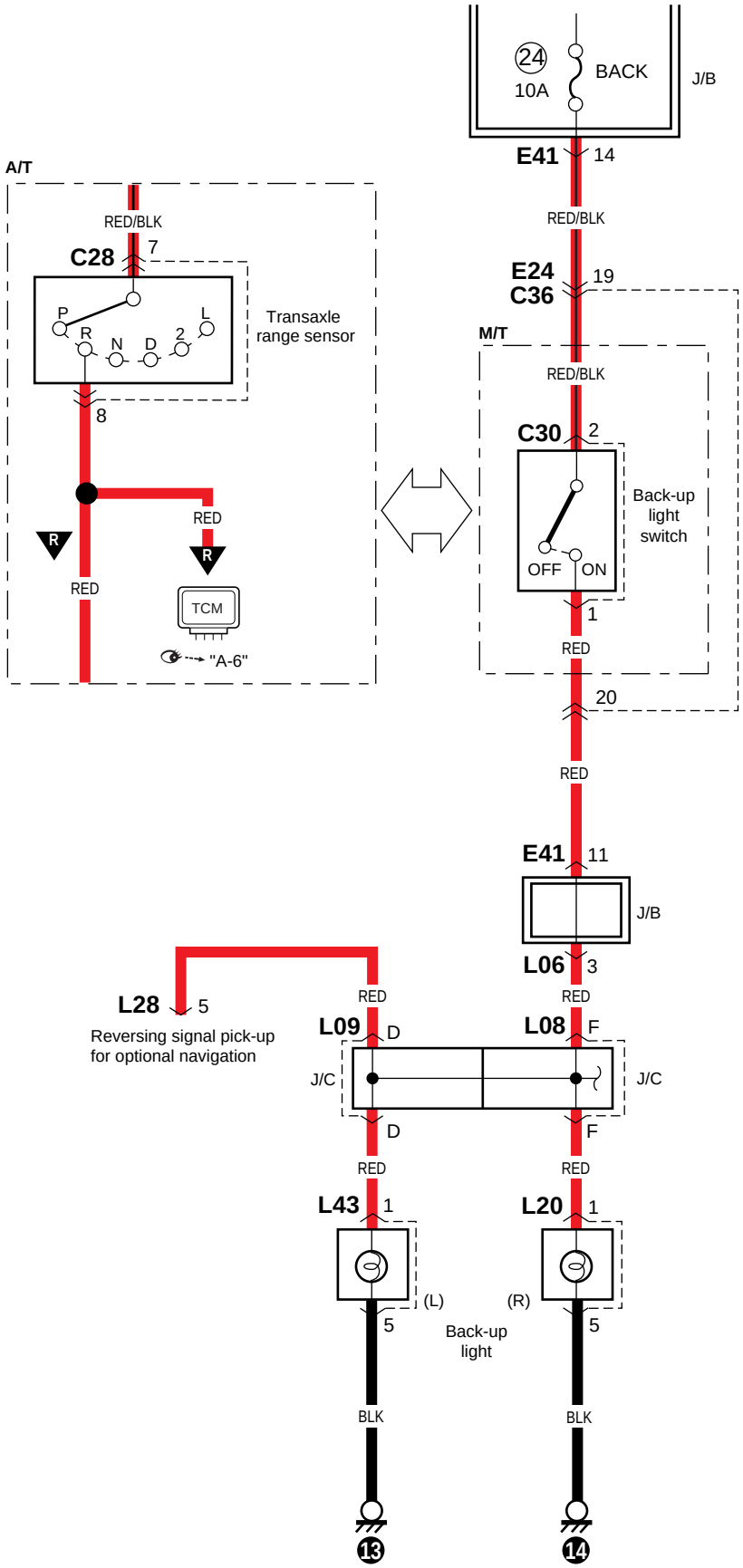
S4RS0A910E026



I4RS0A910951-

D-8 Back-Up Light System Circuit Diagram

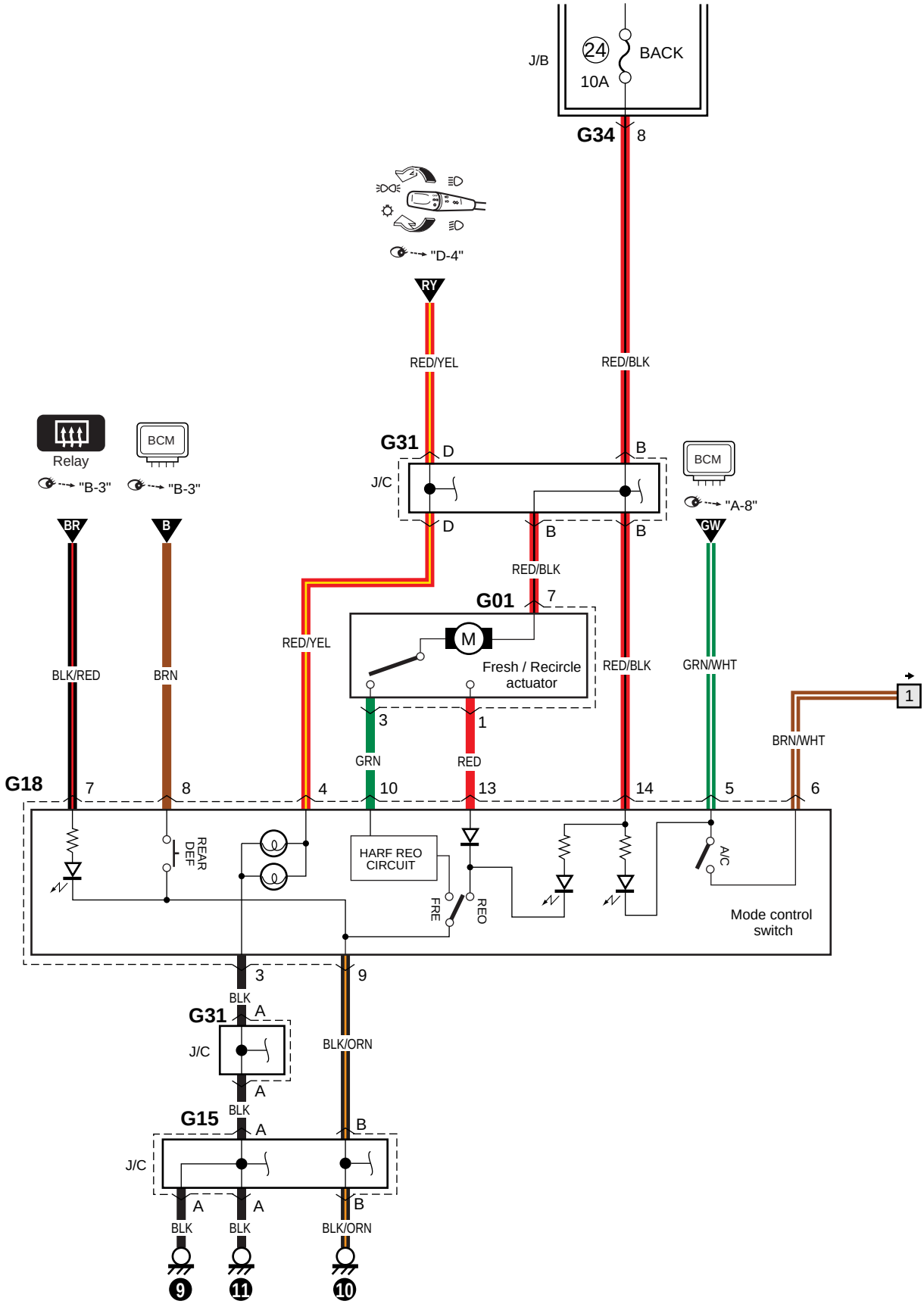
S4RS0A910E027



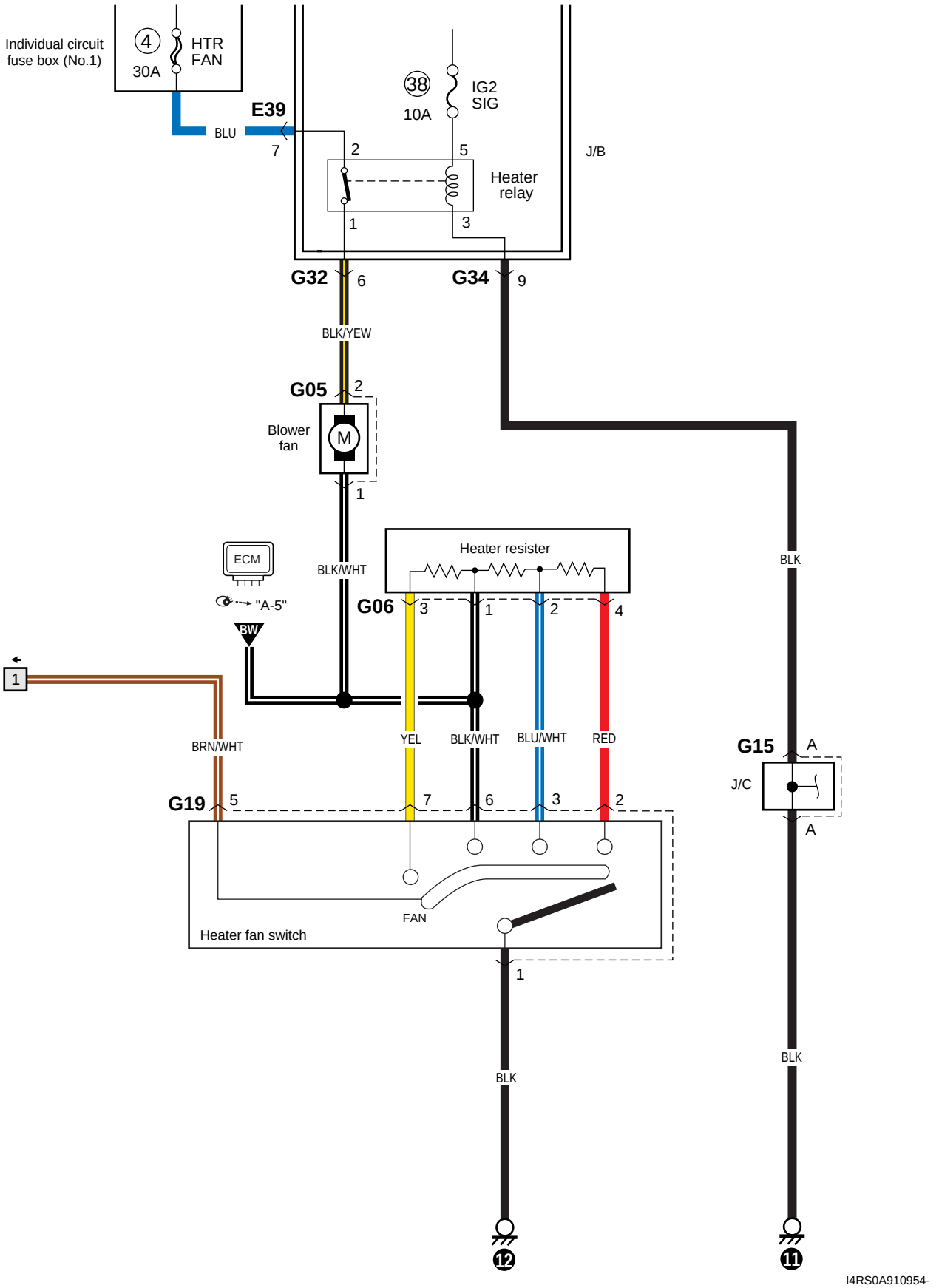
I4RS0A910952-

E-1 Heater System Circuit Diagram

S4RS0A910E028

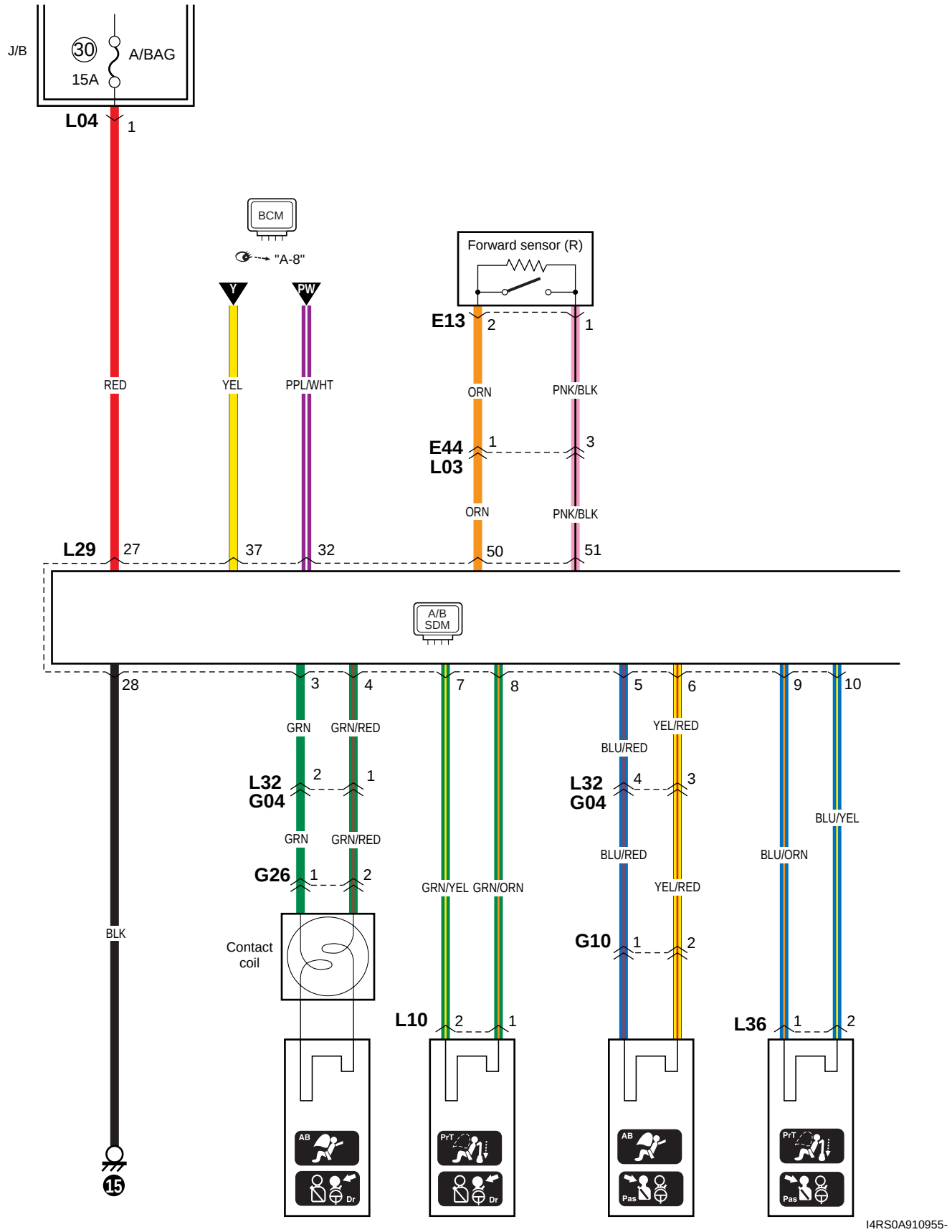


I4RS0A910953-

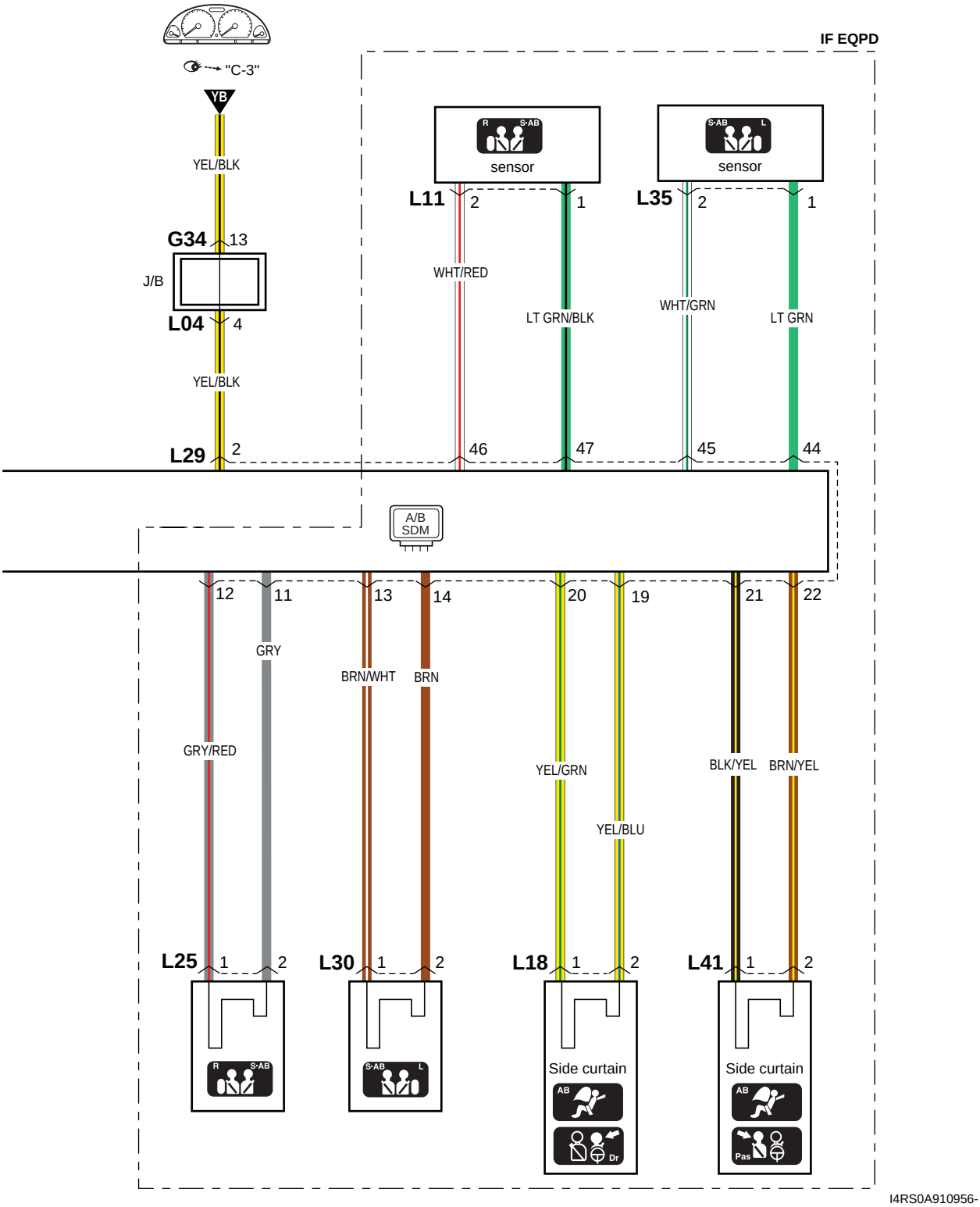

Individual circuit fuse box (No.1)
4
30A
HTR FAN
BLU
E39
7
38
10A
IG2 SIG
2
5
1
3
Heater relay
J/B
G32
6
G34
9
BLK/YEW
G05
2
Blower fan
M
1
ECM
"A-5"
BLK/WHT
Heater resister
G06
3
1
2
4
BW
BLK
1
BRN/WHT
YEL
BLK/WHT
BLU/WHT
RED
G15
A
J/C
A
G19
5
7
6
3
2
FAN
Heater fan switch
1
BLK
BLK
12
11
I4RS0A910954-

F-1 Air-Bag System Circuit Diagram

S4RS0A910E029

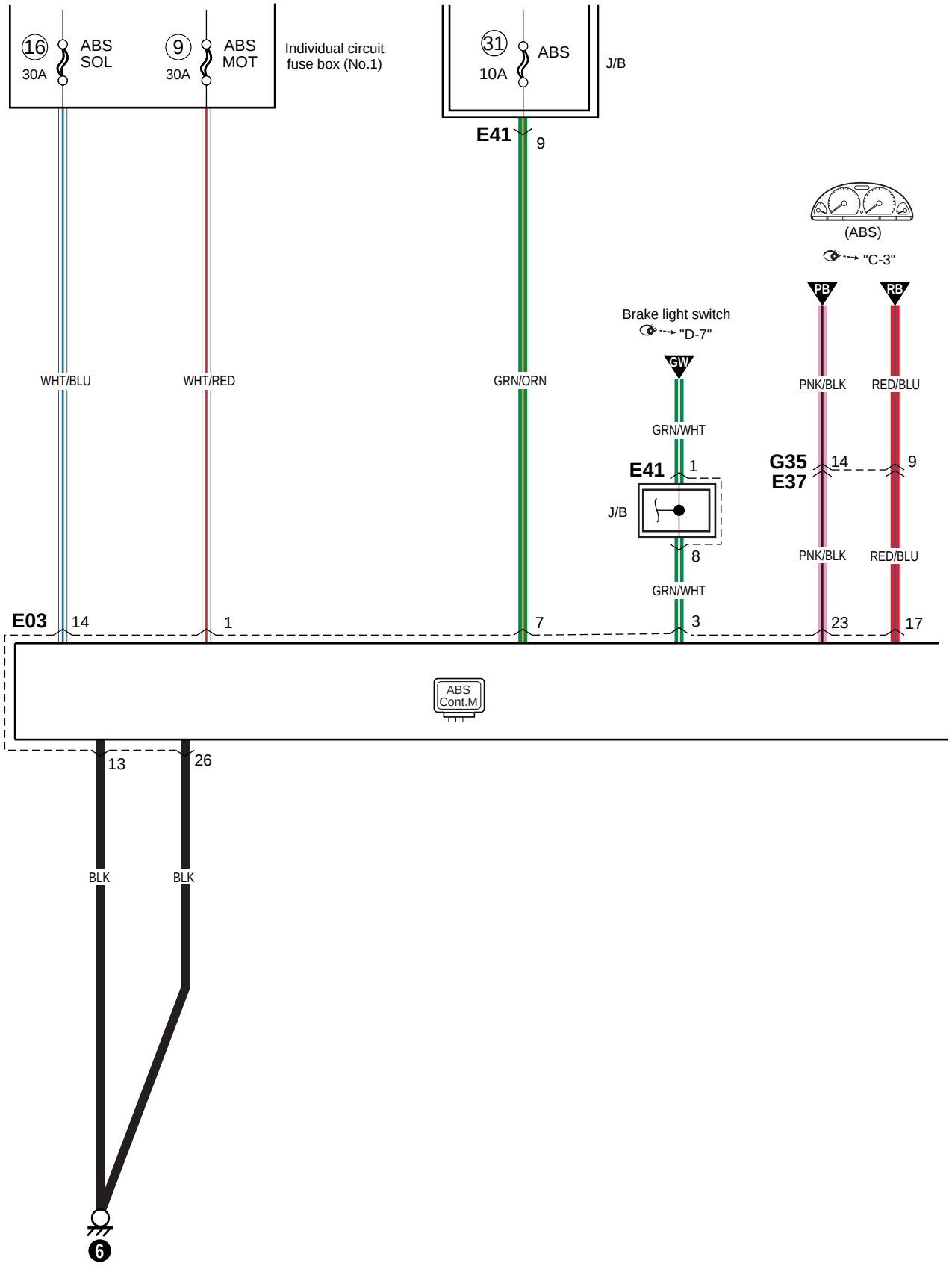


I4RS0A910955-

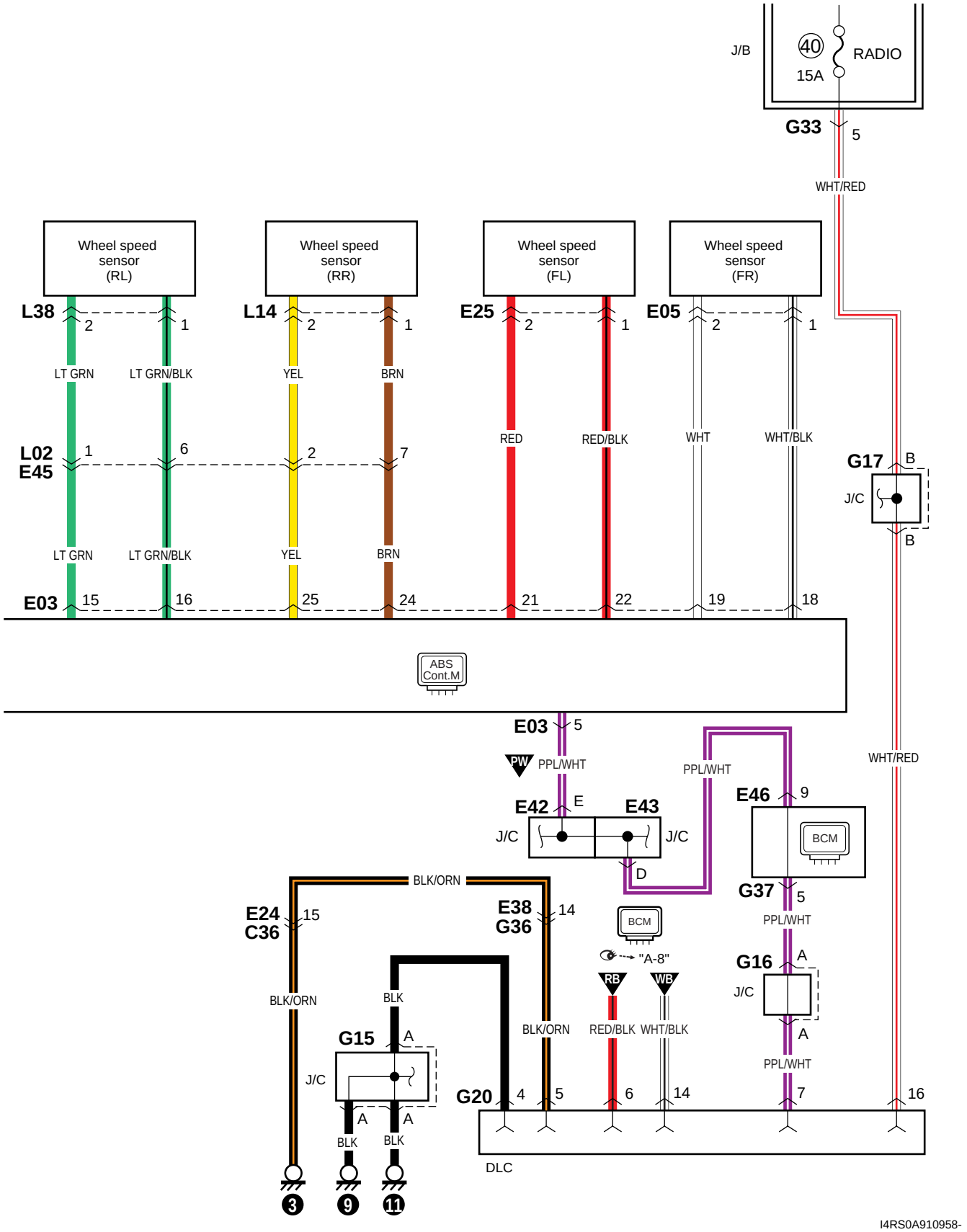

IF EQPD
"C-3"
YB
YEL/BLK
G34
13
J/B
L04
4
YEL/BLK
L29
2
sensor
L11
2
1
WHT/RED
LT GRN/BLK
sensor
L35
2
1
WHT/GRN
LT GRN
46
47
45
44
A/B
SDM
12
11
13
14
20
19
21
22
GRY
BRN/WHT
BRN
GRY/RED
YEL/GRN
YEL/BLU
BLK/YEL
BRN/YEL
L25
1
2
L30
1
2
L18
1
2
L41
1
2
Side curtain
Side curtain
I4RS0A910956-

F-2 Anti-Lock Brake System Circuit Diagram

S4RS0A910E030



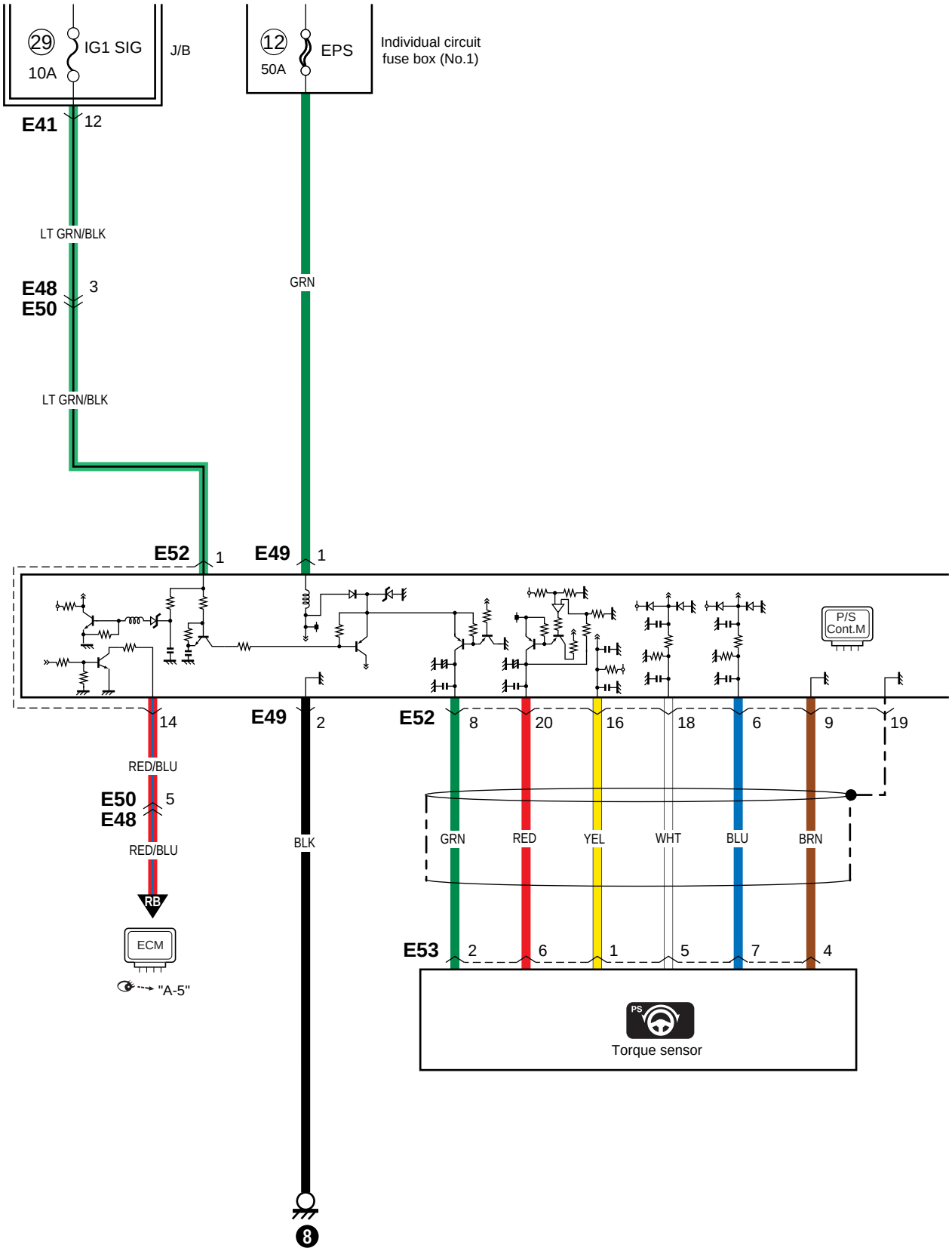
I4RS0A910957-



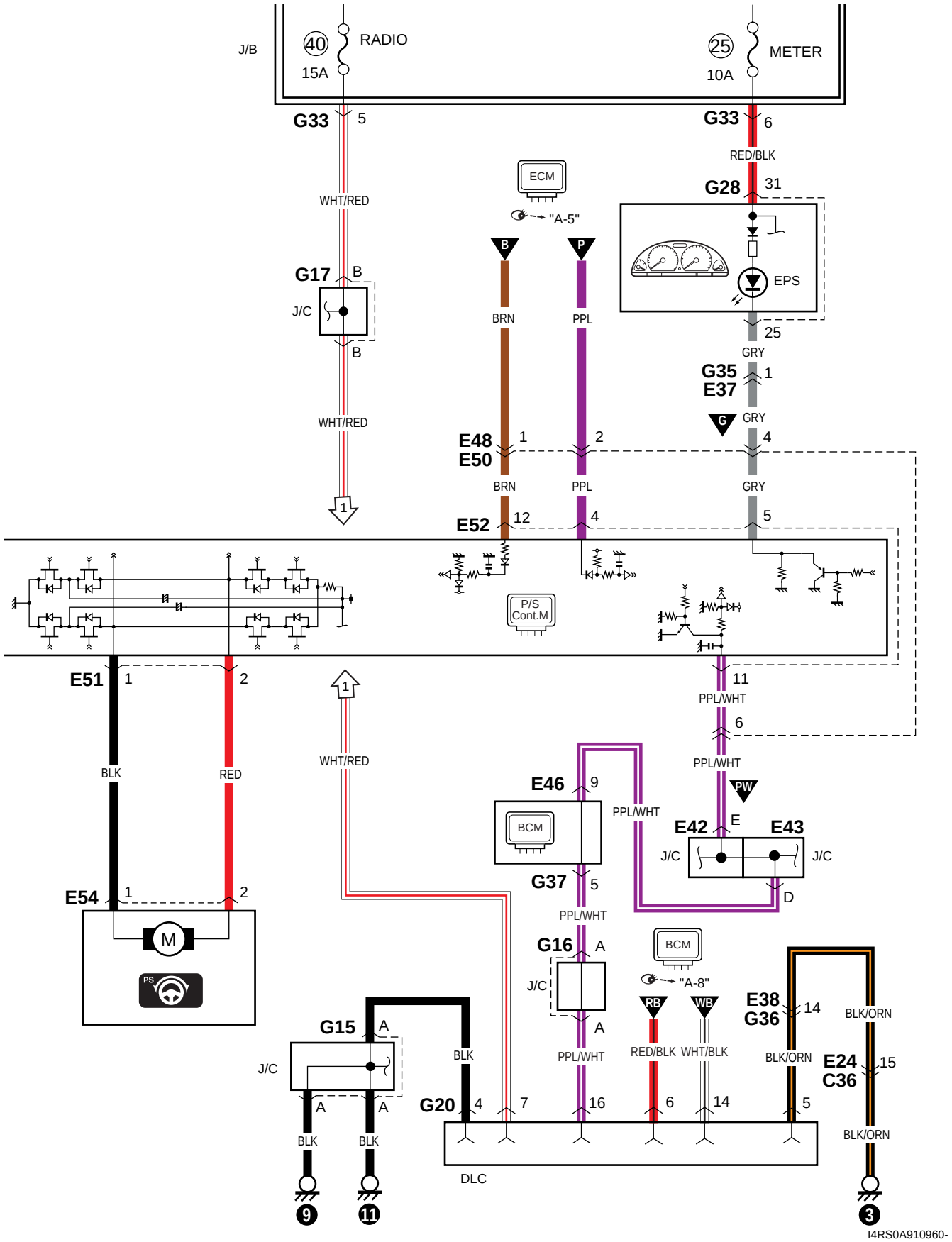
I4RS0A910958-

F-3 Power Steering System Circuit Diagram

S4RS0A910E031

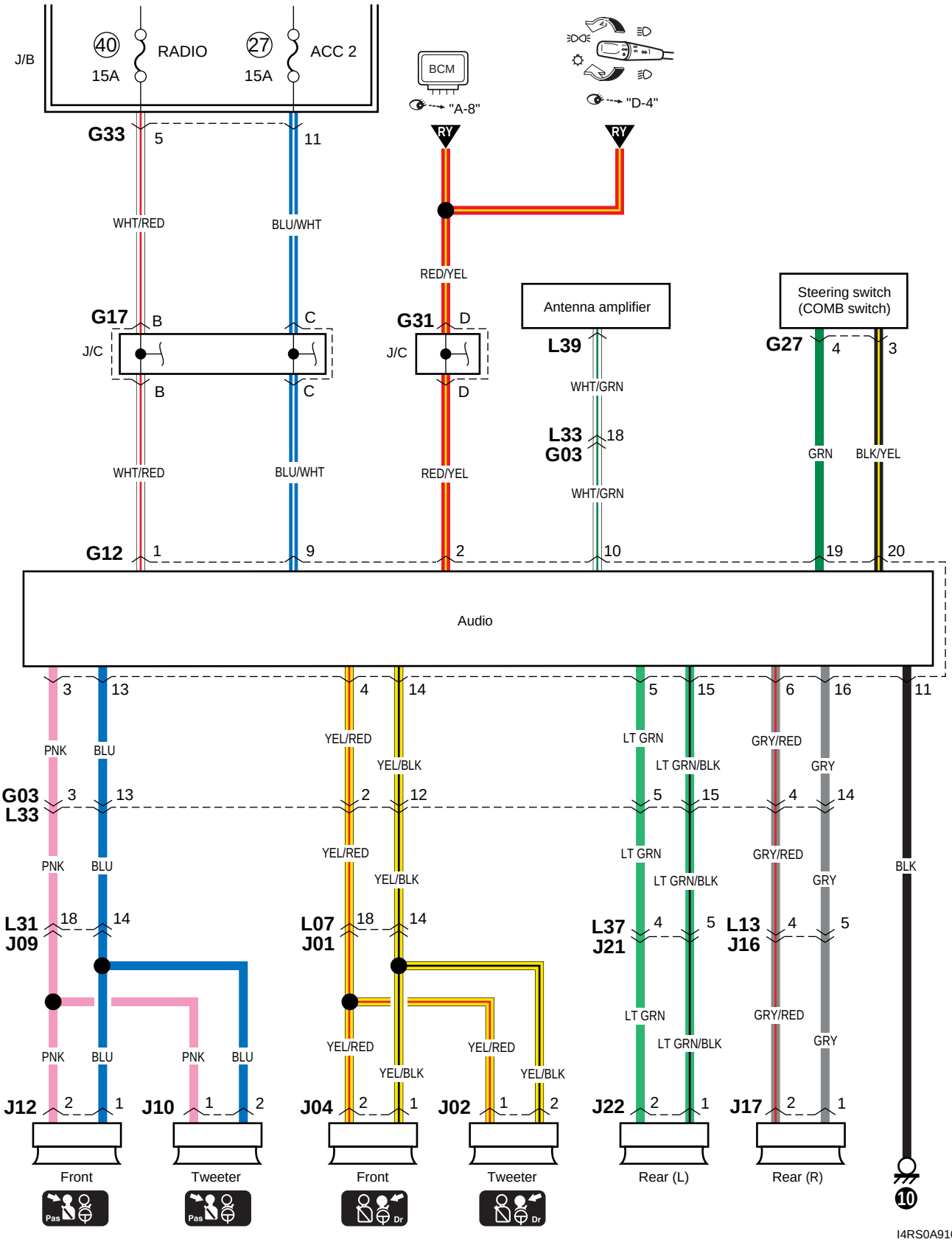


I4RS0A910959-


J/B
40
RADIO
15A
25
METER
10A
G33
5
G33
6
RED/BLK
WHT/RED
ECM
"A-5"
G28
31
G17
B
J/C
B
B
BRN
P
PPL
EPS
25
GRY
G35
E37
1
G
GRY
4
WHT/RED
E48
E50
1
2
BRN
PPL
GRY
1
E52
12
4
5
P/S
Cont.M
E51
1
2
11
PPL/WHT
6
PPL/WHT
BLK
RED
WHT/RED
E46
9
PPL/WHT
PW
BCM
E42
E
E43
J/C
J/C
D
G37
5
E54
1
2
PPL/WHT
M
PS
G16
A
BCM
J/C
"A-8"
A
G15
A
RB
WB
E38
G36
14
BLK/ORN
J/C
BLK
PPL/WHT
RED/BLK
WHT/BLK
BLK/ORN
E24
C36
15
A
A
G20
4
7
16
6
14
5
BLK/ORN
BLK
BLK
DLC
9
11
3
I4RS0A910960-

G-1 Audio System Circuit Diagram

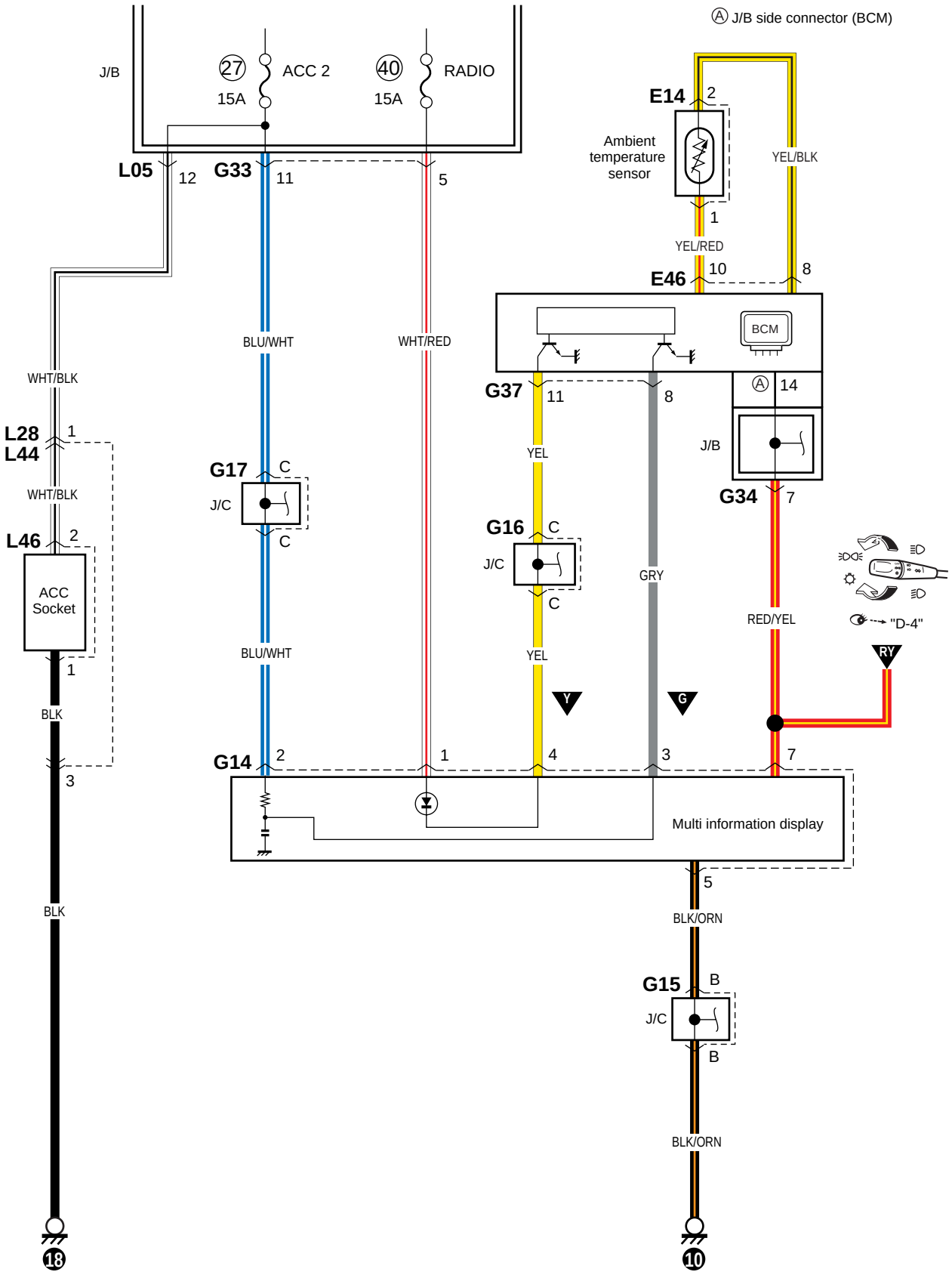
S4RS0A910E032



I4RS0A910961-

G-2 Multi Information Display / Accessory Socket System Circuit Diagram

S4RS0A910E033



I4RS0A910962-

List of Connectors

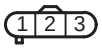
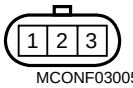
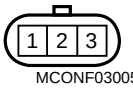
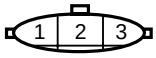
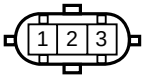
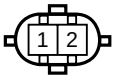
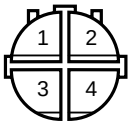
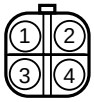
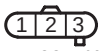
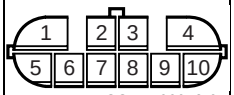
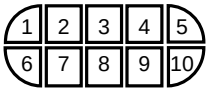
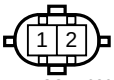
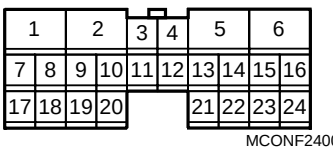
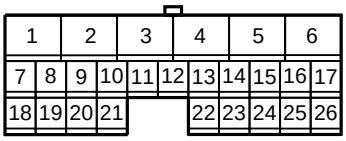
List of Connectors

S4RS0A910F001

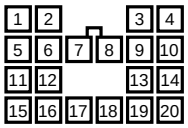
Refer to “C Connector: ”.
Refer to “E Connector: ”.
Refer to “G Connector: ”.
Refer to “J Connector: ”.
Refer to “K Connector: ”.
Refer to “L Connector: ”.
Refer to “O Connector: ”.
Refer to “R Connector: ”.

C Connector

S4RS0A910F002

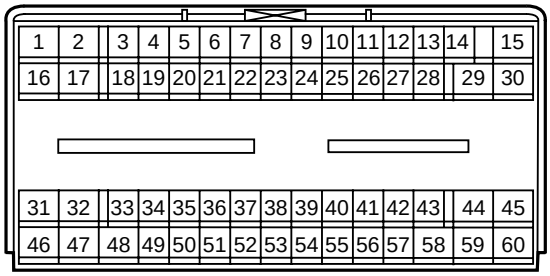
C01  MCONF030051-01	C02  MCONF030055-01	C03  MCONF030055-01	C04 MCONF020065-01	C05 MCONF020065-01	C06 MCONF020065-01
C07 MCONF020065-01	C08  MCONF030016-01	C09 MCONF020057-01	C10 MCONF060018-01	C11 MCONF030062-01	C12  MCONF030084-01
C13 MCONF050025-01	C14  MCONF020156-01	C15  MCONF040008-01	C16  MCONF040024-01	C17 MCONF010076-01	C18 MCONF010027-01
C19 MCONM020042-01	C20 MCONF030052-01	C21 MCONF020194-01	C22 MCONF010057-01	C23 MCONF010019-01	C24 MCONF010077-01
C25  MCONF030052-01	C26 MCONF010054-01	C27 MCONF020064-01	C28  MCONF100053-01 A/T	C29  MCONF100048-01 A/T	C30  MCONF020156-01 M/T
C31 MCONF010078-01	C33 MCONF010047-01	C34  MCONF240011-01	C35  MCONF260014-01		

C36 (TO E24)



MCONF200011-01

C37



MCONF600002-01

C38

MCONN000002-01

C39

MCONN000002-01

C40

MCONN000002-01

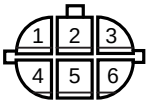
C41

MCONN000002-01

E Connector

S4RS0A910F003

E01

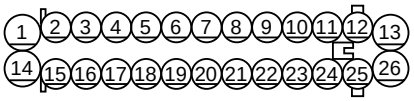


MCONF060062-01

E02

MCONF020195-01

E03



MCONF260011-01

E04

MCONF030062-01

E05

MCONM020043-01

E06

MCONF020196-01

E07

MCONF020013-01

E08

MCONF030101-01

E09

MCONF020197-01

E10

MCONF020008-01

E11

MCONF020008-01

E12

MCONF020198-01

IF EQPD

E13

MCONF020199-01

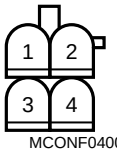
E14

MCONF020200-01

E15

MCONF010079-01

E17



MCONF040094-01

E18

MCONF020198-01

IF EQPD

E19

MCONF020196-01

E20

MCONF020197-01

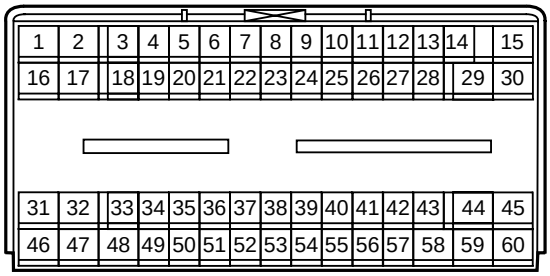
E21

MCONF030101-01

E22

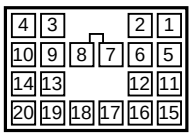
MCONF020013-01

E23



MCONF600003-01

E24 (TO C36)



MCONM200005-01

E25

MCONM020043-01

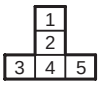
E26

MCONF020114-01

E27

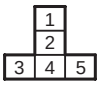
MCONF020201-01

E28



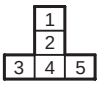
MCONF050015-01

E29



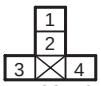
MCONF050015-01

E30



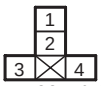
MCONF050015-01

E31



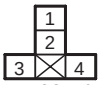
MCONF040004-01

E32



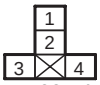
MCONF040004-01

E33



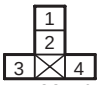
MCONF040004-01

E34



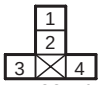
MCONF040004-01

E35



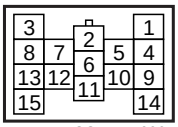
MCONF040004-01

E36



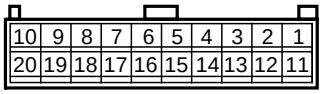
MCONF040004-01

E37 (TO G35)



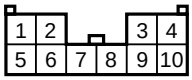
MCONM150001-01

E38 (TO G36)



MCONM200008-01

E39

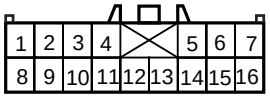


MCONF100003-01

E40

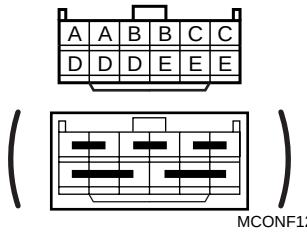
MCONF020202-01

E41



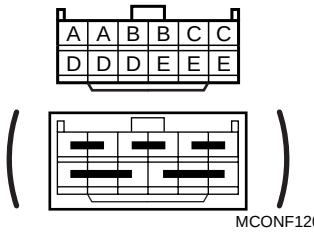
MCONF160034-01

E42



MCONF120027-01

E43

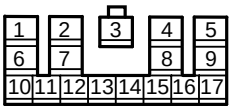


MCONF120027-01

E44 (TO L03)

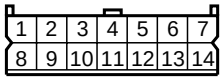
MCONF040095-01

E45 (TO L02)



MCONF170005-01

E46

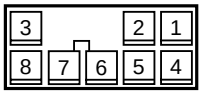


MCONF140012-01

E47

MCONF040016-01

E48 (TO E50)

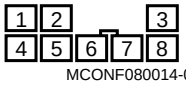


MCONM080012-01

E49

MCONF020203-01

E50 (TO E48)

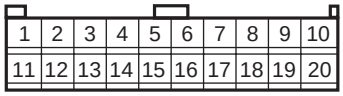


MCONF080014-01

E51

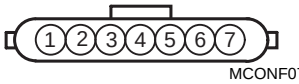
MCONF020204-01

E52



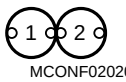
MCONF200021-01

E53



MCONF070015-01

E54



MCONF020205-01

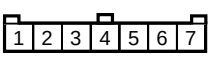
E55

MCONN000002-01

G Connector

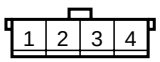
S4RS0A910F004

G01



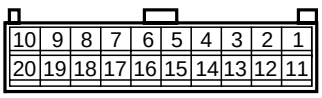
MCONF070001-01

G02



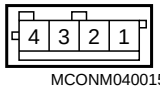
MCONF040096-01

G03 (TO L33)



MCONM200008-01

G04 (TO L32)



MCONM040015-01

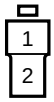
G05

MCONF020206-01

G06

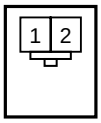
MCONF040097-01

G09



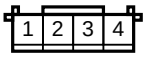
MCONF020112-01

G10



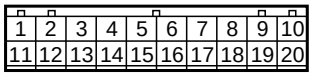
MCONF020207-01

G11



MCONF040098-01

G12

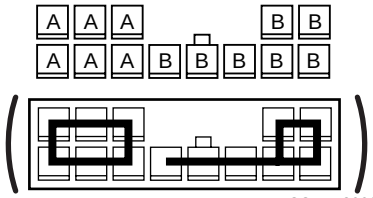


MCONF200014-01

G14

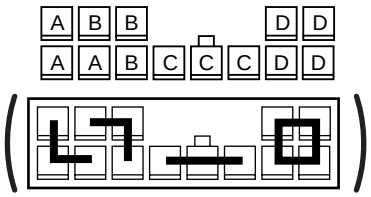
MCONF070004-01

G15



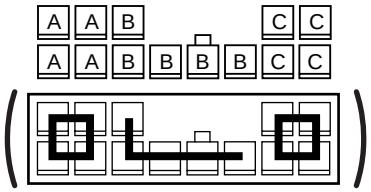
MCONF130007-01

G16



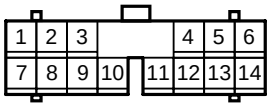
MCONF130008-01

G17



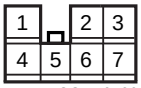
MCONF130009-01

G18



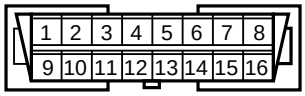
MCONF140018-01

G19



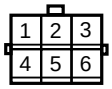
MCONF070016-01

G20



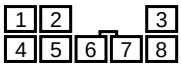
MCONF160023-01

G21



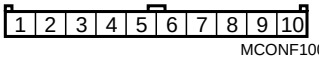
MCONF060063-01

G22



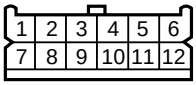
MCONF080014-01

G23



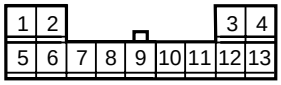
MCONF100038-01

G24



MCONF120026-01

G25



MCONF130010-01

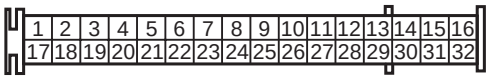
G26

MCONF020111-01

G27

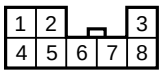
MCONF050021-01

G28



MCONF320005-01

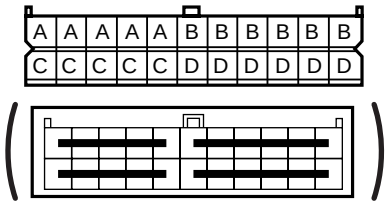
G29



MCONF080002-01

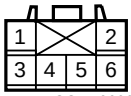
IF EQPD

G31



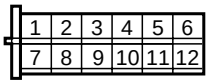
MCONF220011-01

G32



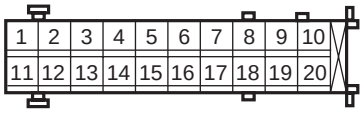
MCONF060064-01

G33



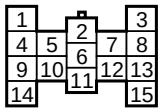
MCONF120028-01

G34



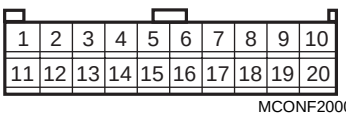
MCONF200020-01

G35 (TO E37)



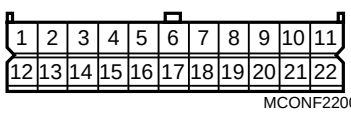
MCONF150002-01

G36 (TO E38)



MCONF200021-01

G37

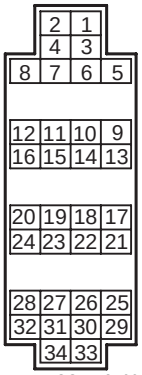


MCONF220009-01

J Connector

S4RS0A910F005

J01 (TO L06)

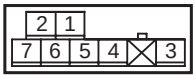


MCONM340002-01

J02

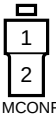
MCONF020134-01

J03



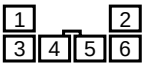
MCONM070005-01

J04



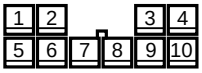
MCONF020112-01

J05



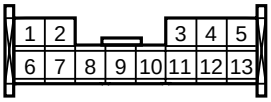
MCONF060046-01

J06



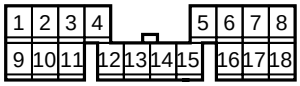
MCONF100054-01

J07



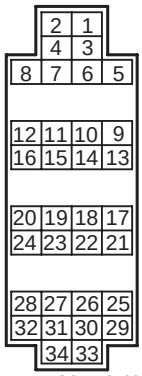
MCONF130011-01

J08



MCONF180011-01

J09 (TO L31)

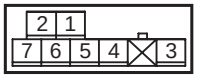


MCONM340002-01

J10

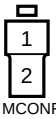
MCONF020134-01

J11



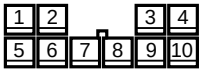
MCONM070005-01

J12



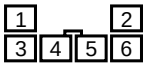
MCONF020112-01

J13



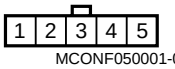
MCONF100054-01

J14



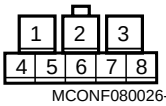
MCONF060046-01

J15



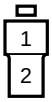
MCONF050001-01

J16 (TO L13)



MCONF080026-01

J17

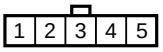


MCONF020112-01

J18

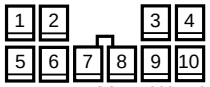
MCONF020208-01

J19



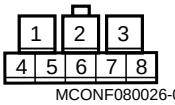
MCONF050001-01

J20



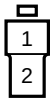
MCONF100055-01

J21 (TO L37)



MCONF080026-01

J22



MCONF020112-01

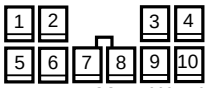
J23

MCONF020208-01

J24

MCONF050001-01

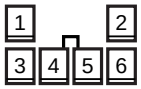
J25



MCONF100055-01

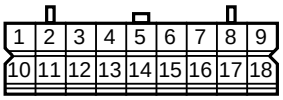
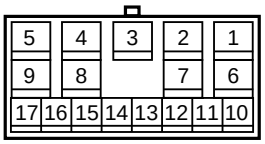
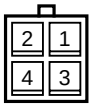
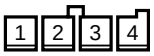
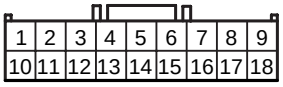
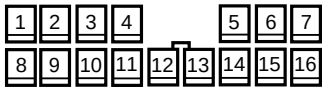
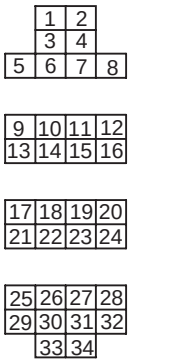
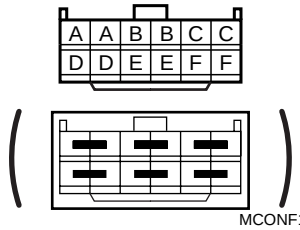
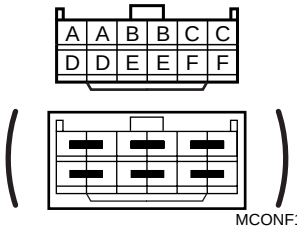
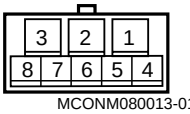
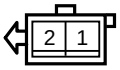
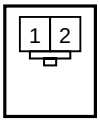
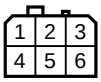
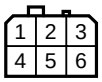
K Connector

S4RS0A910F006

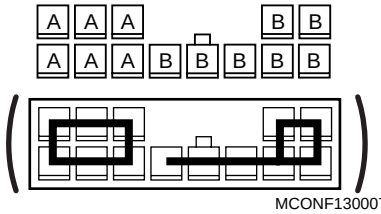
K01	K02
 MCONF060065-01	MCONF030102-01

L Connector

S4RS0A910F007

L01	L02 (TO E45)	L03 (TO E44)	L04
 MCONF180012-01	 MCONM170001-01	 MCONM040022-01	 MCONF040033-01
L05	**L06**	**L07 (TO J01)**	
 MCONF180013-01	 MCONF160014-01	 MCONF340005-01	
L08	**L09**	**L10**	**L11**
 MCONF120029-01	 MCONF120029-01	MCONF020209-01	MCONF020210-01 IF EQPD
L12	**L13 (TO J16)**	**L14**	**L15 (TO R01)**
MCONF010060-01	 MCONM080013-01	MCONM020044-01	MCONM040023-01
L16	**L17**		
MCONF010060-01	 MCONM020045-01		
L18	**L19**	**L20**	**L21 (TO L22)**
 MCONF020207-01 IF EQPD	MCONF020211-01	 MCONF060044-01	MCONF020060-01
L22 (TO L21)	**L23**		
MCONM020043-01	 MCONF060044-01 A/T		

L24



MCONF130007-01

L25

MCONF020212-01

IF EQPD

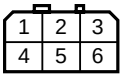
L26

MCONF020151-01

L27

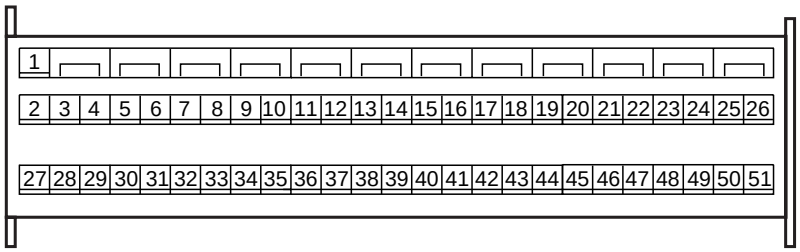
MCONF010021-01

L28 (TO L44)



MCONF060013-01

L29



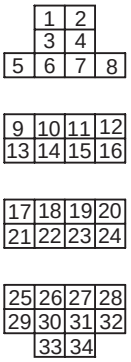
MCONF510002-01

L30

MCONF020212-01

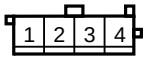
IF EQPD

L31 (TO J09)



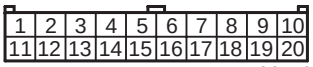
MCONF340005-01

L32 (TO G04)



MCONF040099-01

L33 (TO G03)



MCONF200003-01

L34

MCONF010060-01

L35

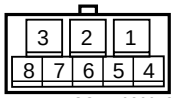
MCONF020210-01

IF EQPD

L36

MCONF020209-01

L37 (TO J21)



MCONM080013-01

L38

MCONM020044-01

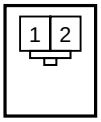
L39

MCONM010004-01

L40

MCONF010060-01

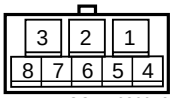
L41



MCONF020207-01

IF EQPD

L42 (TO O01)

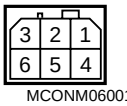


MCONM080013-01

L43

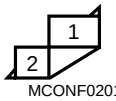
MCONF060044-01

L44 (TO L28)



MCONM060012-01

L46



MCONF020116-01

L47

MCONF020013-01

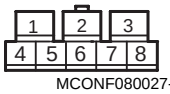
L48

MCONF020013-01

O Connector

S4RS0A910F008

O01 (TO L42)



MCONF080027-01

O02

MCONF010061-01

O03

MCONF040012-01

O04

MCONF040095-01

O05

MCONF040095-01

O06

MCONF010061-01

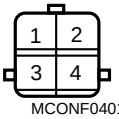
R Connector

S4RS0A910F009

R01 (TO L15)

MCONF040100-01

R02



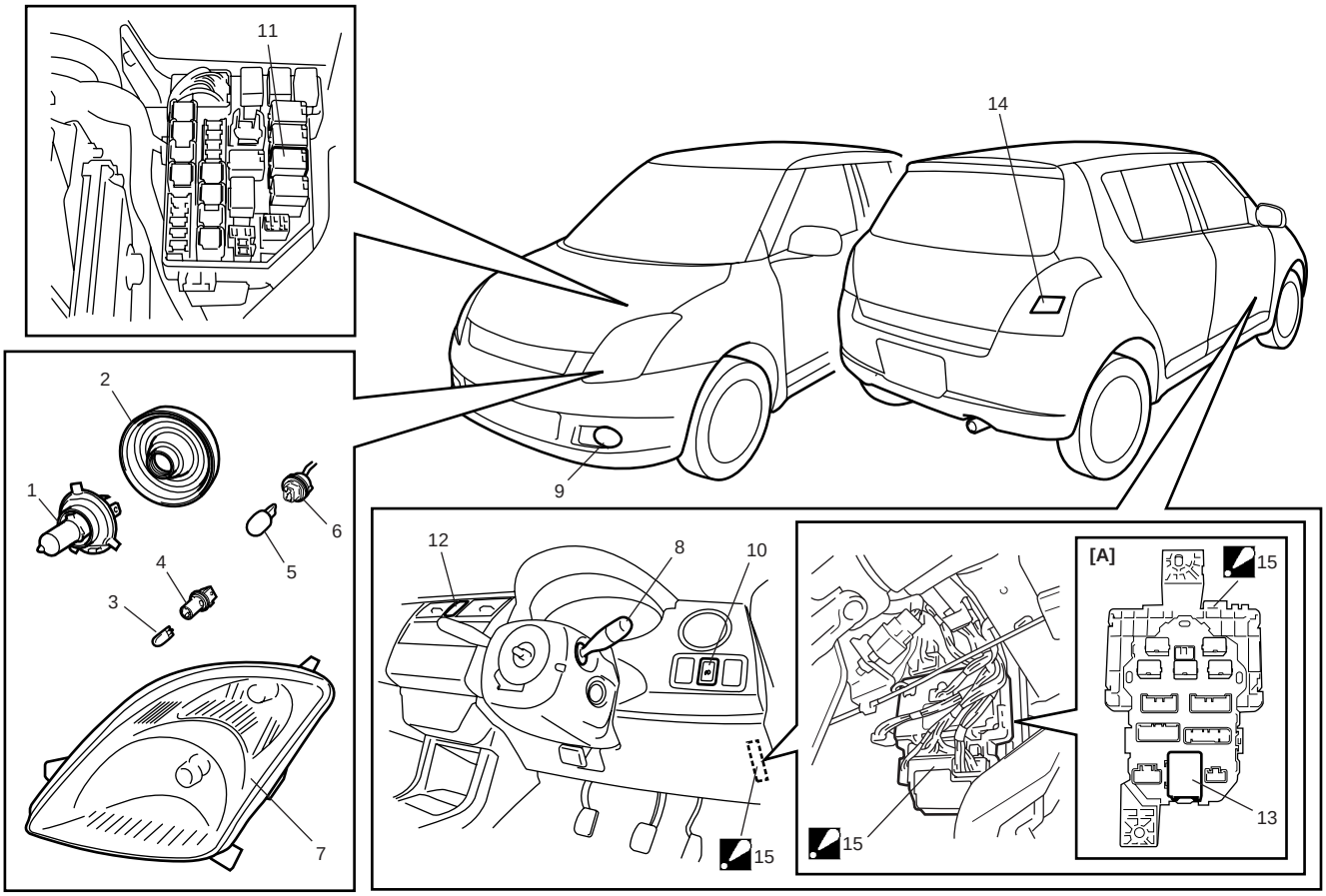
MCONF040101-01

Lighting Systems

Component Location

Lighting System Location

S4RS0A9203001

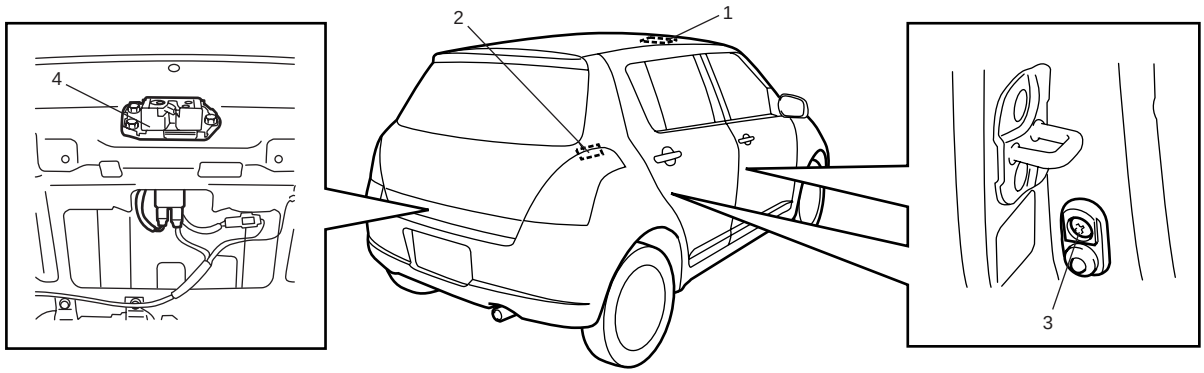


I4RS0A920001-

1. Headlight bulb	7. Headlight unit	13. Turn signal / hazard warning relay
2. Socket cover	8. Lighting switch	14. Rear combination light
3. Clearance light bulb	9. Front fog light (if equipped)	15. Junction block assembly : BCM cannot be removed from junction block.
4. Clearance light bulb socket	10. Front fog light switch (if equipped)	[A]: Junction block assembly viewed from relay side
5. Turn signal light bulb	11. Front fog light relay	
6. Turn signal light bulb socket	12. Hazard warning switch	

Interior Light System Location

S4RS0A9203002



I4RS0A920002-

1. Dome light	3. Door switches (both sides)
2. Luggage compartment light	4. Rear end door switch (included in lock assembly)

Diagnostic Information and Procedures

Headlight Symptom Diagnosis

S4RS0A9204001

Condition	Possible cause	Correction / Reference Item
Headlights do not light up	Bulbs blown	*Replace bulbs.*
	Lighting or dimmer switch faulty	*Check headlight switch referring to "Headlight Switch (in Lighting Switch) Inspection: ".*
	Headlight R and L fuses blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
Only one headlight does not light up	Bulb blown	*Replace bulb.*
	Headlight R or L fuse blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
Only one beam ("Hi" or "Lo") does not light	Bulb blown	*Replace bulb.*
	Lighting or dimmer switch faulty	*Check headlight switch referring to "Headlight Switch (in Lighting Switch) Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Turn Signal and Hazard Warning Light Symptom Diagnosis

S4RS0A9204003

Condition	Possible cause	Correction / Reference Item
Flash rate high or one side only flashes	Bulb blown on “flash rate high”-side	*Replace bulb.*
	Incorrect bulb	*Replace bulb.*
	Turn signal / hazard warning relay faulty	*Check turn signal / hazard warning relay referring to “Turn Signal and Hazard Warning Relay Inspection: ”.*
	Open circuit or high resistance existing either; between turn signal switch and non lighting bulb, or between hazard warning switch and non lighting bulb	*Repair circuit.*
	Wiring or grounding faulty	*Repair circuit.*
No flashing ***NOTE:*** • ***Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to “Diagnosis Using Output Test Function of SUZUKI Scan Tool” under “Scan Tool Data: in Section 10B”.*** • ***Check each part in the order from the top of the following list.***	Circuit fuse(s) blown	*Replace fuse(s) and check for short circuit.*
	Hazard warning switch faulty	*Check hazard warning switch referring to “Hazard Warning Switch Inspection: ”.*
	Turn signal light switch faulty	*Check turn signal light switch referring to “Turn Signal Light Switch (in Lighting Switch) Inspection: ”.*
	Turn signal / hazard warning relay faulty	*Check turn signal / hazard warning relay referring to “Turn Signal and Hazard Warning Relay Inspection: ”.*
	Open circuit or high resistance existing between battery and switch	*Repair circuit.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Flash rate low	Supply voltage low	*Check charging system.*
	Turn signal / hazard warning relay faulty	*Check turn signal / hazard warning relay referring to “Turn Signal and Hazard Warning Relay Inspection: ”.*

Clearance, Tail and License Plate Light Symptom Diagnosis

S4RS0A9204004

Condition	Possible cause	Correction / Reference Item
All lights do not light up	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Lighting and dimmer switch of combination switch faulty	*Check lighting and dimmer switch referring to “Headlight Switch (in Lighting Switch) Inspection: ”.*
	Wiring or grounding faulty	*Repair circuit.*
Some lights do not light up	Bulb(s) blown	*Replace bulb(s).*
	Wiring or grounding faulty	*Repair circuit.*

Back-Up Light Symptom Diagnosis

S4RS0A9204005

Condition	Possible cause	Correction / Reference Item
Back-up lights do not light up	Bulb(s) blown	*Replace bulb(s).*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Back-up light switch (M/T) or transmission range sensor (A/T) faulty	*Check back-up light switch or transmission range sensor referring to "Back Up Lamp Switch Inspection: in Section 5B" or "Transmission Range Sensor (Shift Switch) Inspection and Adjustment: in Section 5A".*
	Wiring or grounding faulty	*Repair circuit.*
Back-up lights stay on	Back-up light switch (M/T) or transmission range sensor (A/T) faulty	*Check back-up light switch or transmission range sensor referring to "Back Up Lamp Switch Inspection: in Section 5B" or "Transmission Range Sensor (Shift Switch) Inspection and Adjustment: in Section 5A".*

Stop (Brake) Lamp Symptom Diagnosis

S4RS0A9204006

Condition	Possible cause	Correction / Reference Item
Stop (brake) lamp do not light up	Bulb(s) blown	*Replace bulb(s).*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Stop (brake) lamp switch faulty	*Check stop (brake) lamp switch referring to "Stop (Brake) Lamp Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
Stop (brake) lamp stay on	Stop (brake) lamp switch faulty	*Check or adjust stop (brake) lamp switch referring to "Stop (Brake) Lamp Switch Inspection: " or "Stop Light Switch Adjustment: in Section 4A".*

Front Fog Light Symptom Diagnosis (If Equipped)

S4RS0A9204007

Condition	Possible cause	Correction / Reference Item
Only one light does not light	Bulb blown	*Replace bulb.*
	Wiring or grounding faulty	*Repair circuit.*
Front fog lights do not light	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Front fog light switch faulty	*Check front fog light switch referring to "Front Fog Light Switch Inspection: ".*
	Front fog light relay faulty	*Check front fog light relay referring to "Front Fog Light Relay Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Interior Light Symptom Diagnosis

S4RS0A9204009

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Dome light does not light up	Bulb blown	*Replace bulb.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Dome light switch faulty	*Check dome light switch.*
	Door switch faulty	*Check door switch referring to "Door Switch (Front / Rear Door) Inspection: in Section 9C".*
	Wiring or grounding	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Luggage compartment light does not light up	Bulb blown	*Replace bulb.*
	Back door switch faulty	*Check switch referring to "Rear End Door Switch Inspection: in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*

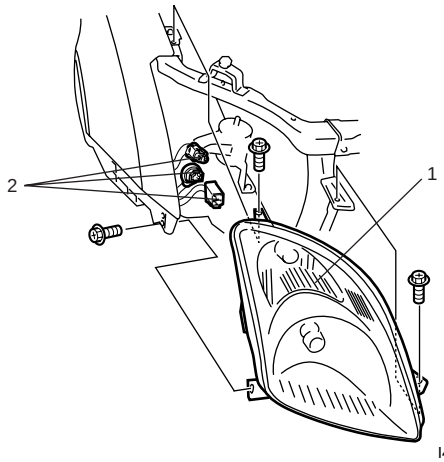
Repair Instructions

Headlight Housing Removal and Installation

S4RS0A9206001

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper. Refer to "Front Bumper and Rear Bumper Components: in Section 9K".
3) Remove headlight mounting bolts.
4) Detach headlight housing (1) from vehicle.
5) Disconnect couplers (2) from headlight housing (1).

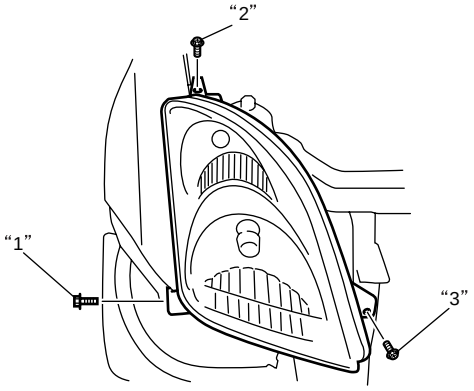


I4RS0A920003-

Installation

Reverse removal procedure noting the following.

- Install headlight mounting bolts, and then tighten headlight mounting bolts ("1" – "3") according to numerical order as shown in figure.



I4RS0A920004-

- After installation, be sure to inspect and adjust aiming referring to "Headlight Aiming Adjustment with Screen: ".

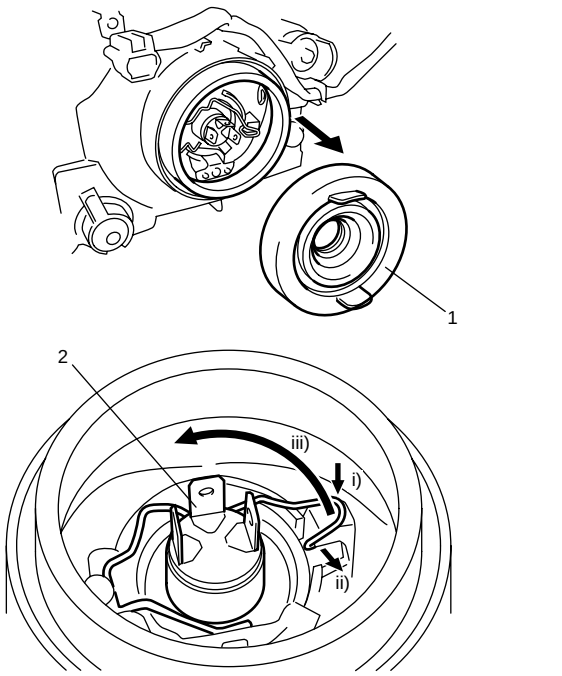
Headlight Bulb Replacement

S4RS0A9206002

WARNING:

- **To avoid danger of being burned, don't touch when the bulb is hot.**
- **Don't touch glass surface of bulb, to avoid deteriorate as the case may be unclear when bulb light on at dirty condition.**

1) Disconnect negative (–) cable at battery.
2) Disconnect coupler from bulb.
3) Remove socket cover (1).
4) Replace bulb (2) and assemble all removed parts.



I4RS0A920005-

Headlight Aiming Adjustment with Screen

S4RS0A9206003

NOTE:

- **Unless otherwise obligated by local regulations, adjust headlight aiming according to the following procedure.**
- **After replacing headlight housing, be sure to adjust aiming.**

1) Make sure the following items.
   - Place vehicle on a flat surface in front of blank wall (screen) (1) ahead of headlight surface.

   Distance "a"
   10 m (32.8 ft.)

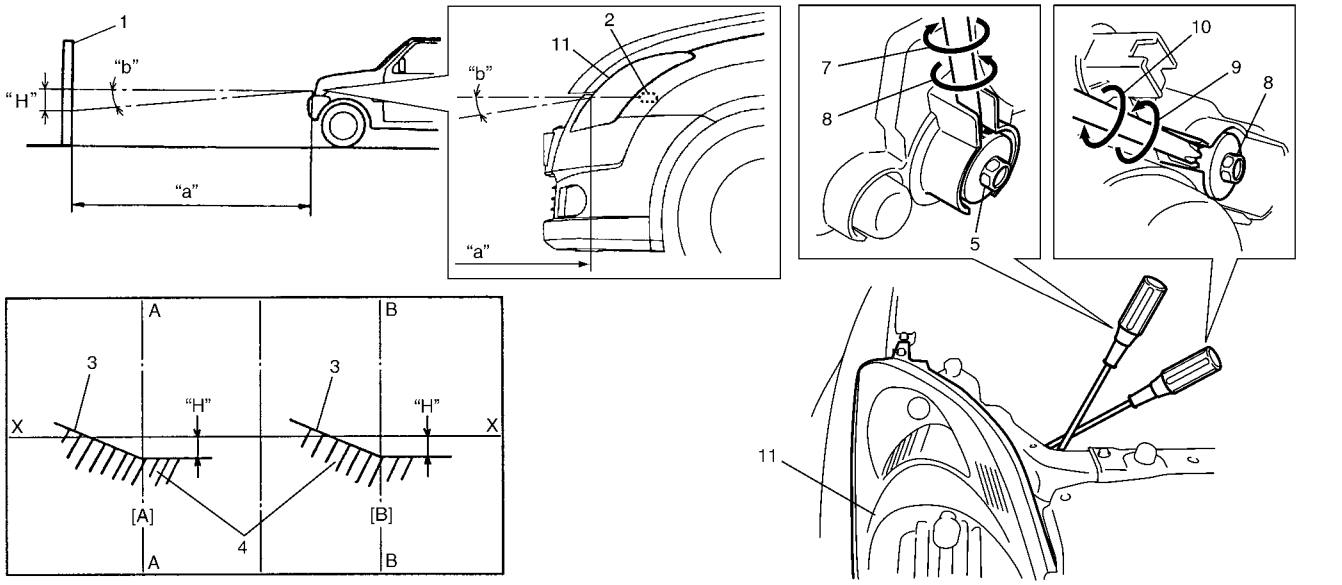
   - Adjust air pressure of all tires to the specified value respectively.
   - Bounce vehicle body up and down by hand to stabilize suspension.
   - Carry out aiming with a driver aboard.

   Driver's weight
   75 kg (165 lb)

2) Check to see if hot spot (high intensity zone) of each low beam axis falls as shown in figure.

   Hot spot specification
   Angle "b": 0.75° (Specification)
   Calculated distance "H": Approx. 130 mm (5.15 in.)

3) Align headlight aiming to specification by adjusting aiming gear if it is not set properly.



I4RS0A920006-

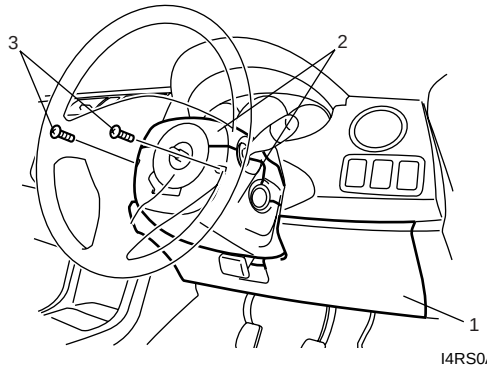
2. Headlight bulb	7. Turning (for down adjustment)	X-X: Horizontal center line of headlight bulbs
3. Cut line (bounding line)	8. Aiming gear (for right / left adjustment)	A-A: Vertical center line of left headlight bulb
4. Hot spot	9. Turning (for right adjustment)	B-B: Vertical center line of right headlight bulb
5. Aiming gear (for up / down adjustment)	10. Turning (for left adjustment)	[A]: Left headlight
6. Turning (for up adjustment)	11. Headlight housing	[B]: Right headlight

Headlight Switch (in Lighting Switch) Removal and Installation

S4RS0A9206004

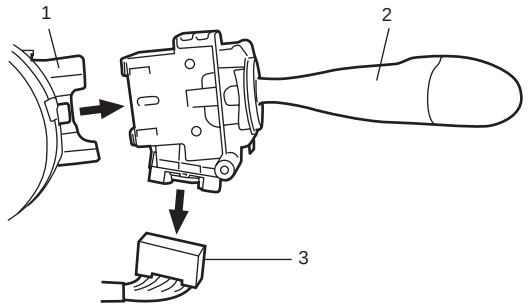
Removal

1) Disconnect negative cable at battery.
2) Remove steering column hole cover (1).
3) Remove steering column covers (2).
   Turn steering wheel to remove steering column cover screws (3).



I4RS0A920007-

4) Remove lighting switch (1) from combination switch assembly (2) and disconnect its coupler (3).



I4RS0A920008-

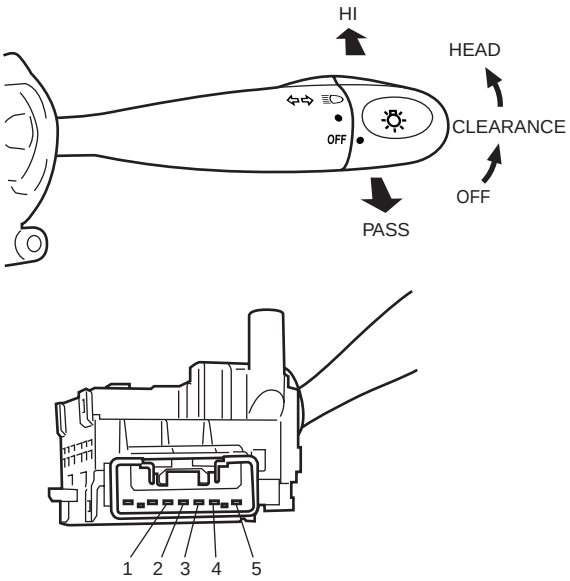
Installation

Reverse removal procedure for installation.

Headlight Switch (in Lighting Switch) Inspection

S4RS0A9206005

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Shaft condition \ Terminal		5	3	1	2	4
OFF	LOW					
	PASS				○	○
	HI					
CLEARANCE	LOW	○	○			
	PASS	○	○		○	○
	HI	○	○			
HEAD	LOW	○	○	○	○	○
	PASS	○	○		○	○
	HI	○	○		○	○

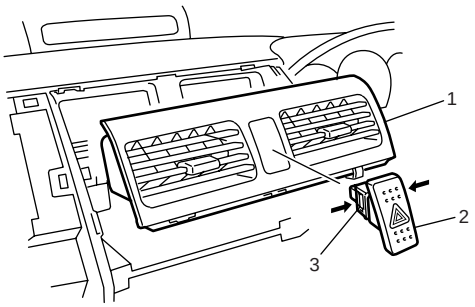
I4RS0A920009-

Hazard Warning Switch Removal and Installation

S4RS0A9206019

Removal

1) Disconnect negative (–) cable at battery.
2) Remove center ventilation louver (1) referring to “Center Ventilation Louver Removal and Installation: in Section 7A”.
3) Disconnect coupler, and then remove hazard warning switch (2) from center ventilation louver (1) while releasing the locks (3).



I4RS0A920010-

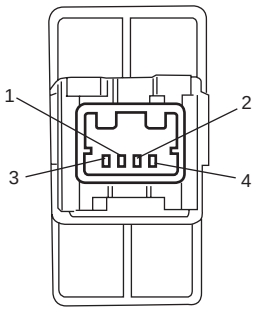
Installation

Reverse removal procedure for installation.

Hazard Warning Switch Inspection

S4RS0A9206010

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Shaft condition \ Terminal	1	2	3	4
OFF			○ W ○	
ON	○	○	○ W ○	

I4RS0A920011-

Stop (Brake) Lamp Switch Inspection

S4RS0A9206011

Check stop (brake) lamp switch for continuity between terminals at each switch position.
If check result is not as specified, replace switch.

Shaft condition \ Terminal	1	2	3	4
FREE	○	○	○	○
PUSH				

I4RS0A920012-

Turn Signal Light Switch (in Lighting Switch) Removal and Installation

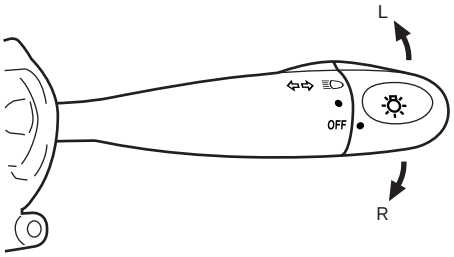
S4RS0A9206012

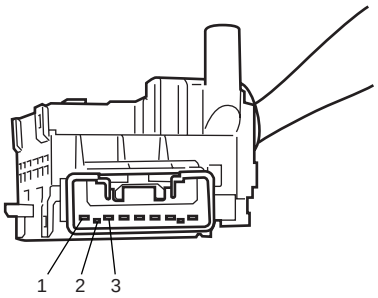
For removal and Installation, refer to “Headlight Switch (in Lighting Switch) Removal and Installation: ”.

Turn Signal Light Switch (in Lighting Switch) Inspection

S4RS0A9206013

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.





Turn signal SW \ Terminal	1	2	3
L		○	○
N			
R	○	○	

I4RS0A920013-

Turn Signal and Hazard Warning Relay Removal and Installation

S4RS0A9206020

Removal

1) Disconnect negative (–) cable at battery.
2) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation: in Section 10B”.
3) Remove turn signal and hazard warning relay.

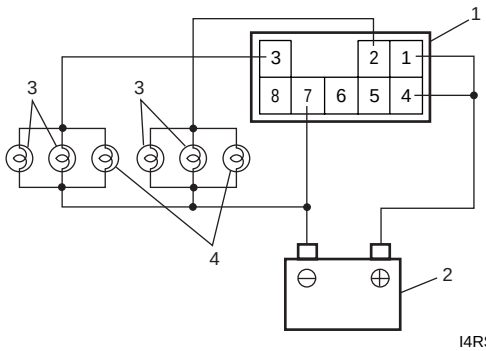
Installation

Reverse removal procedure for installation.

Turn Signal and Hazard Warning Relay Inspection

S4RS0A9206021

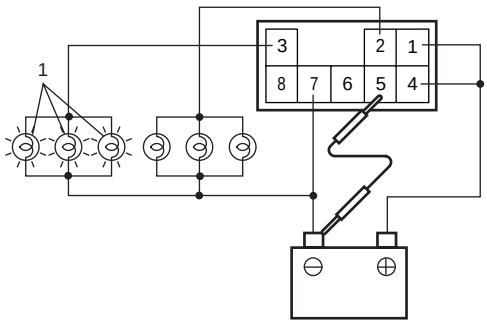
1) Connect turn signal and hazard warning relay (1), battery (2) and six test bulbs ((12V, 21W) (3) and 12 V, 5W (4)) as shown.



I4RS0A920014-

2) Check turn L circuit
Connect terminal “5” and battery negative (–) terminal by a jumper wire.
Check left side bulbs (1) for flashing cycle.
If check result is not as specified, replace turn signal and hazard warning relay.

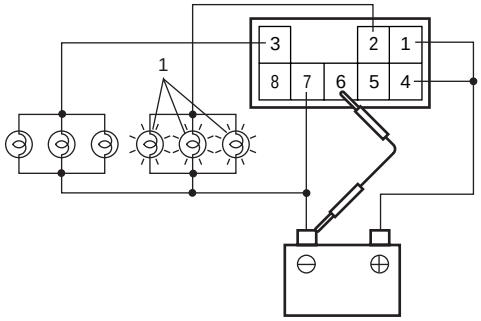
Reference flashing cycle
60 – 120 cycle/minute



I4RS0A920015-

3) Check turn R circuit
Connect terminal “6” and battery negative (–) terminal by a jumper wire.
Check right side bulbs (1) for flashing cycle.
If check result is not as specified, replace turn signal and hazard warning relay.

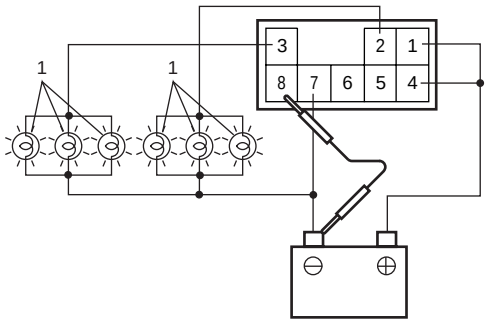
Reference flashing cycle
60 – 120 cycle/minute



I4RS0A920016-

4) Check Hazard ON circuit
Connect terminal “8” and battery negative (–) terminal by a jumper wire.
Check all bulbs (1) for flashing cycle.
If check result is not as specified, replace turn signal and hazard warning relay.

Reference flashing cycle
60 – 120 cycle/minute



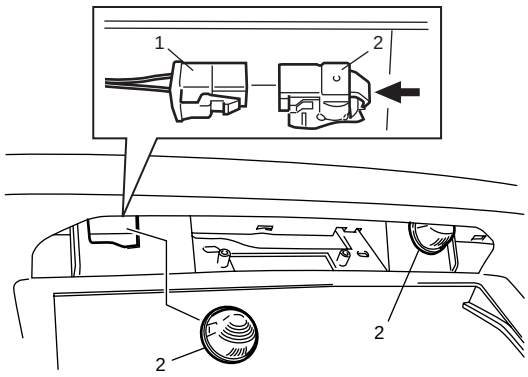
I4RS0A920017-

License Lamp Assembly Removal and Installation

S4RS0A9206022

Removal

1) Disconnect negative (–) cable at battery.
2) Remove rear bumper. Refer to “Front Bumper and Rear Bumper Components: in Section 9K”
3) Disconnect coupler (1) from license lamp assembly (2).
4) Push locking part to arrow direction, and then remove license lamp assembly (2).



I4RS0A920018-

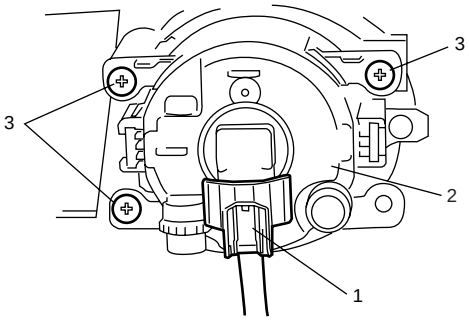
Installation
Reverse removal procedure for installation.

Front Fog Light Assembly Removal and Installation

S4RS0A9206016

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper. Refer to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect couplers (1) from fog light (2).
4) Remove fog light screws (3), and remove front fog light assembly (2).



I4RS0A920019-

Installation
Reverse removal procedure for installation nothing the following:

- After installing, adjust aiming referring to “Front Fog Light Aiming Adjustment with Screen: ”.

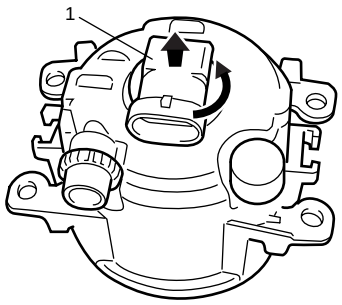
Front Fog Light Bulb Replacement

S4RS0A9206017

WARNING:

- **To avoid danger of being burned, don't touch when the bulb is hot.**
- **Don't touch glass surface of bulb to avoid deteriorate as the case may be unclear when bulb light on at dirty condition.**

1) Remove fog light referring to "Front Fog Light Assembly Removal and Installation: ".
2) Remove fog light bulb (1) as shown.



I4RS0A920020-

3) Replace fog light bulb and assemble all removed parts.

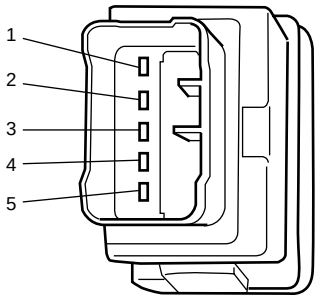
Front Fog Light Switch Inspection

S4RS0A9206018

NOTE:

Front fog lights light up only when headlight switch is in HEADLIGHT position (low or high beams) or SMALL position. Front fog lights turn OFF automatically when headlight switch is turned to OFF position. If front fog light switch holds ON position, front fog lights turn ON automatically when headlight switch is tuned to HEADLIGHT position (low or high beams) or SMALL position again.

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



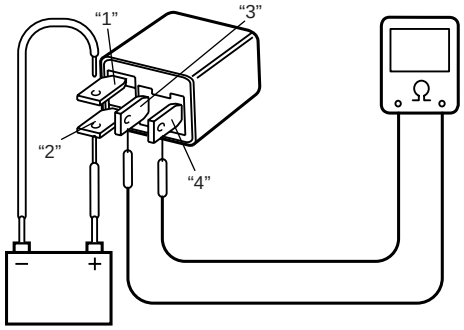
Terminal / Switch Position	2	3	1	5	4
OFF		○	○	○	○
ON (PUSH IN)	○	○	○		

I4RS0A920021-

Front Fog Light Relay Inspection

S4RS0A9206009

1) Check that there is no continuity between terminal "3" and "4". If there is continuity, replace relay.
2) Connect battery positive (+) terminal to terminal "2" of relay.
3) Connect battery negative (–) terminal to terminal "1" of relay.
4) Check continuity between terminal "3" and "4". If there is no continuity when relay is connected to the battery, replace relay.



I4RS0A920022-

Front Fog Light Aiming Adjustment with Screen

S4RS0A9206023

Basic Aiming

NOTE:

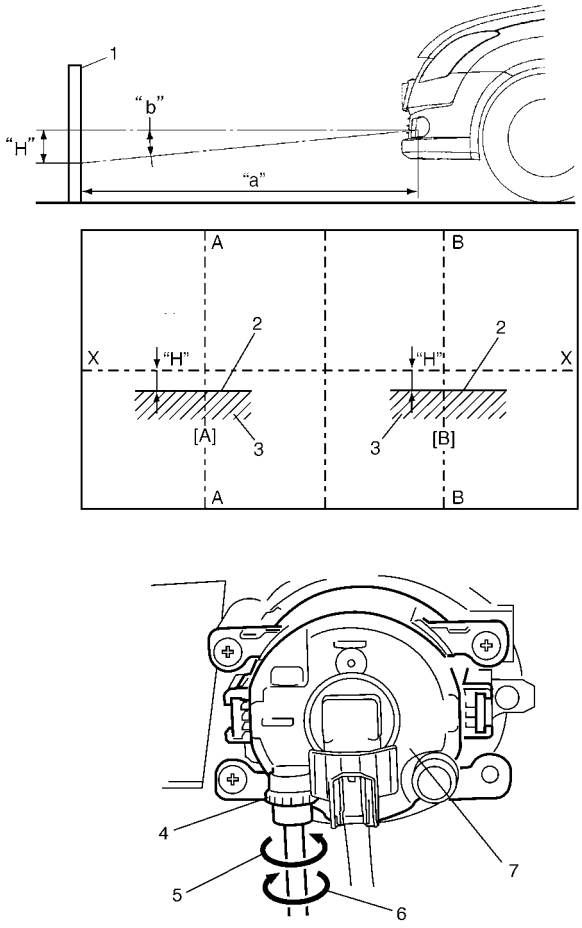
- **Unless otherwise obligated by local regulations, adjust front fog light aiming according to the following procedure.**
- **An example in case that the light-to-wall distance 10 m is shown in the illustration. The beam descending distance "H" is calculated when "a" is 10 m with the specification angle "b" (1.14°).**

1) Make sure the following items.
   - Place vehicle on a flat surface in front of blank wall (screen) (1) ahead of front fog light surface.

     Distance between screen and front fog light
     "a": 10 m (32.8 ft.)
   - Adjust air pressure of all tires to the specified value respectively.
   - Bounce vehicle body up and down by hand to stabilize suspension.
   - Carry out aiming with a driver aboard.

     Driver's weight
     75 kg (165 lb)
2) Check to see if hot spot (high intensity zone) of each front fog light axis falls as shown in the figure.

   Hot spot specification
   Angle "b": 1.14° (Specification)
   Calculated distance "H": Approx. 199 mm (7.83 in.)
3) If it is not set properly, align front fog light to specification by rotating aiming gear.



I4RS0B920011-

2.	Bounding line
3.	Hot spot
4.	Aiming gear (for up / down adjustment)
5.	Turning (for up adjustment)
6.	Turning (for down adjustment)
7.	Front fog light assembly
X-X:	Horizontal center line of front fog light bulb
A-A:	Vertical center line of left front fog light bulb
B-B:	Vertical center line of right front fog light bulb
[A]:	Left front fog light
[B]:	Right front fog light

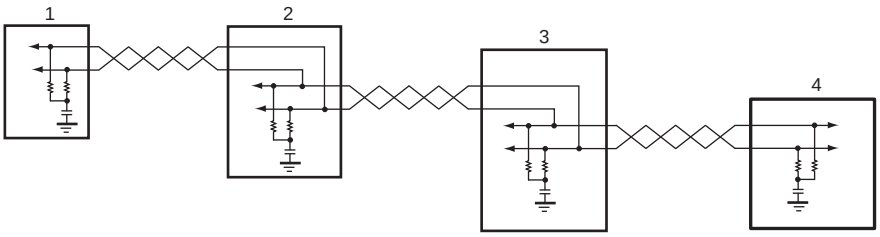
Instrumentation / Driver Info. / Horn

General Description

CAN Communication Data of Combination Meter

S4RS0A9301001

Communication of ECM (3), TCM (if equipped) (4), BCM (2) and combination meter (1) is established by CAN (Controller Area Network).



I4RS0A930035-

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneoulsy. In addition, it has a functionality to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. Combination meter receives the following information from each control module.

Data which combination meter receives from ECM

- Engine revolution speed signal
- Engine coolant temperature signal
- Vehicle speed signal
- Malfunction indicator lamp (MIL) control signal
- Immobilizer lamp control signal

Data which combination meter receives from TCM (A/T model)

- Transmission range sensor signal (A/T select lever position indicator)
- Malfunction indicator lamp (MIL) control signal

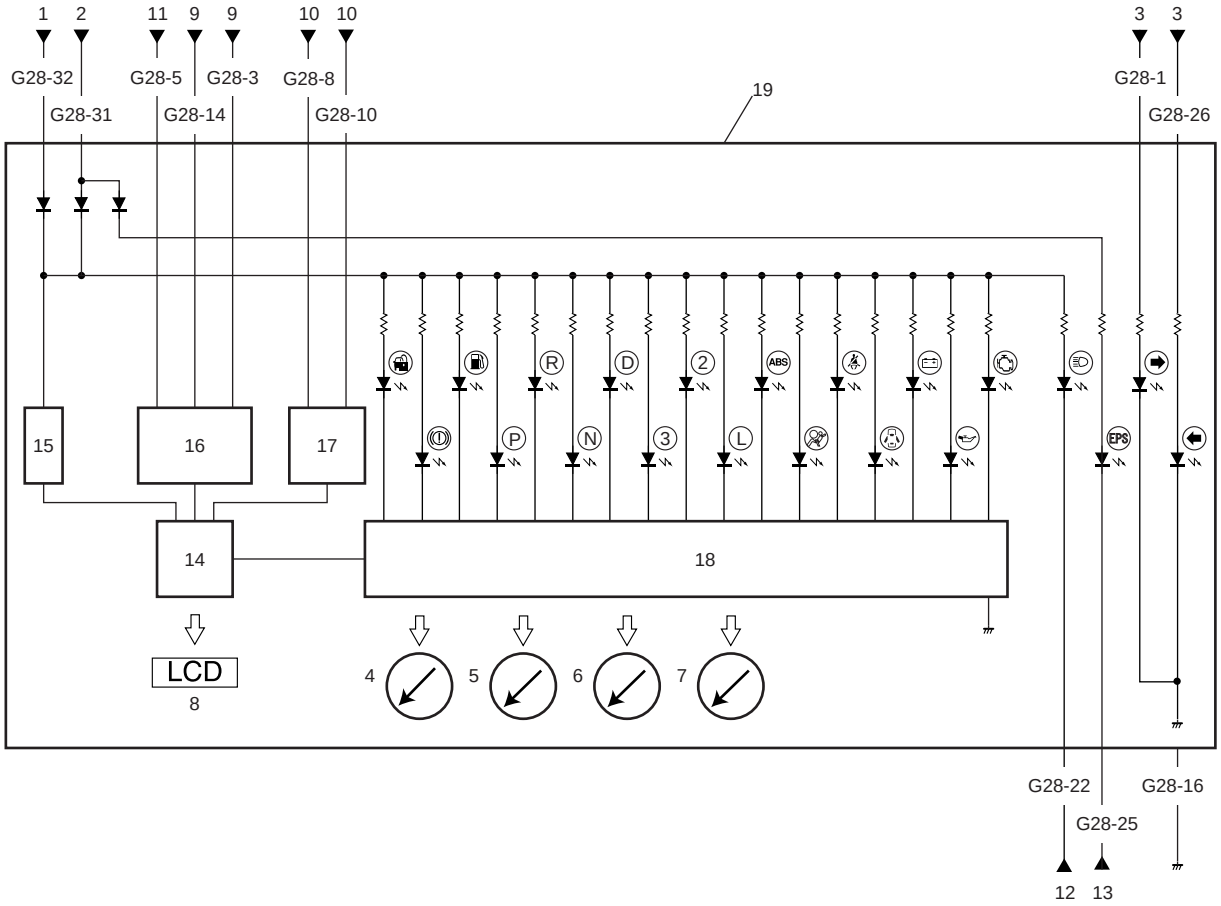
Data which combination meter receives from BCM

- Brake fluid level switch signal (brake warning light control signal)
- Parking brake switch signal (brake warning light control signal)
- Driver side seat belt buckle switch signal (Seat belt warning light control signal)
- Charging system warning lamp signal (Charge warning light control signal)
- Engine oil pressure switch signal (Oil pressure warning light control signal)
- Lighting switch signal
- Door switch signal (door ajar warning lamp)

Schematic and Routing Diagram

Combination Meter Circuit Diagram

S4RS0A9302001



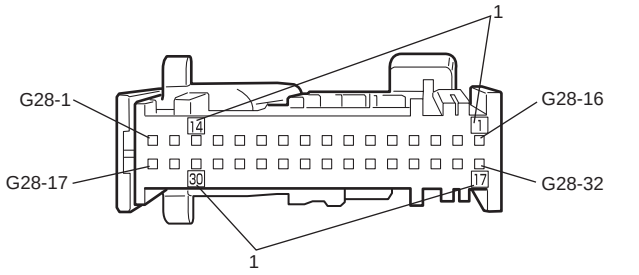
I4RS0A930002-

1. Main fuse	6. Fuel meter	11. SDM	16. Interface circuit
2. METER fuse	7. ECT meter	12. Combination switch (high beam)	17. CAN driver
3. Combination switch	8. ODO-TRIP	13. EPS control module	18. Stepper motor and LED output driver
4. Tacho meter	9. ABS control module	14. CPU	19. Combination meter
5. Speedometer	10. BCM	15. Power supply	

Terminal arrangement of coupler viewed from combination meter side

NOTE:

Molded numbers (1) have no relation to the terminal numbers.



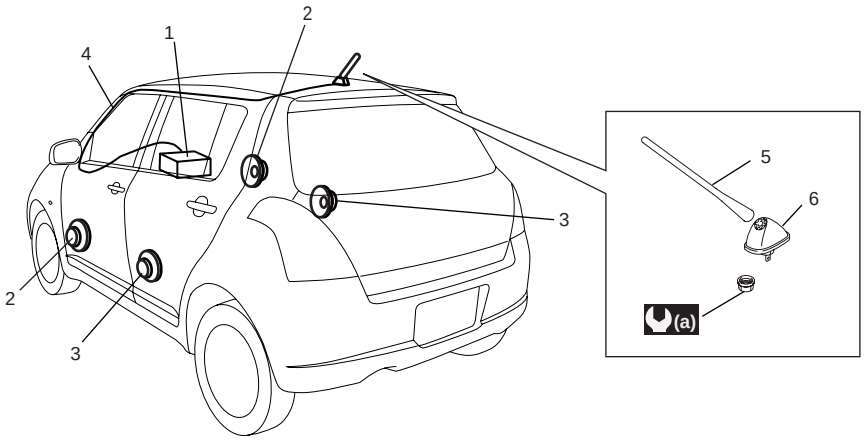
I4RS0A930003-

Terminal	Circuit	Terminal	Circuit
G28-1	To turn signal light switch (turn R)	G28-17	—
G28-2	—	G28-18	—
G28-3	To ABS control module (EBD warning lamp control signal)	G28-19	—
G28-4	—	G22-20	—
G28-5	To SDM (air bag indicator control signal)	G28-21	—
G28-6	—	G28-22	To lighting switch (high beam)
G28-7	—	G28-23	—
G28-8	CAN communication line (Active High Signal)	G28-24	—
G28-9	—	G28-25	To EPS control module (EPS indicator control signal)
G28-10	CAN communication line (Active Low Signal)	G28-26	To turn signal light switch (turn L)
G28-11	—	G28-27	—
G28-12	—	G28-28	—
G28-13	—	G28-29	—
G28-14	To ABS control module (ABS warning lamp control signal)	G28-30	—
G28-15	—	G28-31	To METER fuse
G28-16	GND	G28-32	To RADIO fuse

Component Location

Audio System Component Location

S4RS0A9303001



I4RS0A930004-

1. Radio assembly	4. Antenna feeder	(a) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
2. Front speaker	5. Antenna	
3. Rear speaker	6. Antenna base with antenna amplifier	

Diagnostic Information and Procedures

Speedometer and VSS Symptom Diagnosis

S4RS0A9304001

NOTE:

Make sure that any DTC is not detected by both ECM and TCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Speedometer shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	VSS faulty (M/T vehicle)	*Check VSS referring to "Vehicle Speed Sensor (VSS) Inspection (M/T model): in Section 1C".*
	Output shaft speed sensor / VSS faulty (A/T vehicle)	*Check output shaft speed sensor / VSS referring to "Output Shaft Speed Sensor (VSS) Inspection: in Section 5A".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Tacho meter Symptom Diagnosis

S4RS0A9304015

NOTE:

Make sure that any DTC is not detected by ECM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Tacho meter shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Engine Coolant Temperature (ECT) Meter Symptom Diagnosis

S4RS0A9304016

NOTE:

Make sure that any DTC is not detected by ECM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Engine coolant temperature (ECT) meter shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Fuel Meter Symptom Diagnosis

S4RS0A9304017

NOTE:

Make sure that any DTC is not detected by ECM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Fuel meter shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Low Fuel Warning Light Symptom Diagnosis

S4RS0A9304018

NOTE:

- **Make sure that any DTC is not detected by ECM an before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.**
- **Confirm that fuel meter is in good condition before referring to the following possible causes.**
  - **When fuel level meter circuit is shorted to ground circuit, fuel level meter indicates empty and low fuel warning lamp comes ON even if fuel tank does not empty.**
  - **The low fuel warning light comes ON when fuel level is lower than specification below.**

Low fuel warning light operation:

Low fuel warning light operation:	Fuel amount:	Resistance of fuel level sensor:
ON	Approx. 6.5 liter	Approx. 251 Ω

Condition	Possible cause	Correction / Reference Item
Low fuel warning light does not come ON when fuel level is lower than specification	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Low fuel warning light comes ON steady	Low fuel	*Refill fuel.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Oil Pressure Warning Light Symptom Diagnosis

S4RS0A9304019

NOTE:

Make sure that any DTC is not detected by BCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Oil pressure warning light does not light up when ignition switch is turned to ON position at engine off	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Oil pressure switch faulty	*Check oil pressure switch referring to "Oil Pressure Switch Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Oil pressure warning light stays ON	Oil pressure switch faulty	*Check oil pressure switch referring to "Oil Pressure Switch Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Brake and Parking Brake Warning Light Symptom Diagnosis

S4RS0A9304020

NOTE:

Make sure that any DTC is not detected by BCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Brake warning light does not light up when brake fluid level is low or parking brake is pulled up or for 5 speeds after turning ON ignition switch (with ABS vehicle only)	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Brake fluid level switch faulty	*Check brake fluid level switch referring to "Brake Fluid Level Switch Inspection: ".*
	Parking brake switch faulty	*Check parking brake switch referring to "Parking Brake Switch Inspection: ".*
	ABS system faulty	*Refer to "ABS Check: in Section 4E".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Brake warning light stays ON	Brake fluid level switch faulty	*Check brake fluid level switch referring to "Brake Fluid Level Switch Inspection: ".*
	Parking brake switch faulty	*Check parking brake switch referring to "Parking Brake Switch Inspection: ".*
	EBD system faulty	*Refer to "EBD Warning Lamp (Brake Warning Lamp) Check: in Section 4E".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Seat Belt Reminder Light Symptom Diagnosis (If Equipped)

S4RS0A9304021

NOTE:

Make sure that any DTC is not detected by BCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Seat belt reminder light does not light up	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Seat belt switch faulty	*Check seat belt switch referring to "Front Seat Belt Inspection: in Section 8A".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Seat belt reminder light stays ON	Seat belt switch faulty	*Check seat belt switch referring to "Front Seat Belt Inspection: in Section 8A".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

A/T Shift Position Indicator (A/T Vehicle Only) Symptom Diagnosis

S4RS0A9304022

NOTE:

Make sure that any DTC is not detected by TCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
All A/T shift position indicator does not light up	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Charge Warning Light Symptom Diagnosis

S4RS0A9304023

NOTE:

Make sure that any DTC is not detected by BCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Charge warning light does not come ON	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Charge warning light stay ON	Charging system faulty	*Check charging system.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Main Beam (High Beam) Indicator Symptom Diagnosis

S4RS0A9304024

Condition	Possible cause	Correction / Reference Item
Main beam (high beam) indicator does not come ON	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Combination switch faulty	*Check combination switch referring to "Headlight Switch (in Lighting Switch) Inspection: in Section 9B".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Main beam (high beam) indicator stay ON	Combination switch faulty	*Check combination switch referring to "Headlight Switch (in Lighting Switch) Inspection: in Section 9B".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Warning Buzzer Circuit Symptom Diagnosis

S4RS0A9304025

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Warning buzzer shows no sounding	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Driver side door switch faulty	*Check driver side door switch referring to "Door Switch (Front / Rear Door) Inspection: ".*
	Lighting switch faulty	*Check lighting switch referring to "Headlight Switch (in Lighting Switch) Inspection: in Section 9B".*
	Key remainder switch faulty	*Check key remainder switch referring to "Ignition Switch Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Cigarette Lighter Symptom Diagnosis (If Equipped)

S4RS0A9304010

Condition	Possible cause	Correction / Reference Item
Cigarette lighter shows no operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Cigarette lighter faulty	*Check cigarette lighter.*
	Ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Horn Symptom Diagnosis

S4RS0A9304011

Condition	Possible cause	Correction / Reference Item
Horn does not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Horn switch faulty	*Check horn switch.*
	Horn relay faulty	*Check horn relay.*
	Wiring or grounding faulty	*Repair circuit.*
	Horn faulty	*Replace horn.*

Information Display Symptom Diagnosis (If Equipped)

S4RS0A9304012

NOTE:

This thermometer indicates the ambient temperature in back of front bumper member. Under any one of the following listed conditions, however, even when the ambient temperature goes up, the thermometer display does not rise so as to correct the rise of the ambient temperature caused by the radiant heat of the engine. When the ambient temperature drops, the thermometer reading follows the change in the temperature.
Be sure to bear this in mind when diagnosing trouble.

- **The vehicle speed is 30 km/h (18 mph) or lower.**
- **VSS signal is faulty.**
- **The ignition switch is turned on again within 2 hours.**

Condition	Possible cause	Correction / Reference Item
No displaying of information display	Circuit fuse Blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Information display unit faulty	*Replace unit.*
Incorrect thermometer display	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection: ".*
	VSS signal faulty	*Check VSS referring to "DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: in Section 1A" or "DTC P0722: Output Speed Sensor (VSS) Circuit No Signal: in Section 5A".*
	Wiring and/or grounding faulty	*Repair as necessary.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Display does not change at –30 °C	Outside air temperature is –30 °C (–22 °F) or less	—
	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection: ".*
	Outside air temperature sensor wiring circuit open circuit and/or short to power circuit	*Repair as necessary.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Display does not change at 50 °C	Outside air temperature is 50 °C (122 °F) or more	—
	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection: ".*
	Outside air temperature sensor wiring circuit short to ground circuit	*Repair as necessary.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Audio System Symptom Diagnosis (If Equipped)

S4RS0A9304013

Radio

NOTE:

Electronic part / system with undiagnosed problem may cause electromagnetic interference. Electromagnetic interference condition may have poor radio reception. To test for presence of electromagnetic interference in part / system, perform the following procedures.

1. **Turn ignition switch to OFF.**
2. **Systematically disconnect the electronic part / system connector(s) one at a time.**
3. **Turn ignition switch to ON.**
4. **Check any improvement in radio reception.**

Condition	Possible cause	Correction / Reference Item
Poor radio reception	Out of service area (Poor location)	—
	Antenna faulty	*Replace antenna.*
	Antenna amplifier faulty	*Replace antenna amplifier.*
	Electrical part / system faulty	*Repair or replace electrical part / system referring to after-mentioned NOTE.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Radio does not operate and speaker does not sound	Circuit fuse(s) blown	*Replace fuse(s) and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Radio does not operate, but speaker sound	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Radio is operative, but all speakers does not sound	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Individual speaker is noisy or inoperative	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker faulty	*Replace speaker.*
	Radio assembly faulty	*Replace radio assembly.*
Sound quality is poor	Out of service area (Poor location)	—
	Speaker installed incorrectly	*Install correctly.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker faulty	*Replace speaker.*
	Radio assembly faulty	*Replace radio assembly.*

CD Player

Condition	Possible cause	Correction / Reference Item
CD-ROM does not insert	Another CD-ROM already inserted	*Eject CD-ROM.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Extraneous material come to be mixed CD player	*Clear extraneous material from CD player or replace radio assembly.*
	Radio assembly faulty	*Replace radio assembly.*
CD-ROM does not eject	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Extraneous material come to be mixed in CD player	*Clear extraneous material from CD player or replace radio assembly.*
	Radio assembly faulty	*Replace radio assembly.*
CD player does not load CD-ROM	CD-ROM faulty	—
	CD-ROM inserted with incorrect side up	*Insert correctly.*
	Temperature in cabin is too hot	—
	Water droplets form on internal lens	*Dry about 1 hour with power on.*
	Radio assembly faulty	*Replace radio assembly.*

Condition	Possible cause	Correction / Reference Item
Sound skips or is noisy	CD-ROM faulty	—
	Driving vibration	—
	Water droplets form on internal lens	*Dry about 1 hour with power on.*
	Radio assembly installed incorrectly	*Install correctly.*
	Radio assembly faulty	*Replace radio assembly.*
CD player is operative, but all speakers does not sound	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Individual speaker is noisy or inoperative	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker faulty	*Replace speaker.*
	Radio assembly faulty	*Replace radio assembly.*
Sound quality or volume is poor	CD-ROM faulty	—
	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker installed incorrectly	*Install correctly.*
	Speaker faulty	*Replace speaker.*

Remote Audio Control Switch (If Equipped) Symptom Diagnosis

S4RS0A9304014

Condition	Possible cause	Correction / Reference Item
Audio system is operative, but remote control switch does not control audio system	Remote audio control switch faulty	*Check remote audio control switch referring to "Remote Audio Control Switch Inspection: ".*
	Contact coil faulty	*Replace contact coil.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*

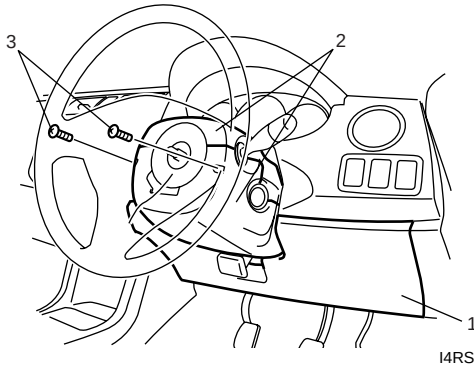
Repair Instructions

Ignition Switch Removal and Installation

S4RS0A9306001

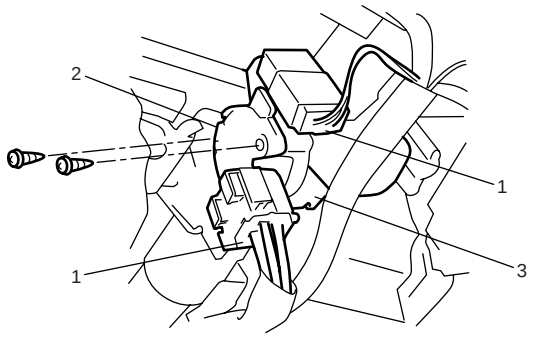
Removal

1) Disconnect negative cable at battery.
2) Confirm that ignition key is removed.
3) Remove steering column hole cover (1).
4) Turn steering wheel to remove steering column cover screws (3) and then remove steering column covers (2).



I4RS0A920007-

5) Disconnect couplers (1) from ignition switch (2).
6) Remove ignition switch (2) from key cylinder (3).



I4RS0A930008-

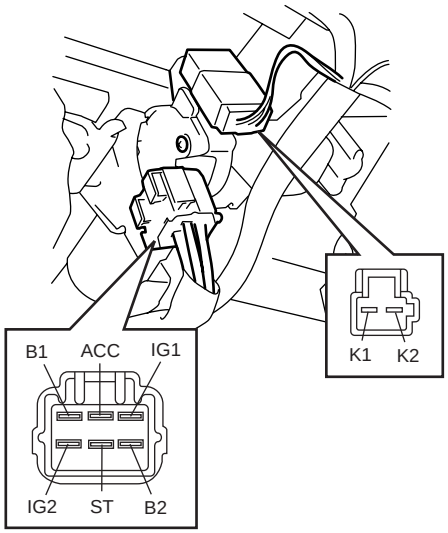
Installation

Reverse removal procedure.

Ignition Switch Inspection

S4RS0A9306002

- Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Key \ Terminal	Position	B1	B2	ACC	IG1	IG2	ST	K1	K2
OFF	LOCK	○							
ON	LOCK	○						○	○
	ACC	○		○					
	ON	○	○	○	○	○			
	START	○	○	○			○		

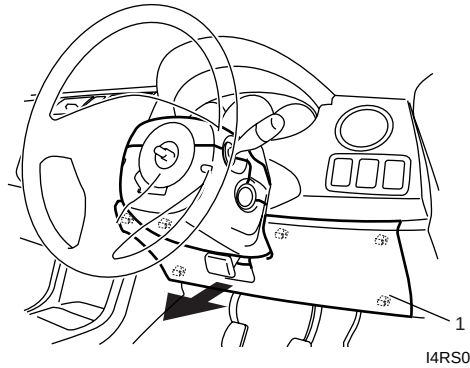
I4RS0A930009-

Combination Meter Removal and Installation

S4RS0A9306003

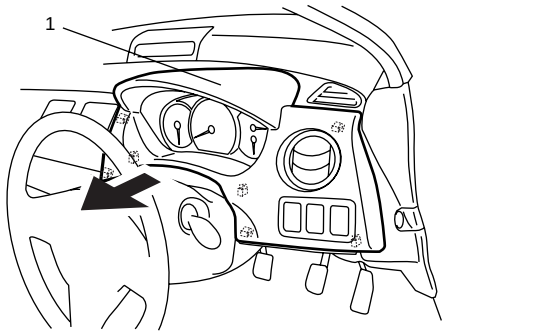
Removal

1) Disconnect negative (–) cable at battery.
2) Remove column hole cover (1) pulling it in arrow direction shown in figure.



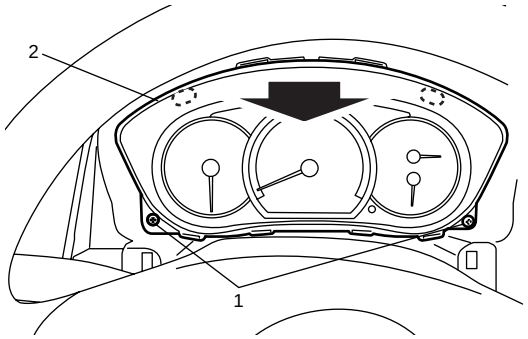
I4RS0A930010-

3) Remove combination meter cluster panel (1) pulling it in arrow direction shown in figure.



I4RS0A930011-

4) Remove screws (1) fastening combination meter.
5) Remove combination meter (2) pulling it arrow direction as shown.



I4RS0A930012-

Installation

Reverse removal procedure.

Fuel Level Sensor Removal and Installation

S4RS0A9306004

Removal

Remove fuel pump assembly referring to “Fuel Pump Assembly Removal and Installation: in Section 1G”.

Installation

Install fuel pump assembly referring to “Fuel Pump Assembly Removal and Installation: in Section 1G”.

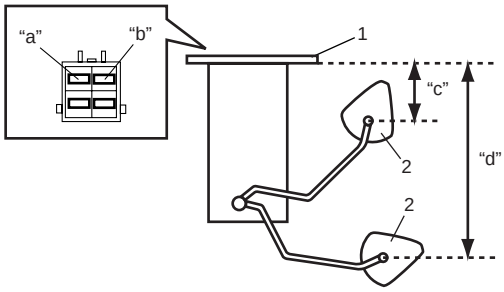
Fuel Level Sensor Inspection

S4RS0A9306005

- Check that resistance between terminals “a” and “b” of fuel level sensor changes with change of float position.
- Check resistance between terminals “a” and “b” at each float position in the following.
  If the measured value is out of specification, replace fuel pump.

Fuel level sensor specifications

Float Position		Resistance (Ω)
Full Upper “c”	**31.0 mm (1.22 in.)**	**40 ± 2**
Full Lower “d”	**172.0 mm (6.77 in.)**	**280 ± 3**



I4RH01930003-

1. Fuel pump	
2. Float	

Oil Pressure Switch Removal and Installation

S4RS0A9306006

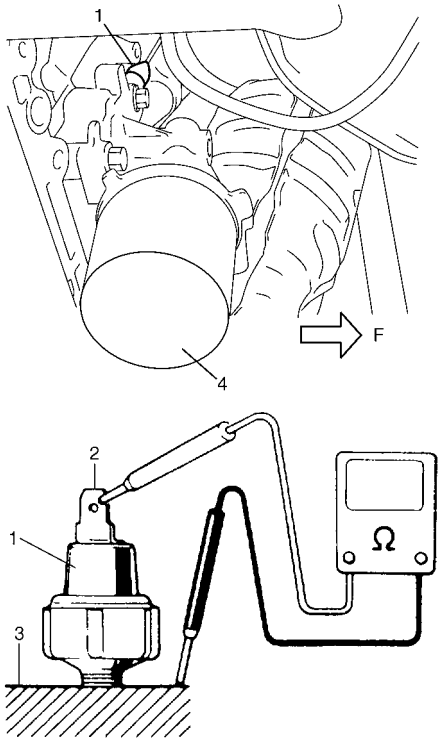
For removal and installation, refer to "Oil Pressure Check: in Section 1E".

Oil Pressure Switch Inspection

S4RS0A9306007

1) Disconnect oil pressure switch (1) lead wire.
2) Check for continuity between oil pressure switch terminal (2) and cylinder block (3) as shown. If check result is not as specified, replace oil pressure switch (1).

Oil pressure sensor specification
During engine running: No continuity
At engine stop: Continuity



I3RM0A930009-

4. Engine oil filter	F: Front

VSS Removal and Installation

S4RS0A9306008

For removal and installation, refer to "Vehicle Speed Sensor (VSS) Removal and Installation: in Section 5B" or "Output Shaft Speed Sensor (VSS) Removal and Installation: in Section 5A".

VSS Inspection

S4RS0A9306009

Refer to "Vehicle Speed Sensor (VSS) Inspection (M/T model): in Section 1C" or "Output Shaft Speed Sensor (VSS) Inspection: in Section 5A".

Engine Coolant Temperature (ECT) Sensor Inspection

S4RS0A9306010

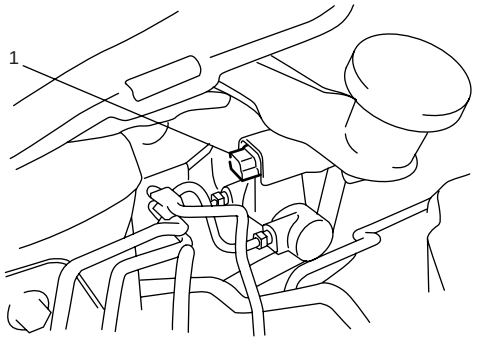
Check engine coolant temperature sensor for resistance, refer to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C".

Brake Fluid Level Switch Inspection

S4RS0A9306011

Check for continuity between terminals of brake fluid level switch coupler (1). If found defective, replace switch.

Brake fluid level switch specification
OFF position (float up): No continuity
ON position (float down): Continuity



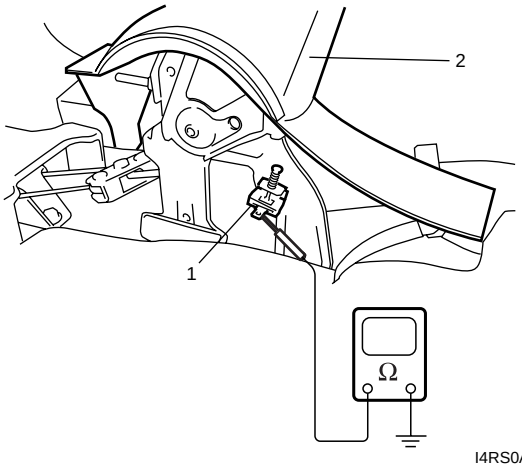
I4RS0A930013-

Parking Brake Switch Inspection

S4RS0A9306012

Check for continuity between parking brake switch terminal and body ground as shown in figure. If found defective, replace switch.

Parking brake switch specification
OFF position (parking brake released): No continuity
ON position (parking brake lever pulled up): Continuity



I4RS0A930014-

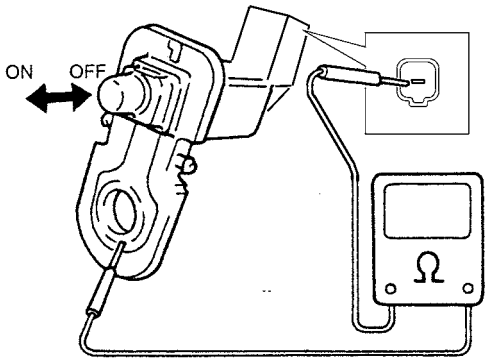
1.	Parking brake switch
2.	Parking brake lever

Door Switch (Front / Rear Door) Inspection

S4RS0A9306013

Remove door switch from body and check switch for continuity. If found defective, replace switch.

Door switch (front / rear door) specification
OFF position (Door closed): No continuity
ON position (Door open): Continuity



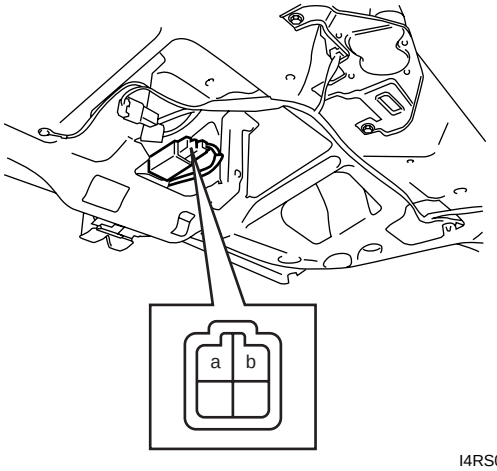
I3RH0A930004-

Rear End Door Switch Inspection

S4RS0A9306014

Check for continuity between terminal “a” and “b” shown in the following.
If check result is not as specified, replace switch.

Rear end door switch specification
Rear end door closed: No continuity
Rear end door opened: Continuity



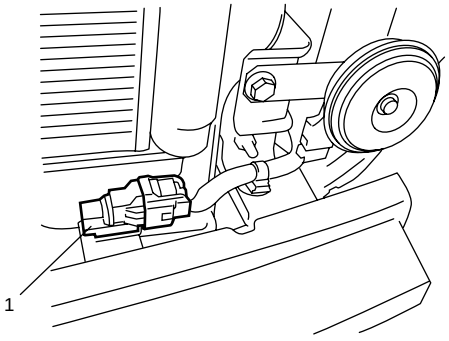
I4RS0A930015-

Outside Air Temperature Sensor Removal and Installation

S4RS0A9306016

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect connector from outside air temperature sensor.
4) Remove outside air temperature sensor (1) from front bumper member.



I4RS0A930016-

Installation

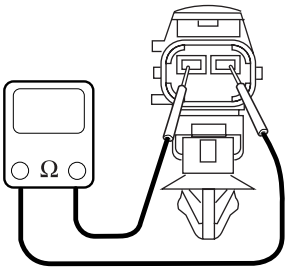
Reverse removal procedure for installation.

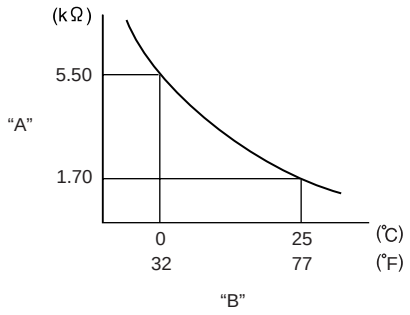
Outside Air Temperature Sensor Inspection

S4RS0A9306017

Measure resistance of outside air temperature sensor using an ohmmeter.
If resistance is out of specification, replace outside air temperature sensor.

Outside air temperature sensor resistance
1.62 kΩ – 1.78 kΩ at 25 °C (77 °F)





I4RS0A930017-

"A":	Resistance
"B":	Temperature

Instrument Panel Removal and Installation

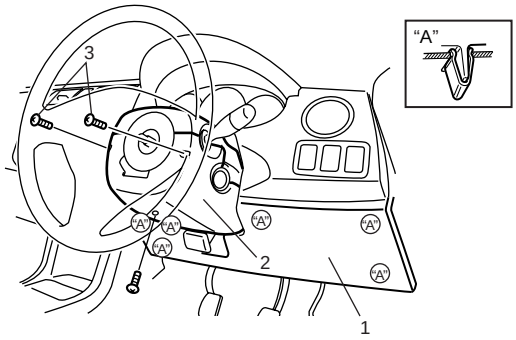
S4RS0A9306018

WARNING:

Refer to "Air Bag Warning: in Section 00" before starting service work.

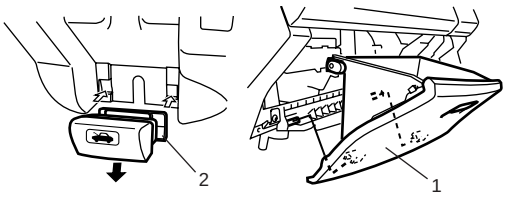
Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to "Disabling Air Bag System: in Section 8B".
3) Remove steering column hole cover (1).
4) Turn steering wheel to remove steering column cover screws (3).
5) Remove steering column covers (2).



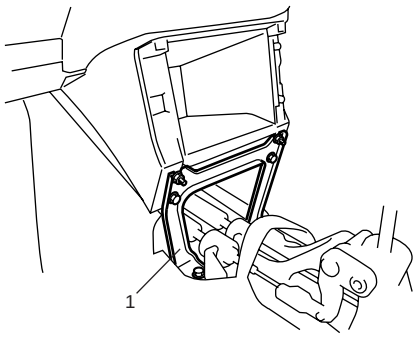
I4RS0A930018-

6) Remove glove box (1).
7) Remove hood latch release lever (2).



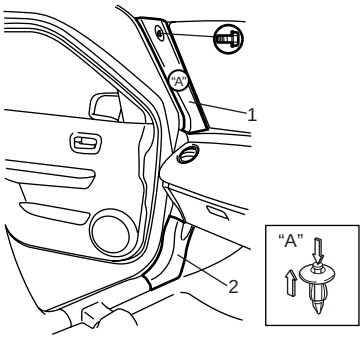
I4RS0A930019-

8) Remove console box referring to "Console Box Components: in Section 9H".
9) Remove instrument panel center lower bracket (1).



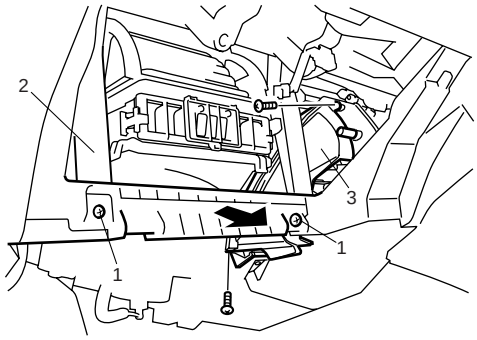
I4RS0A930020-

10) Remove front pillar trims (1) and dash side trims (2).



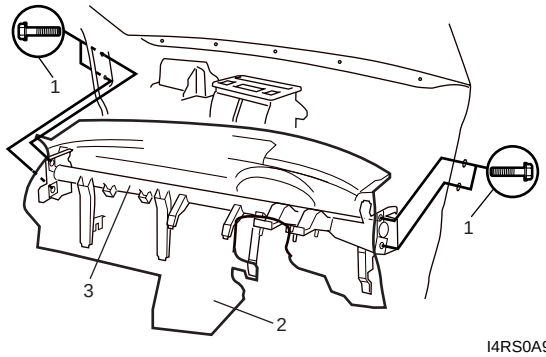
I4RS0A930021-

11) Remove instrument panel mounting screws (1).
12) Detach instrument panel from steering support member (2) and then remove foot duct (3).



I4RS0A930022-

13) Disconnect instrument panel harness connectors, heater control cables and antenna cable instrument panel removal.
14) Remove steering column mounting nuts referring to “Steering Column Removal and Installation: in Section 6B”.
15) Remove instrument panel ground wire.
16) Remove instrument panel mounting bolts (1).
17) Remove instrument panel (2) with steering support member (3) and instrument panel harness.



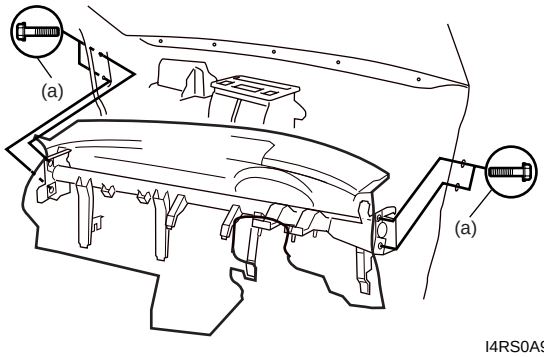
I4RS0A930023-

Installation

Reverse removal procedure noting the following.

- When installing each part, be careful not to catch any cable or wiring harness.
- Tighten instrument panel mounting bolts to specified torque

Tightening torque
Instrument panel mounting bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A930024-

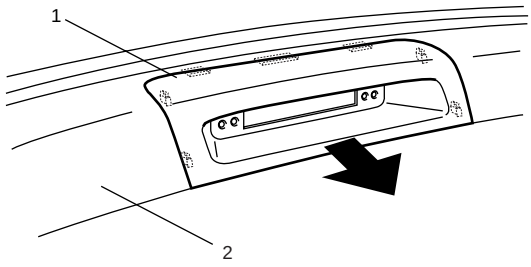
- Tighten steering column mounting nuts referring to “Steering Column Removal and Installation: in Section 6B”.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Information Display Removal and Installation

S4RS0A9306019

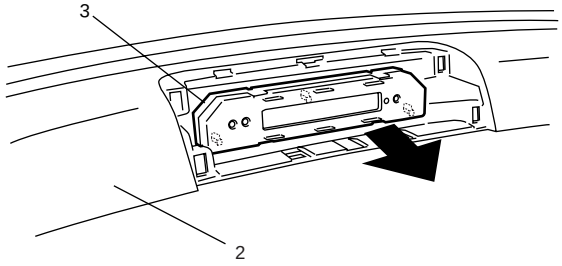
Removal

1) Remove information display garnish (1) from instrument panel (2) pulling it arrow direction as shown.



I4RS0A930032-

2) Remove information display (3) from instrument panel (2) pulling it in arrow direction shown in figure.
3) Disconnect information display coupler.



I4RS0A930025-

Installation

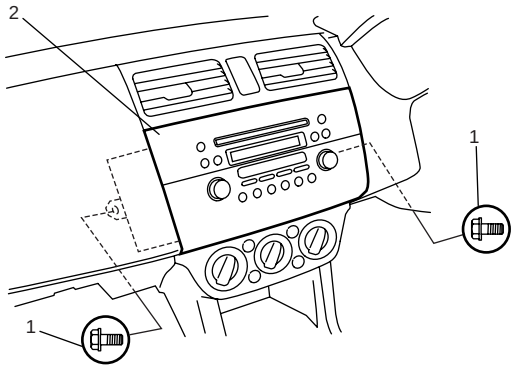
Reverse removal procedure.

Radio Assembly Removal and Installation

S4RS0A9306020

Removal

1) Disconnect negative (–) cable at battery.
2) Remove globe box referring to “Instrument Panel Removal and Installation: ”.
3) Remove 2 mounting bolts (1).
4) Disconnect electrical connectors from radio assembly.
5) Remove radio assembly (2) from instrument panel.



I4RS0A930026-

Installation

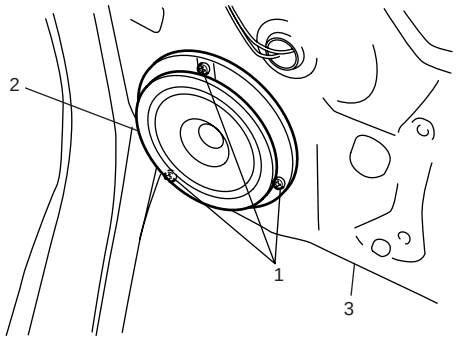
Reverse removal procedure.

Front Speaker Removal and Installation

S4RS0A9306021

Removal

1) Remove door trim referring to Step 1) to 3) of “Front Door Glass Removal and Installation: in Section 9E”.
2) Remove 3 front speaker mounting screws (1).
3) Remove front speaker (2) from front door (3).
4) Disconnect front speaker coupler from front speaker (2).



I4RS0A930027-

Installation

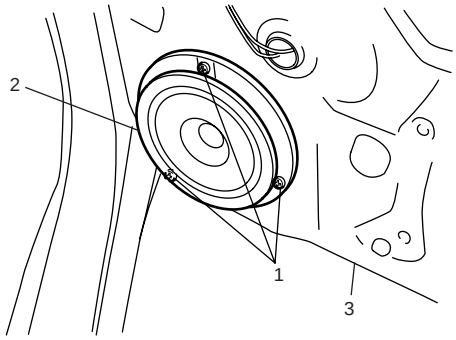
Reverse removal procedure.

Rear Speaker Removal and Installation

S4RS0A9306022

Removal

1) Remove door trim referring to Step 1) to 3) of “Rear Door Glass Removal and Installation: in Section 9E”.
2) Remove 3 rear speaker mounting screws (1).
3) Remove rear speaker (2) from rear door (3).
4) Disconnect rear speaker coupler from rear speaker (2).



I4RS0A930027-

Installation

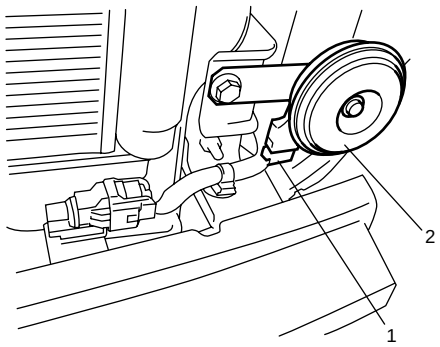
Reverse removal procedure.

Horn Removal and Installation

S4RS0A9306027

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect horn connector (1).
4) Remove horn (2).



I4RS0A930028-

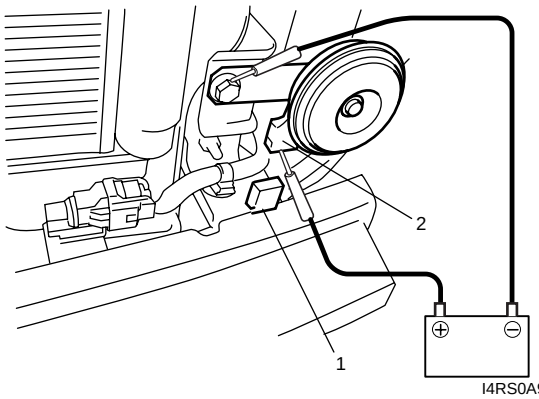
Installation

Reverse removal procedure for installation.

Horn Inspection

S4RS0A9306029

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect horn connector (1).
4) Connect battery positive (+) to terminal of horn connector (2) and negative (–) terminal to body ground.
   If horn is not sounding, replace horn.

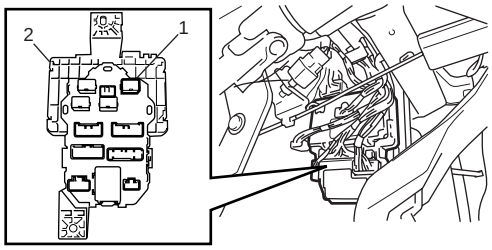


I4RS0A930030-

Horn Relay Inspection

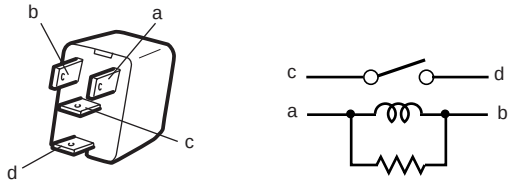
S4RS0A9306028

1) Disconnect negative (–) cable at battery.
2) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation: in Section 10B”.
3) Remove horn relay (1) from junction block assembly (2).



I4RS0A930029-

4) Check that there is no continuity between terminal “c” and “d”. If there is continuity, replace relay.
5) Check that there is continuity between terminals “c” and “d” when a 12 V battery is connected to terminals “a” and “b”. If malfunction is found, replace it with a new one.



I3JA01920006-

Antenna Amplifier Removal and Installation

S4RS0A9306025

NOTE:

Antenna amplifier incorporated with antenna base.

Removal

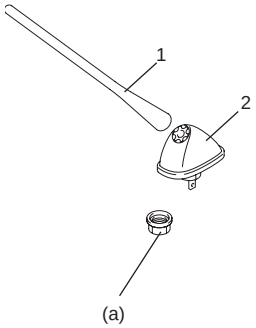
1) Remove head lining referring to “Head Lining Removal and Installation: in Section 9H”.
2) Remove antenna (1) from antenna base (2).
3) Disconnect antenna feeder from antenna base (2).
4) Remove antenna base (2) from vehicle.

Installation

Reverse removal procedure noting the following.

- Tighten antenna base mounting nut to specified torque.

  Tightening torque
  Antenna base mounting nut (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



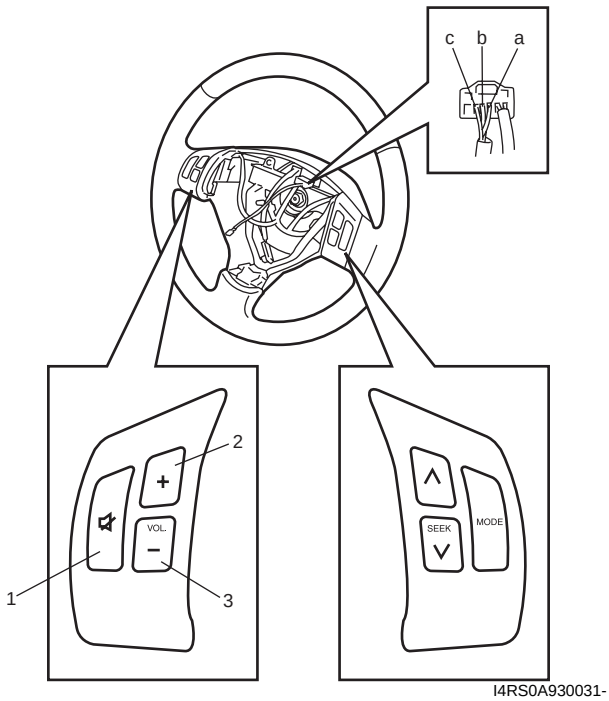
I4RH01930009-

Remote Audio Control Switch Inspection

S4RS0A9306026

1) Remove driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
2) Disconnect remote audio control switch connector from contact coil.
3) Check switch for resistance between “a” and “c” terminals under each condition below.
   If check result is not satisfactory, replace remote audio control switch.

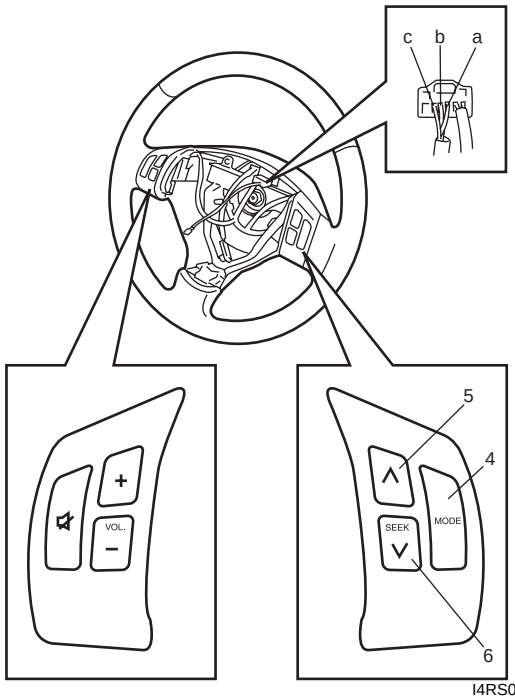
   “ENTER”, “+” and “–” switch resistance
   All switches released (OFF): 4700 – 5600 kΩ
   “ENTER” switch (1) pushing on (ON): 50 – 60 Ω
   “+” switch (2) pushing on (ON): 120 – 140 Ω
   “–” switch (3) pushing on (ON): 220 – 260 Ω



I4RS0A930031-

4) Check switch for resistance between “b” and “c” terminals under each condition below.
If check result is not satisfactory, replace remote audio control switch.

“MODE”, “Λ” and “V” switch resistance
All switches released (OFF): 4700 – 5600 kΩ
“MODE” switch (4) pushing on (ON): 370 – 460 Ω
“Λ” switch (5) pushing on (ON): 680 – 820 Ω
“V” switch (6) pushing on (ON): 1400 – 1700 Ω



I4RS0A930033-

Specifications

Tightening Torque Specifications

S4RS0A9307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Instrument panel mounting bolts	23	2.3	17.0	☞
Antenna base mounting nut	10	1.0	7.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Audio System Component Location: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Wipers / Washers

Diagnostic Information and Procedures

Front Wiper and Washer Symptom Diagnosis

S4RS0A9404001

Condition	Possible cause	Correction / Reference Item
Wiper malfunctions	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiper motor faulty	*Check wiper motor referring to "Windshield Wiper Motor Inspection: ".*
	Combination switch (wiper switch) faulty	*Check wiper switch referring to "Windshield Wiper and Washer Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
Washer malfunctions	Washer hose or nozzle clogged	*Clean or repair clogged hose or nozzle.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Washer motor faulty	*Check washer motor referring to "Washer Pump Inspection: ".*
	Combination switch (washer switch) faulty	*Check washer switch referring to "Windshield Wiper and Washer Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Rear Wiper and Washer (If Equipped) Symptom Diagnosis

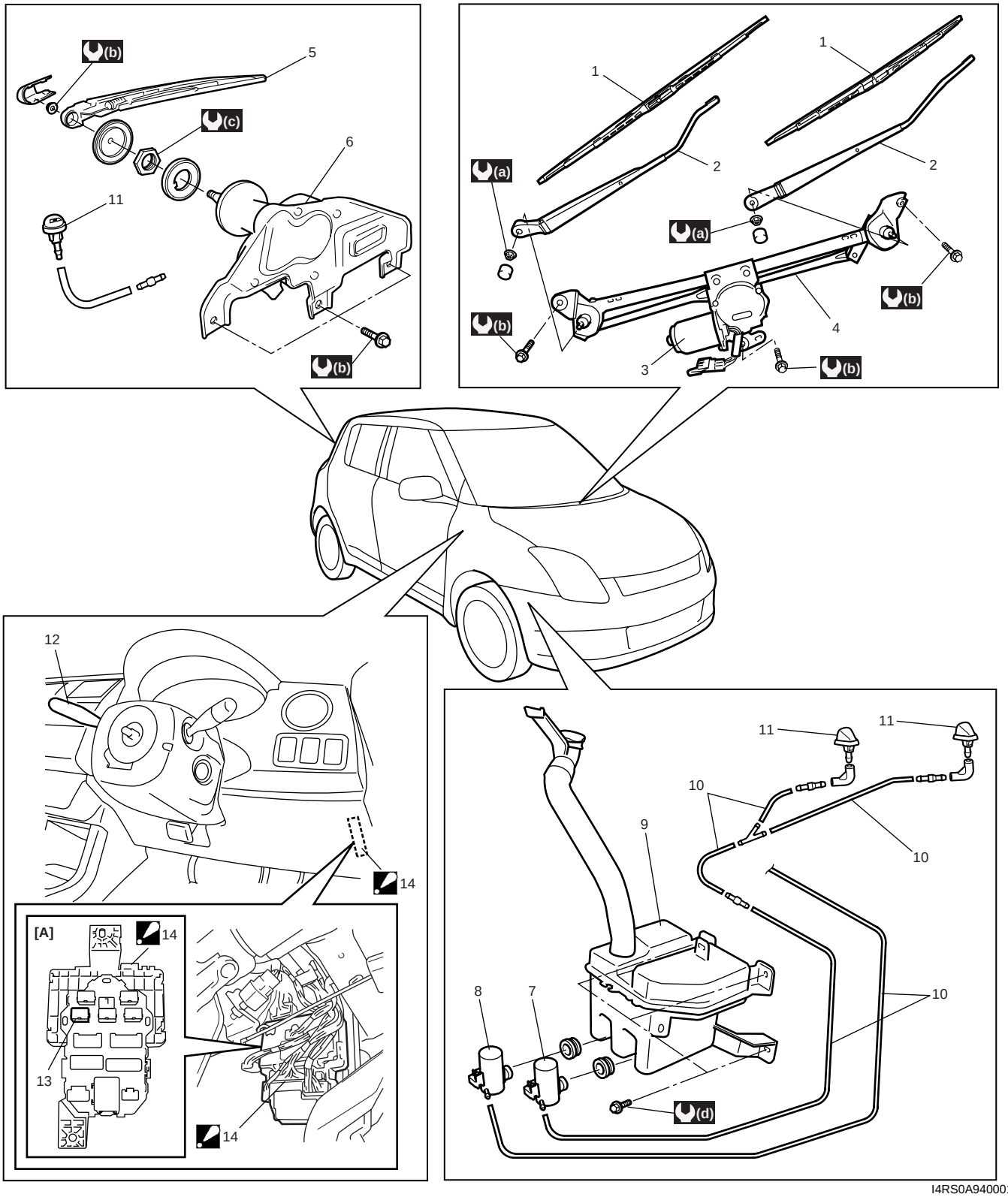
S4RS0A9404002

Condition	Possible cause	Correction / Reference Item
Wiper malfunctions ***NOTE:*** • ***Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".*** • ***Check each part in the order from the top of the following list.***	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiper motor faulty	*Check wiper motor referring to "Rear Wiper Motor (If Equipped) Inspection: ".*
	Combination switch (wiper switch) faulty	*Check wiper switch referring to "Rear Wiper and Washer Switch Inspection: ".*
	Rear wiper relay faulty	*Check rear wiper relay referring to "Rear Wiper Relay Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Washer malfunctions	Washer hose or nozzle clogged	*Clean or repair clogged hose or nozzle.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Washer motor faulty	*Check washer motor referring to "Washer Pump Inspection: ".*
	Combination switch (washer switch) faulty	*Check washer switch referring to "Rear Wiper and Washer Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Repair Instructions

Wipers and Washers Components

S4RS0A9406001



I4RS0A940001-

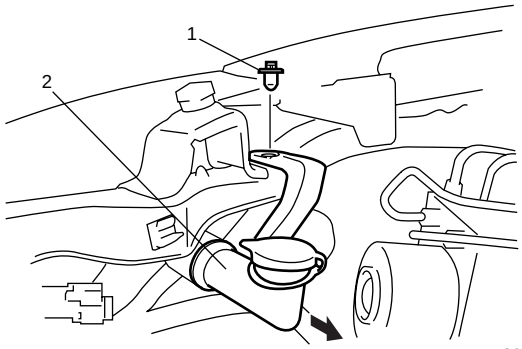
1. Windshield wiper blade	8. Washer pump for rear washer (if equipped)	[A]: Junction block assembly viewed from relay side
2. Windshield wiper arm	9. Washer tank	(a) : 16 N·m (1.6 kg-m, 11.5 lb-ft)
3. Windshield wiper motor	10. Washer hose	(b) : 8 N·m (0.8 kg-m, 6.0 lb-ft)
4. Windshield wiper link	11. Washer nozzle	(c) : 5 N·m (0.5 kg-m, 4.0 lb-ft)
5. Rear wiper arm with blade assembly (if equipped)	12. Wiper switch	(d) : 4 N·m (0.4 kg-m, 3.0 lb-ft)
6. Rear wiper motor (if equipped)	13. Rear wiper relay (if equipped)	
7. Washer pump for windshield washer	14. Junction block assembly (including in BCM) : BCM cannot be removed from junction block.	

Washer Tank and Washer Pump Removal and Installation

S4RS0A9406002

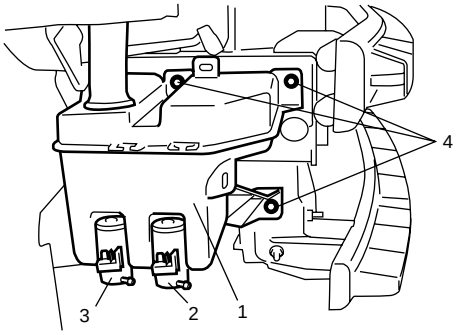
Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Remove grommet (1) and upper part (2) of washer tank.



I4RS0A940002-

4) Remove washer tank attaching bolts (4).
5) Disconnect washer pump lead wire couplers and hoses.
6) Remove washer tank (1).
7) Remove windshield washer pump (2) and rear washer pump (3) (if equipped) from washer tank (1).



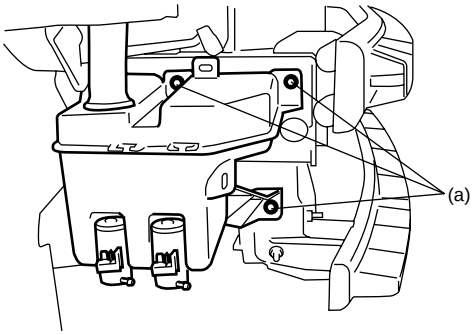
I4RS0A940003-

Installation

Install washer tank and washer pump by reversing removal procedure, noting the following instructions.

- Insert bolts in such direction as shown in figure.
- Tighten all fasteners to specified torque.

Tightening torque
Washer tank bolt (a): 4 N·m (0.4 kg-m, 3.0 lb-ft)

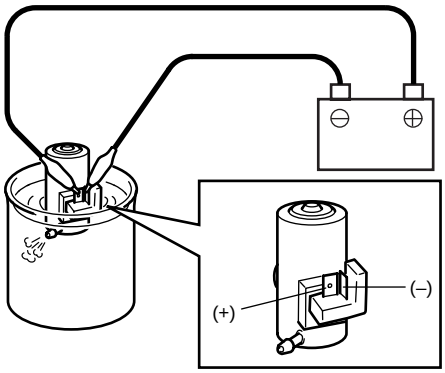


I4RS0A940004-

Washer Pump Inspection

S4RS0A9406003

1) Connect battery positive (+) and negative (–) terminals to pump (+) and (–) terminals respectively.
2) Check front and rear washer pumps for operation. If pump does not operate, replace washer pump.



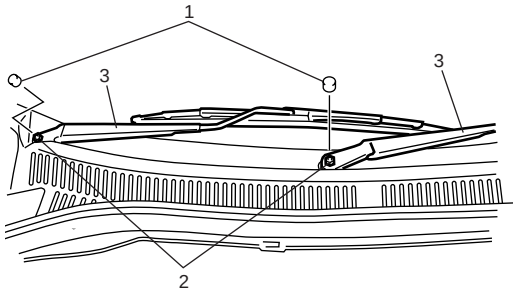
I4RS0A940005-

Windshield Wiper Removal and Installation

S4RS0A9406012

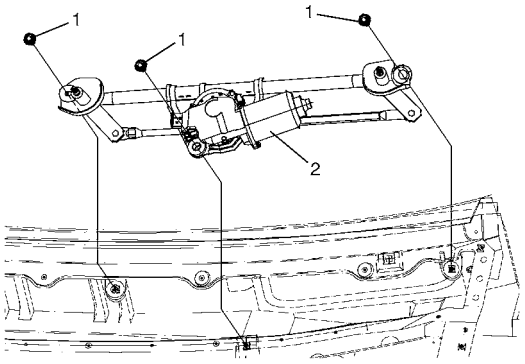
Removal

1) Disconnect negative (–) cable at battery.
2) Remove wiper pivot caps (1) and wiper arm nuts (2), and remove windshield wiper arms with wiper blades (3).



I4RS0A940006-

3) Remove cowl top garnish referring to “Cowl Top Components: in Section 9K”.
4) Disconnect coupler from windshield wiper motor.
5) Remove bolts (1), and remove windshield wiper assembly (2).

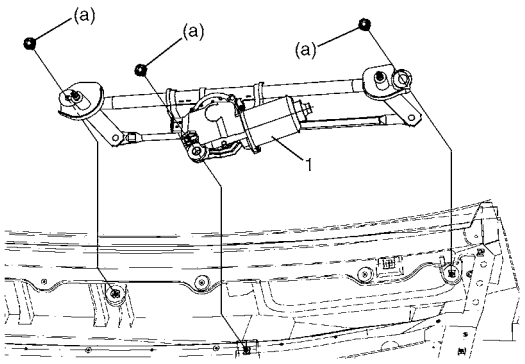


I4RS0A940007-

Installation

1) Install windshield wiper assembly (1), and tighten bolts to specified torque.

Tightening torque
Windshield wiper bolt (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)

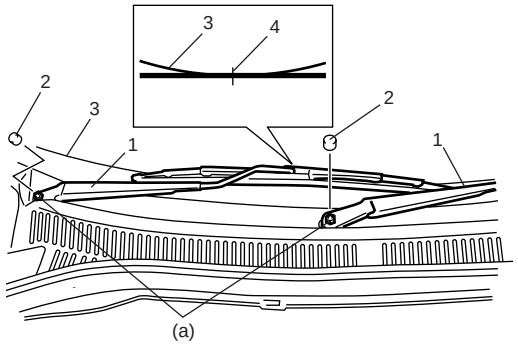


I4RS0A940008-

2) Connect coupler to windshield wiper motor.
3) Install cowl top garnish referring to “Cowl Top Components: in Section 9K”.
4) Install windshield wiper arms with wiper blades (1) to specified position as shown in figure, and then tighten windshield wiper nuts to specified torque.

Tightening torque
Windshield wiper arm nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)

5) Install wiper pivot caps (2) to windshield wiper arm nuts



I4RS0A940009-

3.	Ceramic line
4.	Wiper blade center

6) Connect negative (–) cable to battery.

Windshield Wiper Motor Inspection

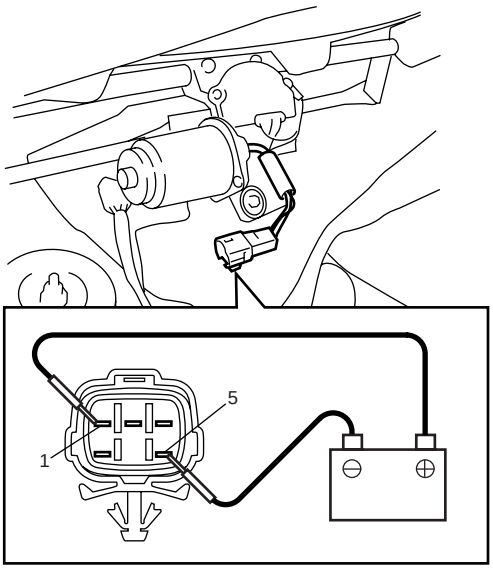
S4RS0A9406004

NOTE:

Make sure that battery voltage is 12 V or more.

1) Disconnect negative (–) cable at battery.
2) Remove windshield wiper arms with wiper blades referring to “Windshield Wiper Removal and Installation: ”.
3) Remove cowl top garnish referring to “Cowl Top Components: in Section 9K”.
4) Disconnect coupler from windshield wiper motor.
5) Reinstall windshield wiper arms with wiper blade. For details, refer to Step 4) of “Installation” in “Windshield Wiper Removal and Installation: ”.
6) Check windshield wiper motor for operation as follows
   - For motor operation in low speed
     a. Connect battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “5”.
     b. Check if wiper arm reciprocation speed is as specification. If check result is not as specified, replace motor.

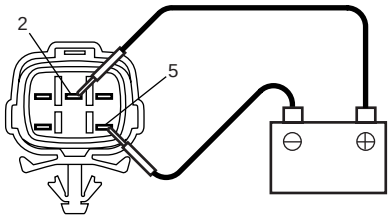
Specification
41 – 51 r/min (rpm)



I4RS0A940010-

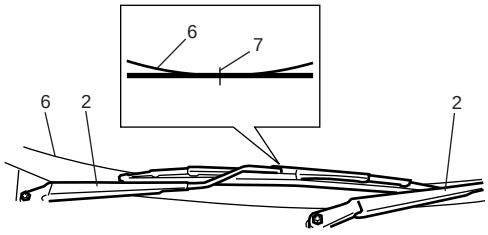
- For motor operation in high speed
  a. Connect battery positive (+) terminal to “2” and its negative (–) terminal to terminal “5”.
  b. Check if motor revolution speed is as specification. If check result is not as specified, replace motor.

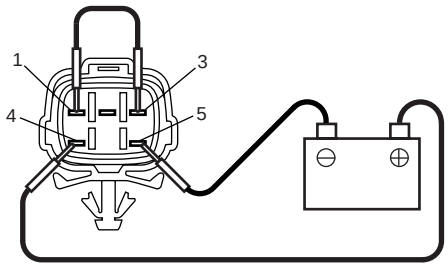
  Specification
  60 – 76 r/min (rpm)



I4RS0A940011-

- For automatic stop operation
  a. Connect battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “5” and let the motor turn.
  b. Disconnect terminal “1” from battery positive (+) terminal, and let the motor stop.
  c. Connect terminals “1” and “3” with a jumper wire, and connect terminal “4” to battery positive (+) terminal.
     Observe the motor turns once again then stops at a specified position as shown.





I4RS0A940012-

2.	Windshield wiper arms with wiper blades
6.	Ceramic line
7.	Wiper blade center

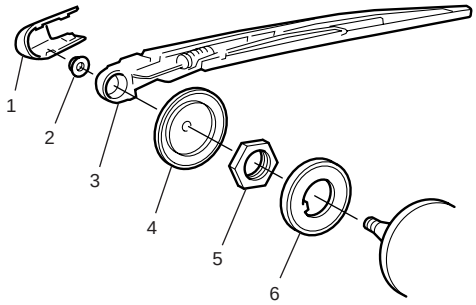
  d. Repeat Step 1) to 3) several times and check that the motor stops at the specified position every time.
     If check result is not satisfied, replace motor.

Rear Wiper (If Equipped) Removal and Installation

S4RS0A9406013

Removal

1) Disconnect negative (–) cable at battery.
2) Remove arm cover (1), rear wiper arm nut (2), rear wiper arm with blade assembly (3), rear wiper pivot cap (4), rear wiper nut (5) and rear wiper seal (6).



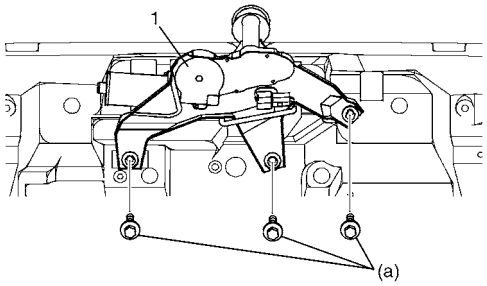
I4RS0A940013-

3) Remove rear end door trim referring to “Rear End Door Lock Assembly Removal and Installation: in Section 9F”.
4) Disconnect coupler from rear wiper motor.
5) Remove rear wiper motor.

Installation

1) Install rear wiper motor (1) and tighten rear wiper motor mounting bolts to specified torque.

Tightening torque
Rear wiper motor mounting bolt (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)

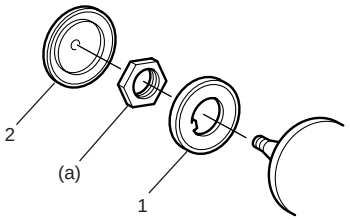


I4RS0A940014-

2) Connect coupler to rear wiper motor
3) Install rear end door trim referring to “Rear End Door Lock Assembly Removal and Installation: in Section 9F”.
4) Install rear wiper seal (1), and tighten rear wiper nut to specified torque.

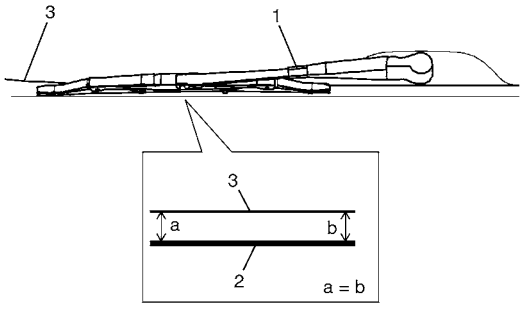
Tightening torque
Rear wiper nut (a): 5 N·m (0.5 kg-m, 4.0 lb-ft)

5) Install rear wiper pivot cap (2).



I4RS0A940015-

6) Install rear wiper arm with blade assembly (1) to specified position as shown in figure.

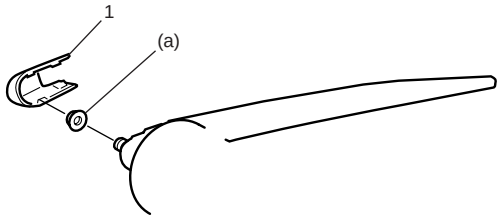


I4RS0A940016-

2.	Rear wiper blade
3.	Ceramic line

7) Tighten rear wiper arm nut to specified torque, and then install arm cover (1).

Tightening torque
Rear wiper arm nut (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)



I4RS0A940017-

8) Connect negative (–) cable to battery.

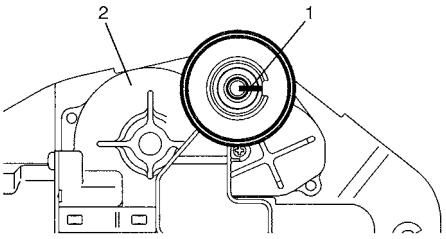
Rear Wiper Motor (If Equipped) Inspection

S4RS0A9406005

NOTE:

Make sure that battery voltage is 12 V or more.

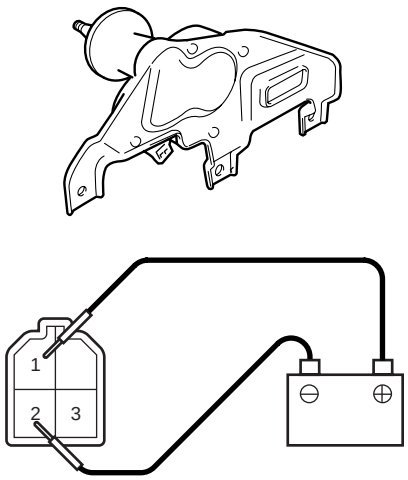
1) Make a mark (1) on rear wiper motor (2) stop position as shown.



I4RS0A940018-

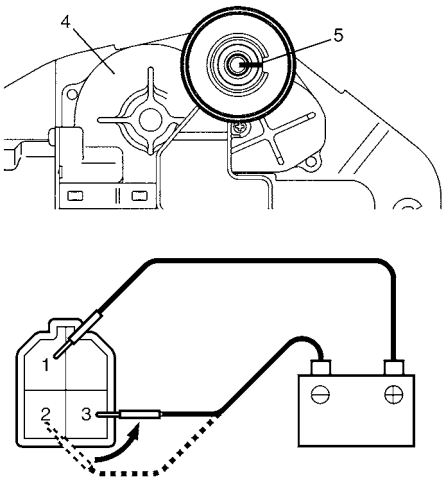
2) Check rear wiper motor for operation as follows.
   - For motor operation
     a. Connect battery positive terminal to terminal “1” and its negative terminal to terminal “2”.
     b. Check motor revolution speed as specification. If check result is not as specified, replace motor.

Specification
35 – 45 r/min (rpm)



I4RS0A940019-

- For automatic stop operation
  a. Connect battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “2” and let the motor turn.
  b. Disconnect terminal “2” from battery negative (–) terminal and let the motor stop.
  c. Observe the motor (4) turns once again then stops at a specified position as shown.



I4RS0A940020-

5. Mark

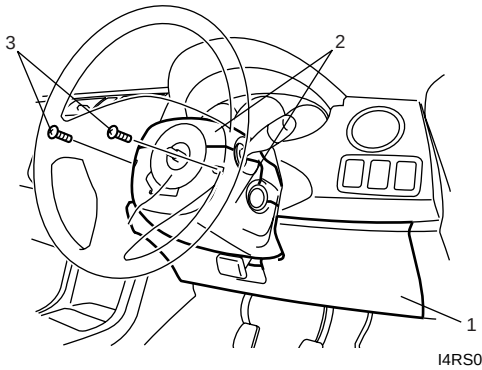
  d. Repeat Step a. to c. several times and check that the motor stops at the specified position every time.
  If check result is not satisfied, replace motor.

Windshield Wiper and Washer Switch Removal and Installation

S4RS0A9406006

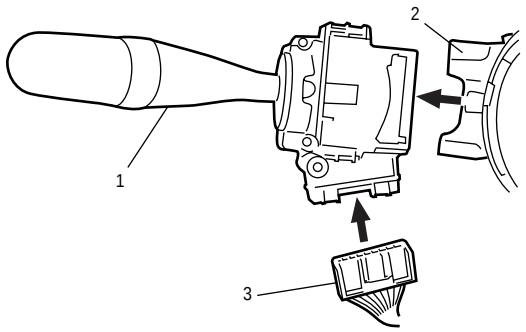
Removal

1) Disconnect negative (–) cable at battery.
2) Remove steering column hole cover (1).
3) Remove steering column covers (2).
Turn steering wheel to access steering column cover rear end screws (3).



I4RS0A940021-

4) Remove windshield wiper and washer switch (1) from combination switch assembly (2) and disconnect its coupler (3).



I4RS0A940022-

Installation

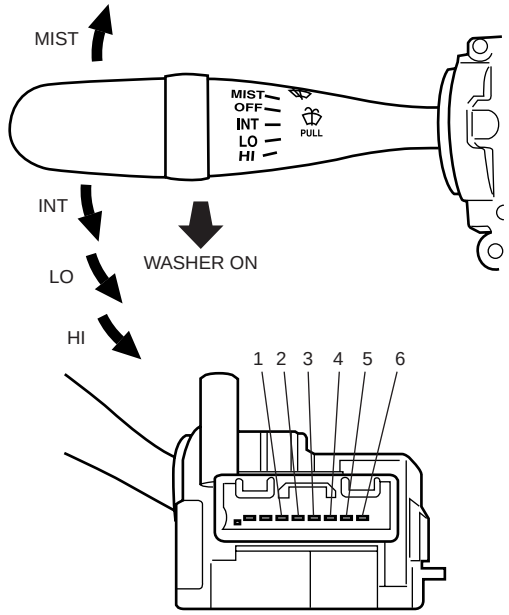
Reverse removal procedure.

Windshield Wiper and Washer Switch Inspection

S4RS0A9406007

Windshield Wiper and Washer Switch

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



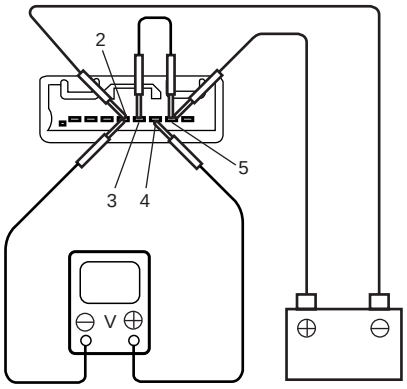
Wiper SW \ Terminal	5	6	4	3
OFF			○	○
INTO			○	○
LO	○		○	
HI	○	○		
MIST	○		○	

Washer SW \ Terminal	1	2
ON		
OFF	○	○

I4RS0A940023-

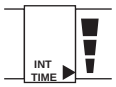
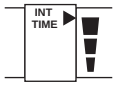
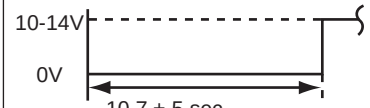
Intermittent Wiper Relay Circuit

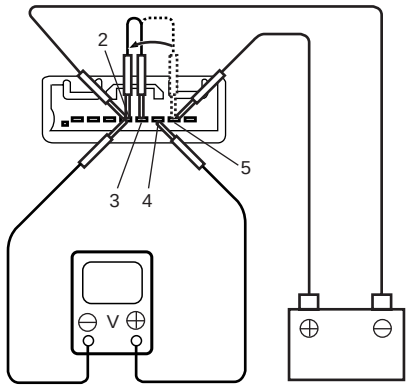
1) Turn the windshield wiper switch to “INT” position.
2) Connect battery positive (+) terminal to terminal “5” and its negative (–) terminal to terminal “2”.
3) Connect voltmeter positive lead to terminal “4” and its negative lead to terminal “2”.
4) Check that the voltmeter indicates the battery voltage (10 – 14 V).
5) Connect terminal “3” and terminal “5” by a jumper wire.



I4RS0A940024-

6) Disconnect end of the jumper wire from terminal “5”.
7) Connect disconnected jumper wire end to terminal “2”, then check that voltage between terminal “4” and terminal “2” changes as shown.
If check result is not satisfied, replace switch.

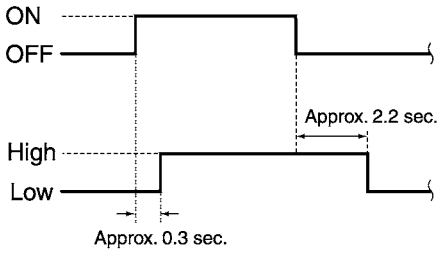
INT time control switch position	Voltage
	
	

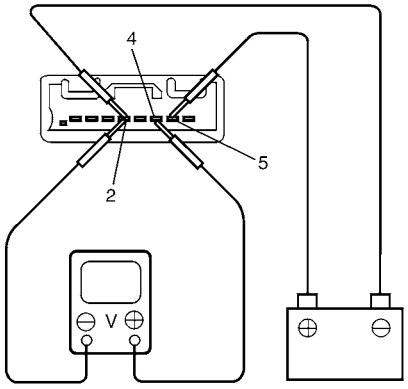


I4RS0A940025-

Washer Linked Circuit

1) Make sure that front wiper switch is at “OFF” position.
2) Connect battery positive (+) terminal to terminal “5” and its negative (–) terminal to terminal “2”.
3) Connect voltmeter positive lead to terminal “4” and its negative lead to terminal “2”.
4) When front wiper switch is ON, check that voltage changes as shown in figure.
If check result is not satisfied, replace switch.





I4RS0A940026-

Rear Wiper and Washer Switch Removal and Installation

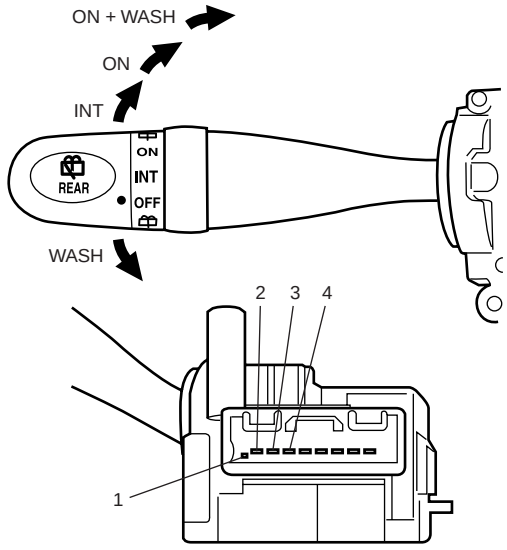
S4RS0A9406008

For removal and installation, refer to “Windshield Wiper and Washer Switch Removal and Installation: ”.

Rear Wiper and Washer Switch Inspection

S4RS0A9406009

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Position \ Terminal	1	2	4	3
OFF				
INTO	○		○	
ON		○	○	
ON + WASH		○	○	○
WASH			○	○

I4RS0A940027-

Rear Wiper Relay Removal and Installation

S4RS0A9406015

Removal

1) Disconnect negative (–) cable at battery.
2) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation: in Section 10B”.
3) Remove rear wiper relay.

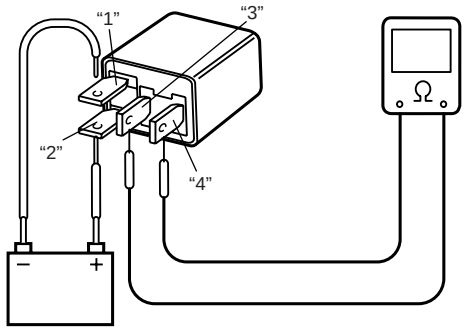
Installation

Reverse removal procedure for installation.

Rear Wiper Relay Inspection

S4RS0A9406014

1) Check that there is no continuity between terminal “3” and “4”. If there is continuity, replace relay.
2) Connect battery positive (+) terminal to terminal “2” of relay.
3) Connect battery negative (–) terminal to terminal “1” of relay.
4) Check continuity between terminal “3” and “4”. If there is no continuity when relay is connected to the battery, replace relay.



I4RS0A940028-

Specifications

Tightening Torque Specifications

S4RS0A9407001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Washer tank bolt	4	0.4	3.0	☞
Windshield wiper bolt	8	0.8	6.0	☞
Windshield wiper arm nut	16	1.6	11.5	☞
Rear wiper motor mounting bolt	8	0.8	6.0	☞
Rear wiper nut	5	0.5	4.0	☞
Rear wiper arm nut	8	0.8	6.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Wipers and Washers Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Glass / Windows / Mirrors

General Description

Rear End Door Window Defogger System Description

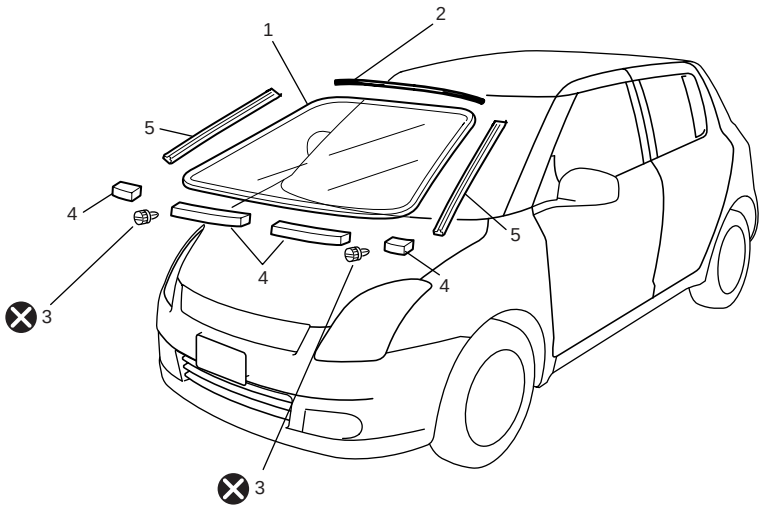
S4RS0A9501002

The rear end door window defogger is controlled by BCM. For the BCM description refer to “BCM General Description: in Section 10B”.

Windshield Construction

S4RS0A9501001

The windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For the windshield replacement, it is important to use an adhesive which provides sufficient adhesion strength and follow the proper procedure.



I4RS0A950001-

1. Windshield glass	3. Windshield glass stopper	5. Windshield side garnish
2. Windshield molding	4. Spacer	⊗ : Do not reuse.

CAUTION:

- **Described is the glass replacement by using 3 types of primers and 1 type of adhesive made by YOKOHAMA (one component urethane adhesive to be used with primer in combination). When using primer and adhesive made by other manufacturers, be sure to refer to handling instructions supplied with them. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.**
- **Should coated surface be scratched or otherwise damaged, be sure to repair damaged part, or corrosion may start from there.**

Use the specific adhesive which has the following property.

Glass adhesive shearing strength
40 kg/cm^2 (569 lb/in^2) or more

Adhesive materials and tools required for removal and installation.

- One component urethane adhesive and primers used in combination (For one sheet of windshield).
  - Adhesive (470 g (15.7 oz.))
  - Primer for glass (30 g (1.0 oz.))
  - Primer for body (30 g (1.0 oz.))
  - Primer for molding (30 g (1.0 oz.))
- Eyeleteer
- Piano string

- Windshield knife
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

Diagnostic Information and Procedures

Rear End door Window Defogger Symptom Diagnosis

S4RS0A9504001

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Rear end door window defogger does not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Rear end door window defogger switch faulty	*Check rear end door window defogger switch referring to "Rear End Door Window Defogger Switch Inspection: ".*
	Rear end door window defogger relay faulty	*Check rear end door window defogger relay referring to "Rear End Door Window Defogger Relay Inspection: "*
	Defogger wire faulty	*Check defogger wire referring to "Rear End Door Window Defogger Wire Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Power Window Control System Symptom Diagnosis

S4RS0A9504002

Condition	Possible cause	Correction / Reference Item
All power windows do not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Power window main switch faulty	*Check power window main switch referring to "Power Window Main Switch Inspection: ".*
	Ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection: in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*
Only one power window does not operate	Power window main switch faulty	*Check power window main switch referring to "Power Window Main Switch Inspection: ".*
	Power window sub switch faulty	*Check power window sub switch referring to "Power Window Sub Switch Inspection: ".*
	Wiring and/or coupler faulty	*Check wiring and/or coupler.*
	Power window regulator faulty	*Check window regulator.*
	Power window motor faulty	*Check power window motor.*
	Wiring or grounding faulty	*Repair circuit.*

Power Door Mirror Control System (If Equipped) Symptom Diagnosis

S4RS0A9504003

Condition	Possible cause	Correction / Reference Item
All power mirrors do not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Power door mirror switch faulty	*Check power door mirror switch referring to "Power Door Mirror Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
One power mirror does not operate	Power door mirror switch faulty	*Check power door mirror switch referring to "Power Door Mirror Switch Inspection: ".*
	Power door mirror actuator faulty	*Check actuator refraining to "Power Door Mirror Actuator Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

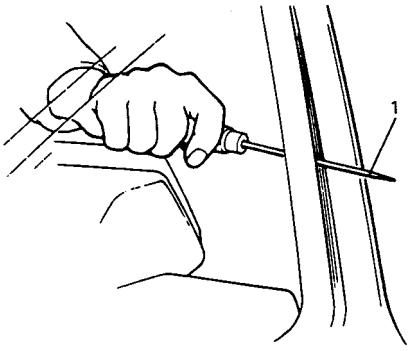
Repair Instructions

Windshield Removal and Installation

S4RS0A9506001

Removal

1) Clean both inside and outside of glass and around it.
2) Remove wiper arms and cowl top garnish.
3) Remove windshield side garnish.
4) Using tape, cover body surface around glass to prevent any damage.
5) Remove rear view mirror, sun visor and front pillar trims (right & left).
6) If necessary, remove instrument panel. Refer to "Instrument Panel Removal and Installation: in Section 9C".
7) If necessary, remove head lining. Refer to "Head Lining Removal and Installation: in Section 9H".
8) Remove (or cut) windshield molding.
9) Drill hole with eyeleteer (1) through adhesive and let piano string through it.

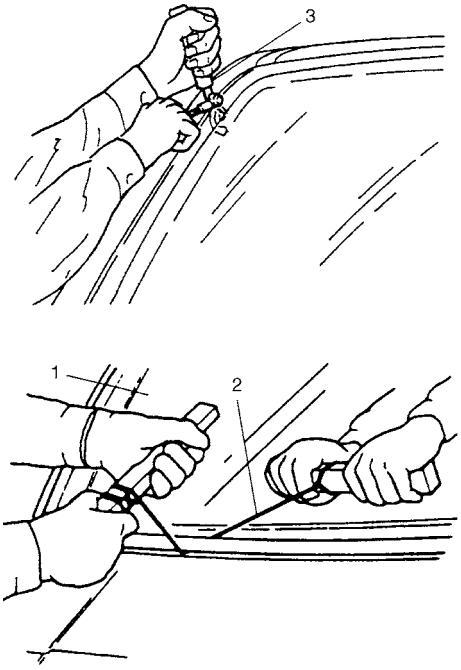


I2RH01950040-

10) Cut adhesive all around windshield (1) with piano string (2). When using tool, windshield knife (3), to cut adhesive, be careful not to cause damage to windshield. Use wire to cut adhesive along lower part of windshield.

NOTE:

Use piano string (2) as close to glass as possible so as to prevent damage to body and instrument panel.

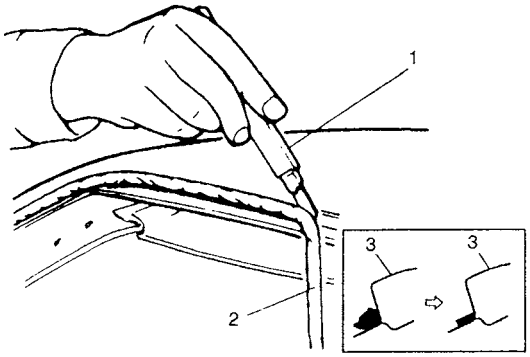


I3RH0A950006-

11) Using knife (1), smoothen adhesive (2) remaining on body side (3) so that it is 1 – 2 mm (0.039 – 0.078 in.) thick all around.

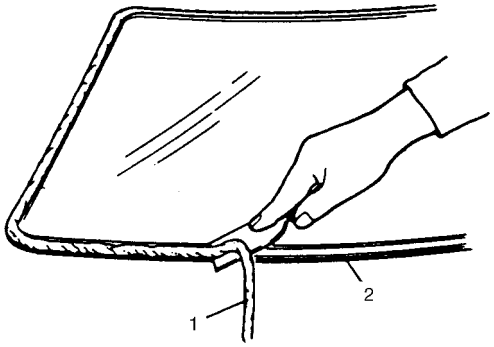
NOTE:

Before using knife (1), clean it with alcohol or the like to remove oil from it.



I2RH01950042-

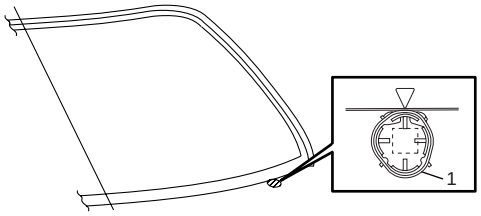
12) When reusing windshield, remove the adhesive (1) from it, using care not to damage primer coated surface (2).



I2RH01950043-

Installation

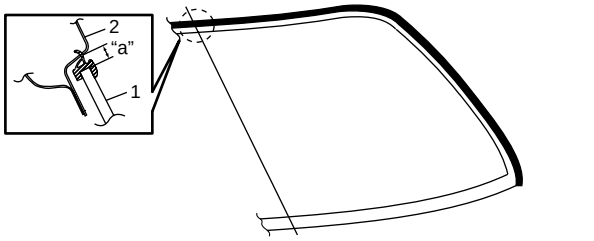
1) Using cleaning solvent, clean windshield edge where windshield glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Install new glass stoppers (1) (2 pieces) to lower side of windshield.



I4RH01950001-

3) To determine installing position of glass (1) to body (2), position glass against body so that clearance between upper end of glass (1) and body (2) is approximately 5 mm (0.197 in.) and clearances between each side end (right & left) of glass (1) and body (2) are even. Then mark mating marks on glass (1) and body (2) as shown. Upper clearance can be adjusted by moving glass stoppers position.

Windshield clearance
"a": approx. 5 mm (0.197 in.)

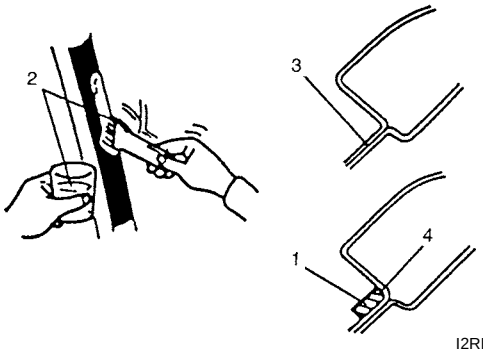


I2RH01950045-

4) Clean contact surfaces of old adhesive (4), paint or bare metal thoroughly.
If surfaces of paint or bare metal come out, apply primer (2) for body with caution not to apply primer (2) to surface of adhesive remaining on body.

NOTE:

- **Be sure to refer to primer maker's instruction for proper handling and drying time.**
- **Do not touch body and old adhesive surfaces where glass is to be adhered.**



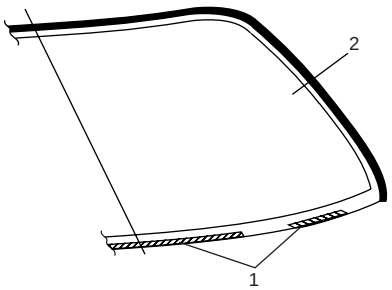
I2RH01950046-

1.	Do not apply primer
3.	Apply primer

5) Install new molding to glass.
6) Clean glass surface to be adhered to body with clean cloth. If cleaning solvent is used, let it dry for 10 minutes or more.

Cleaning Area for windshield (distance from the edge of glass or molding)
30 – 50 mm (1.18 – 1.97 in.)

7) Install new spacers (1) to windshield (2).



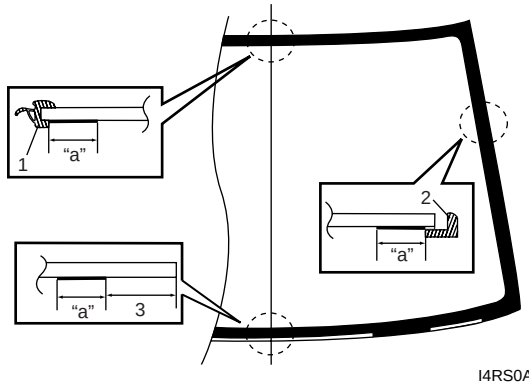
I4RS0A950002-

8) Using new brush, apply sufficient amount of primer onto glass along glass edge.

NOTE:

- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not apply primer on outside of ceramic coated surface.**
- **Do not touch primer coated surface.**

Width applied primer for windshield
"a": 15 mm (0.59 in.)



I4RS0A950003-

1.	Molding
2.	Windshield side garnish clip
3.	32.5 mm (1.28 in.)

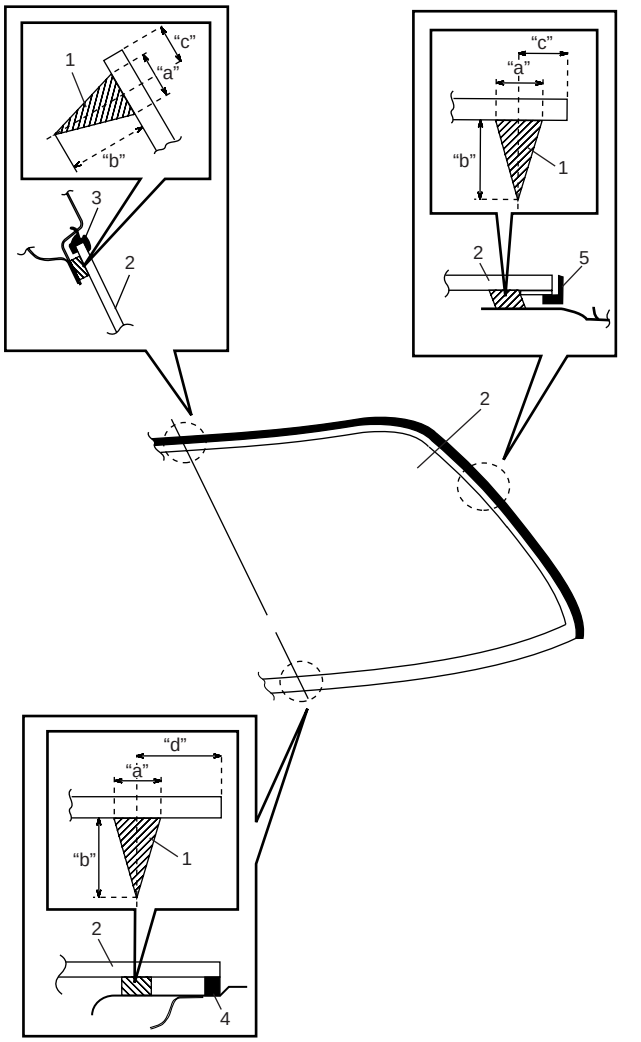
9) Apply primer for molding along molding surface all around.

10) Apply adhesive (1) referring to figure.

NOTE:

- **Press glass (2) against fittings surface of body panel quickly after adhesive (1) is applied.**
- **Use of rubber sucker grip is helpful to hold and carry glass after adhesive (1) is applied.**
- **Perform steps 8) to 9) within 10 min. to ensure sufficient adhesion.**
- **Be sure to refer to adhesive maker's instruction for proper handling and drying time.**
- **Start from bottom side of glass (2).**
- **Be careful not to damage primer.**

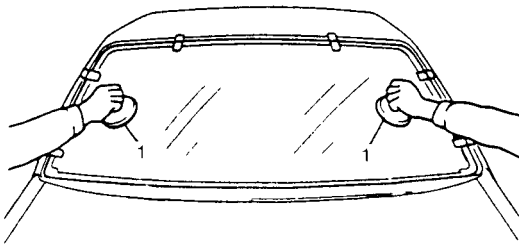
Adhesive amount specifications and position for windshield
Width "a": Approx. 7 mm (0.27 in.)
Height "b": Approx. 15 mm (0.59 in.)
Position "c": Approx. 11 mm (0.43 in.) for front, rear and upper sections
Position "d": Approx. 35 mm (1.38 in.) for bottom section



I4RS0A950004-

3.	Molding
4.	Windshield glass spacer
5.	Windshield side garnish clip

11) Holding rubber sucker grips (1), place glass onto body by aligning mating marks marked in step 3) and press it.



I2RH01950050-

12) Check for water leakage by pouring water over windshield through hose. If leakage is found, dry windshield and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

NOTE:

- **Do not use high pressure water.**
- **Do not blow compressed air directly at adhesive applied part when drying.**
- **Do not use infrared lamp or like for drying.**

I2RH01950051-

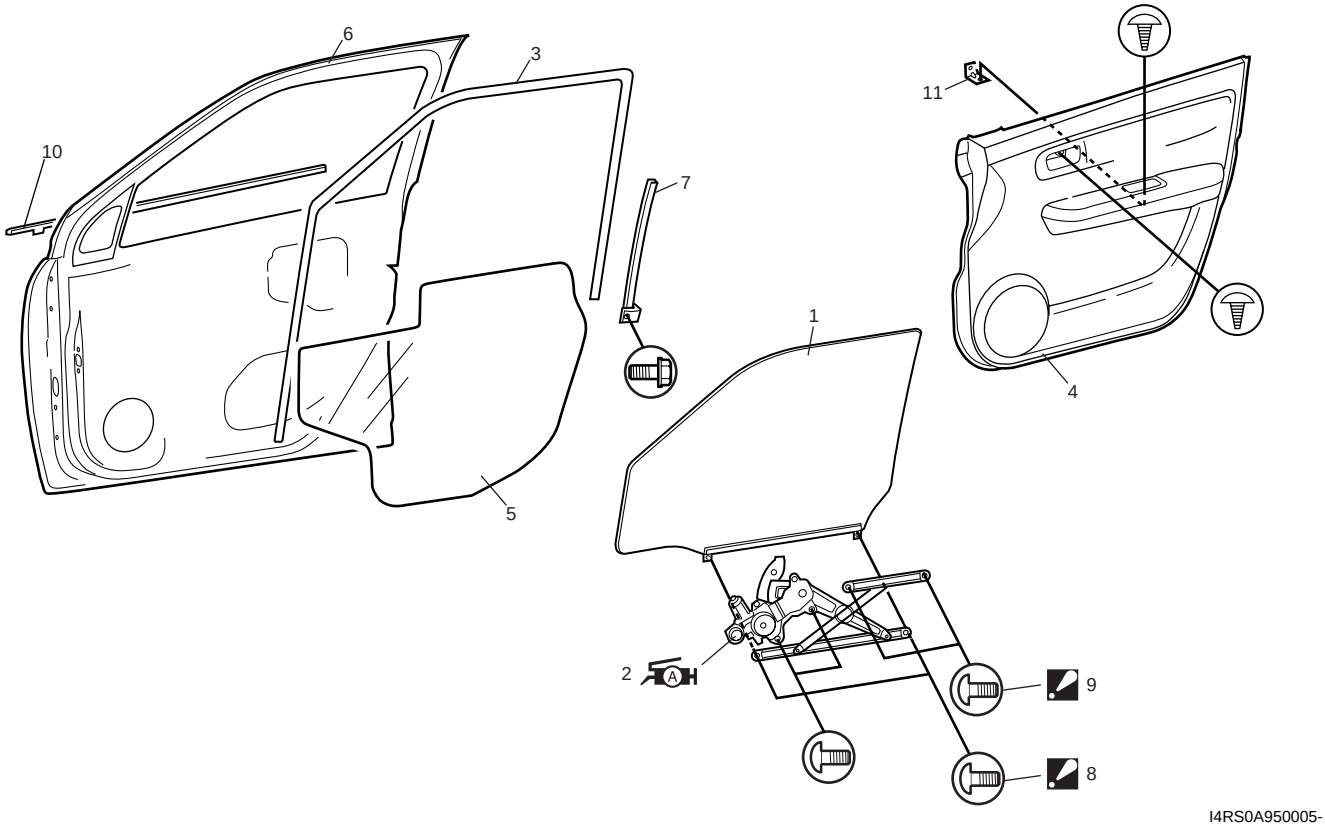
CAUTION:

Upon completion of installation, note the following.

- **Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.**
- **If molding is not securely in place, hold it down with a tape until adhesive is completely set.**
- **Each adhesive has its own setting time.**
- **Be sure to refer to its maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.**
- **Refrain from driving till adhesive is completely set so as to ensure proper and sufficient adhesion.**

Front Door Window Components

S4RS0A9506003



I4RS0A950005-

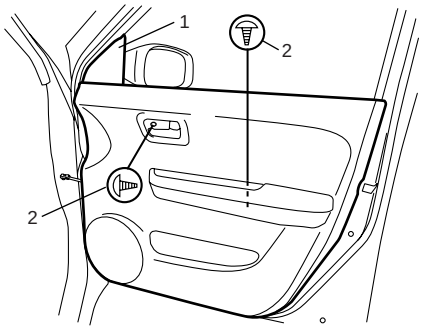
1. Door glass	5. Door sealing cover	9. Front door window regulator mounting screw : Tighten rear screw first, and then tighten front screw.
2. Window regulator assembly : Apply lithium grease 99000-25010 to sliding part.	6. Door panel	10. Front door outer weather-strip
3. Glass run	7. Front door sash	11. Door trim bracket
4. Door trim	8. Door glass mounting screw : Tighten rear screw first, and then tighten front screw.	

Front Door Glass Removal and Installation

S4RS0A9506004

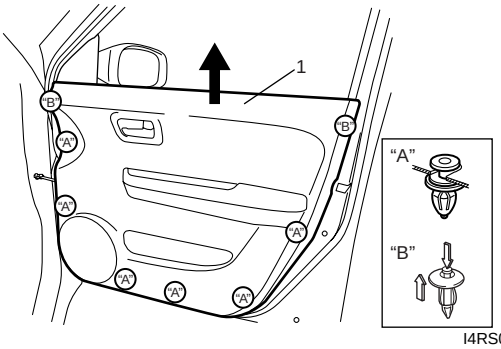
Removal

1) Remove door mirror trim (1).
2) Remove door trim mounting screws (2).



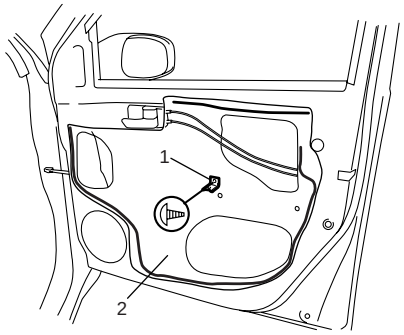
I4RS0A950006-

3) Remove door trim (1) as shown.
   And disconnect power window switch lead wire at coupler.



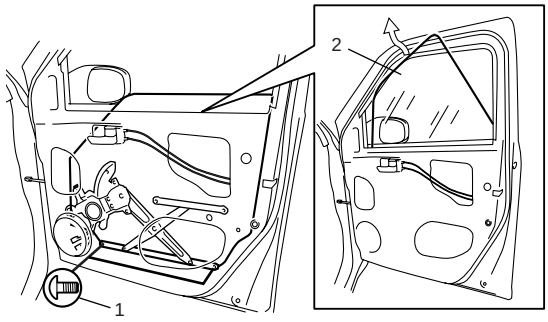
I4RS0A950007-

4) Remove door trim bracket (1).
5) Remove door sealing cover (2).



I4RS0A950008-

6) Remove door glass mounting screws (1).
7) Remove door glass (2) while tilting it as shown.

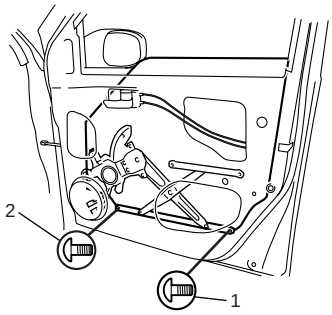


I4RS0A950009-

Installation

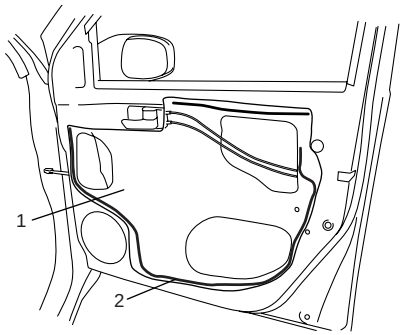
Reverse removal procedure noting the following instructions.

- If there is deformity for glass run, replace it with a new one.
- Tighten door glass rear mounting screw (1) first, and then tighten door glass front mounting screw (2).



I4RS0A950010-

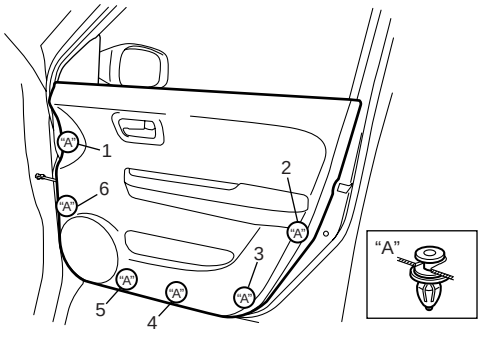
- Secure door sealing cover (1) with adhesive (2).



I4RS0A950011-

- Install front door trim.

Front door trim attaching order
(1) → (2) → (3) → (4) → (5) → (6)



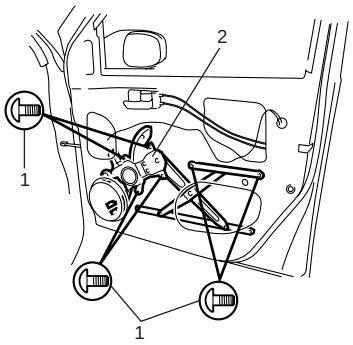
I4RS0A950012-

Front Door Window Regulator Removal and Installation

S4RS0A9506005

Removal

1) Remove door glass referring to “Front Door Glass Removal and Installation: ”.
2) Disconnect power window motor lead wire at coupler.
3) Remove regulator mounting screws (1), and then remove front door window regulator (2).



I4RS0A950013-

Installation

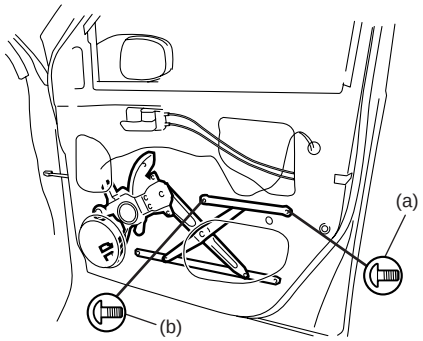
Reverse removal procedure noting the following instruction.

- Apply grease to sliding portions of window regulator.

  : Grease 99000–25010

- Tighten front door window regulator attaching screws.

  Front door window regulator screw tightening order
  (a) → (b)



I4RS0A950014-

Front Door Window Regulator Inspection

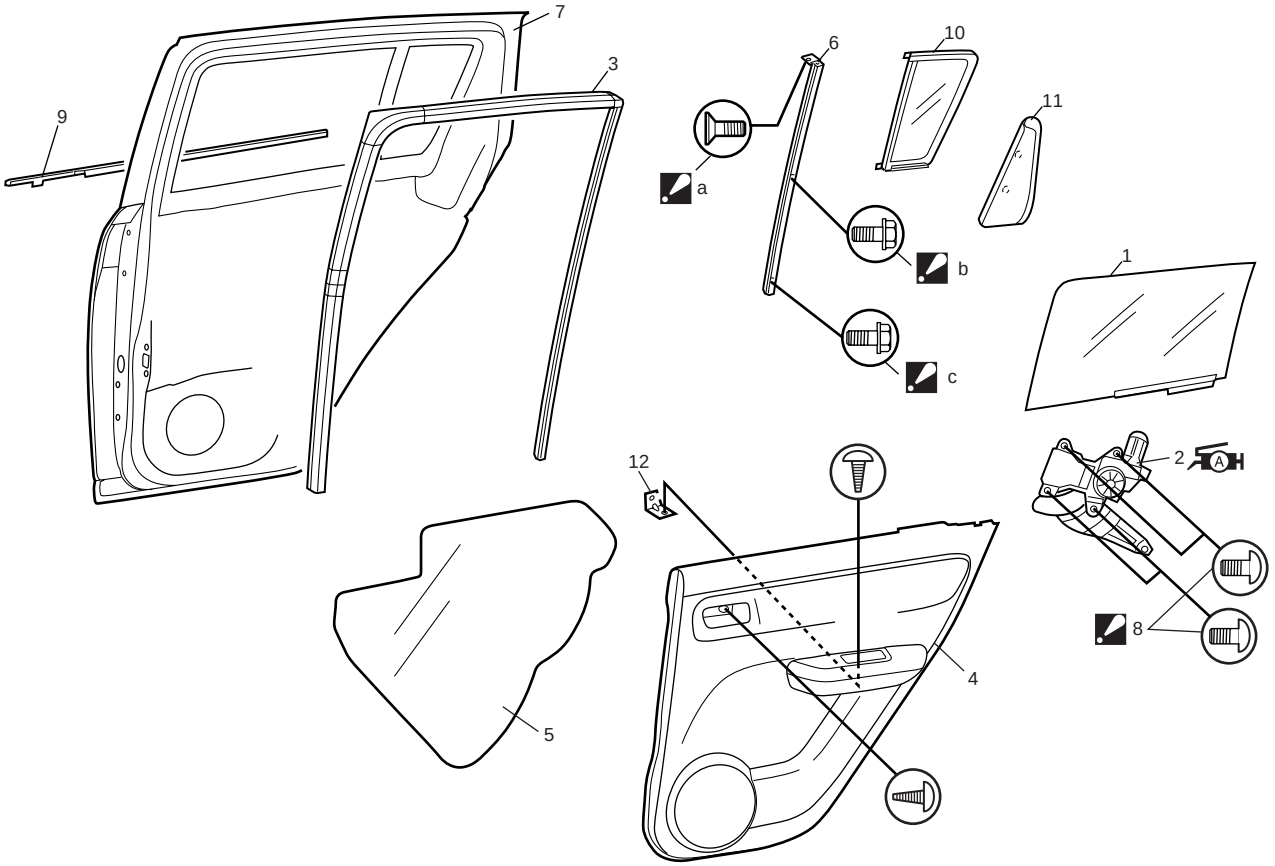
S4RS0A9506006

Check the following parts for wear, damage, smooth operation and lubrication:

- Check regulator sliding and rotating parts.
- Check rollers.

Rear Door Window Components

S4RS0A9506007



I4RS0A950015-

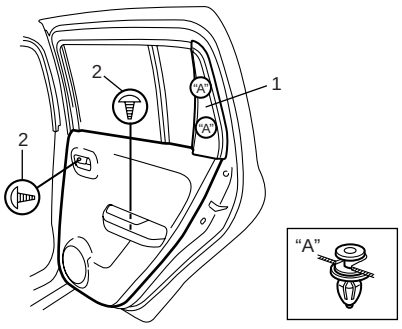
1. Door glass	6. Door sash	11. Rear door inner garnish
A H 2. Window regulator assembly : Apply lithium grease 99000-25010 to sliding part.	7. Door panel	12. Door trim bracket
3. Glass run	8. Rear door window regulator mounting screw : Tighten lower screw first, and then tighten upper screw.	a: Sash upper mounting screw : Tightening order: a → b → c
4. Door trim	9. Rear door outer weather-strip	b, c: Sash lower mounting bolt : Tightening order: a → b → c
5. Door sealing cover	10. Rear door partition glass.	

Rear Door Glass Removal and Installation

S4RS0A9506008

Removal

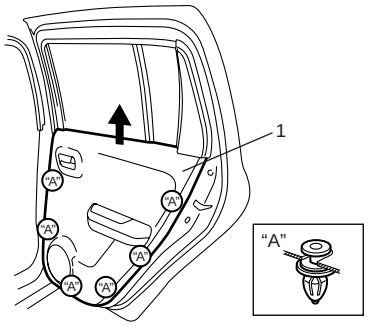
1) Remove rear door inner garnish (1).
2) Remove door trim mounting screws (2).



I4RS0A950016-

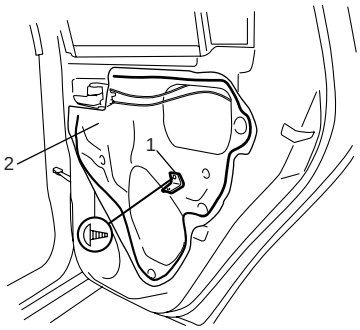
3) Remove door trim (1) as shown.

And disconnect power window switch lead wire at coupler.



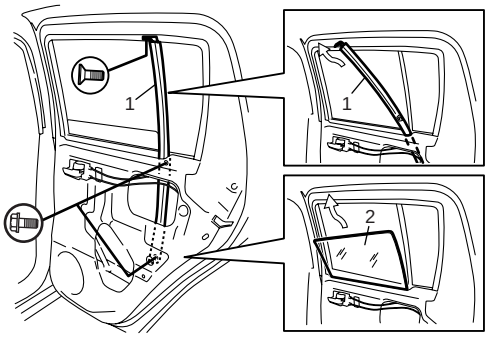
I4RS0A950017-

4) Remove door trim bracket (1).
5) Remove door sealing cover (2).



I4RS0A950018-

6) Detach rear part of glass run from door sash (1), and remove door sash (1).
7) Remove door glass (2) as shown.



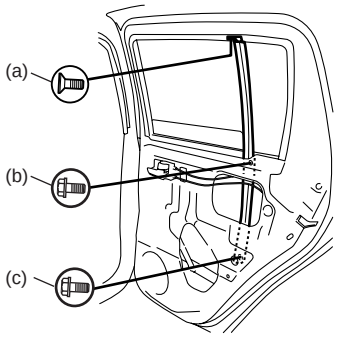
I4RS0A950019-

Installation

Reverse removal procedure noting the following instructions.

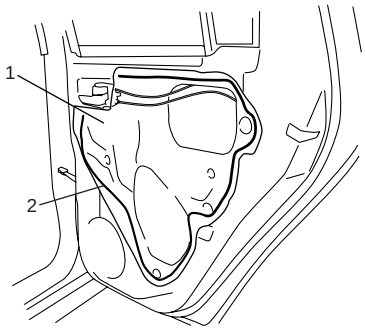
- If there is deformity for glass run, replace it with a new one.
- Tighten door sash mounting screw and bolts.

Door sash mounting screw and bolt tightening order
(a) → (b) → (c)



I4RS0A950020-

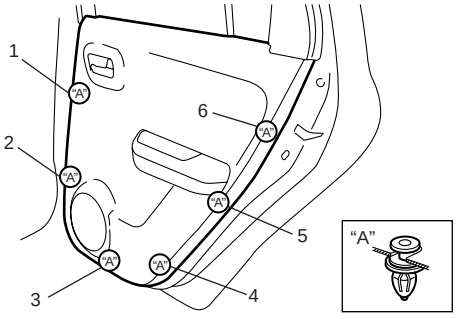
- Secure door sealing cover (1) with adhesive (2).



I4RS0A950021-

- Install rear door trim.

Rear door trim attaching order
(1) → (2) → (3) → (4) → (5) → (6)



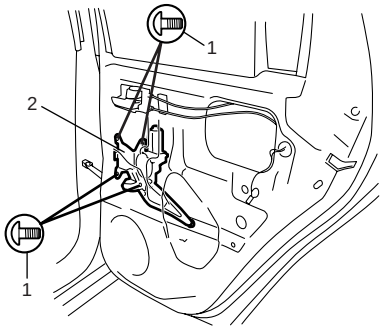
I4RS0A950022-

Rear Door Window Regulator Removal and Installation

S4RS0A9506009

Removal

1) Remove door glass referring to “Rear Door Glass Removal and Installation: ”.
2) Disconnect power window motor lead wire at coupler and loosen clamp.
3) Loosen regulator mounting screws (1), and then remove rear window regulator (2).



I4RS0A950023-

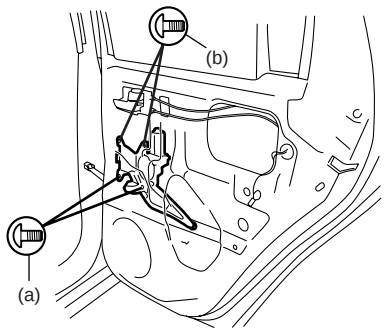
Installation
Reverse removal procedure noting the following.

- Apply grease to sliding and rotating portions of window regulator.

  : Grease 99000–25010

- Tighten rear door window regulator attaching screws.

  Rear door window regulator screw tightening order
  (a) → (b)



I4RS0A950024-

Rear Door Window Regulator Inspection

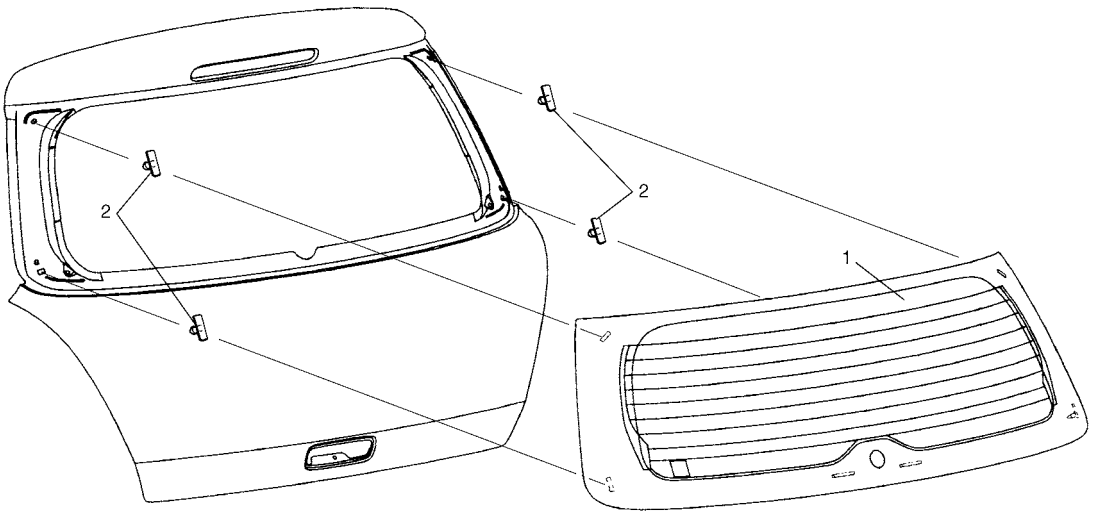
S4RS0A9506010

Check the following point:

- Check regulator sliding and rotating parts.
- Check rollers for wear and damage.

Rear End Door Window Components

S4RS0A9506012



I4RS0A950025-

1. Rear end door glass	2. Fastener

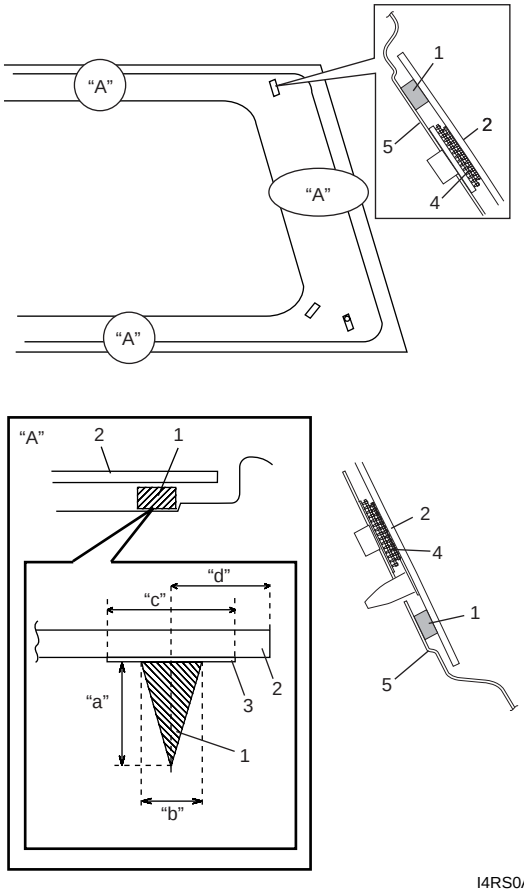
Rear End Door Glass Removal and Installation

S4RS0A9506013

Refer to “Windshield Removal and Installation: ” as removal and installation procedures are basically the same. However, note the following.

- Observe the following precautions when applying adhesive (1) along glass (2) edge.
- Adhesive (1) should be applied evenly especially in height.
- Be careful not to damage primer (3).
- With the position of fastener (4) properly aligned, install glass (2) on rear end door panel (5).
- Press glass against body quickly after adhesive (1) is applied.

Adhesive amount specifications and position for rear end door glass
Height “a”: 13 mm (0.51 in.)
Width “b”: 6 mm (0.24 in.)
Width “c”: 14 mm (0.55 in.)
Position “d”: 12 mm (0.47 in.) for glass upper section
Position “d”: 16 mm (0.63 in.) for glass bottom section
Position “d”: 32.5 mm (1.28 in.) for glass side sections



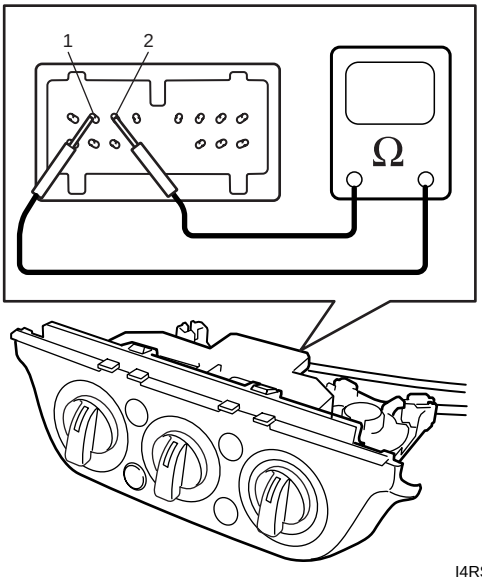
I4RS0A950026-

Rear End Door Window Defogger Switch Inspection

S4RS0A9506016

1) Check rear end door window defogger switch for operation as follows.
   a) Rear end door window defogger switch is built in HVAC control unit.
      Remove HVAC control unit referring to "HVAC Control Unit Removal and Installation: in Section 7A".
   b) Check that there is continuity between terminal (1) and terminal (2) of HVAC control unit when rear end door window defogger switch is at ON position. (Rear end door window defogger switch is kept in push.)
   c) Check that there is no continuity between terminal (1) and terminal (2) of HVAC control unit when rear end door window defogger switch is at OFF position.

If check result does not meet the above conditions, replace HVAC control unit.

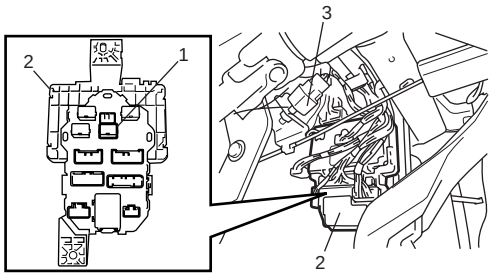


I4RS0A950037-

Rear End Door Window Defogger Relay Inspection

S4RS0A9506027

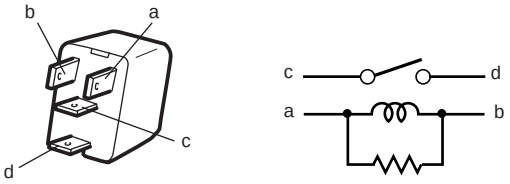
1) Disconnect negative (–) cable from battery.
2) Remove junction block assembly for inspection of rear end door window defogger relay.
   For removal, refer to "BCM (Included in Junction Block Assembly) Removal and Installation: in Section 10B".
3) Remove rear end door window defogger relay (1) from junction block assembly (2).



I4RS0A950027-

3. Brake (stop) lamp switch

4) Check that there is no continuity between terminal "c" and "d". If there is continuity, replace relay.
5) Check that there is continuity between terminals "c" and "d" when a 12 V battery is connected to terminals "a" and "b".
   If malfunction is found, replace it with a new one.



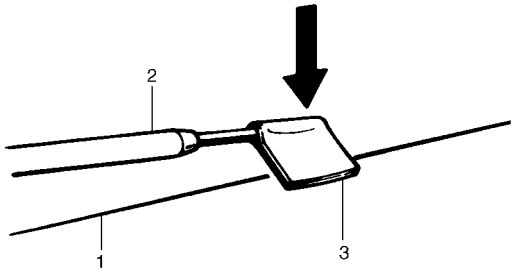
I4RS0A950028-

Rear End Door Window Defogger Wire Inspection

S4RS0A9506017

NOTE:

- **When cleaning rear end door window glass, use a dry cloth to wipe it along heat wire (1) direction.**
- **When cleaning glass, do not use detergent or abrasive-containing glass cleaner.**
- **When measuring wire voltage, use a tester with positive probe (2) wrapped with a tin foil (3) which should be held down on wire by finger pressure.**



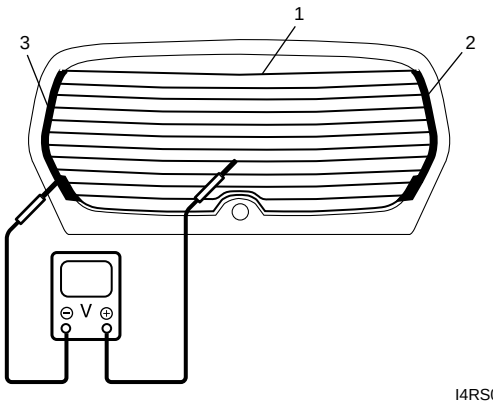
I2RH01950002-

Wire Damage Inspection

1) Turn ignition switch to ON position.
2) Turn on defogger switch.
3) Measure voltage at the center of each defogger wire (1), and check defogger wire condition according to the following table.
   If defogger wire open is found, go to next step.

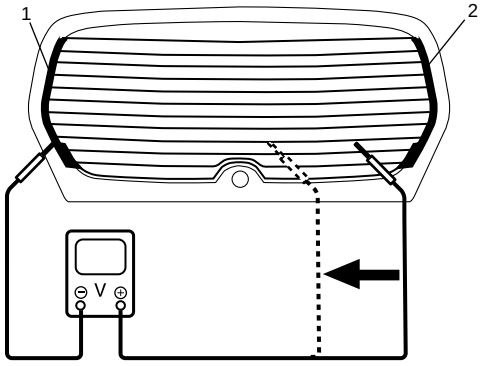
Defogger wire voltage

Voltage	Circuit
0 – 1 V	Defogger wire open between its center and defogger wire power source terminal end (2)
4 – 6 V	Normal condition
10 – 12 V	Defogger wire open between its center and defogger wire ground terminal end (3)



I4RS0A950029-

4) Touch voltmeter negative (–) lead to defogger wire ground terminal end (1).
5) Touch voltmeter positive (+) lead with a foil strip to defogger wire power source terminal end (2), then move it along wire to defogger wire ground terminal end (1).
   The place where voltmeter fluctuates from 10 – 12 V to 0 – 1 V is where there is open.
   If found defective, repair defogger wire referring to "Rear End Door Window Defogger Wire Repair: ".

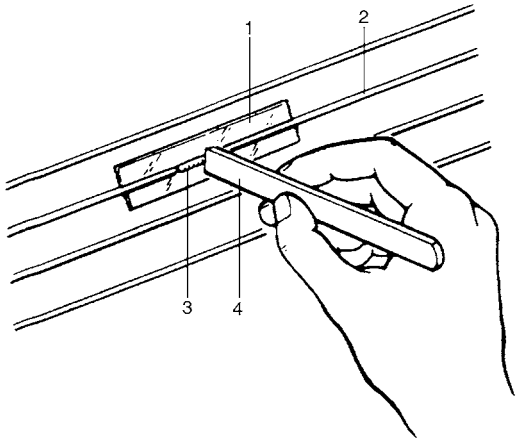


I4RS0A950030-

Rear End Door Window Defogger Wire Repair

S4RS0A9506018

1) Use white gasoline for cleaning.
2) Apply masking tape (1) at both upper and lower sides of heat wire (2) to be repaired.
3) Apply commercially-available repair agent (3) with a fine-tip brush (4).
4) 2 to 3 minutes later, remove masking tapes (1).



I2RH01950005-

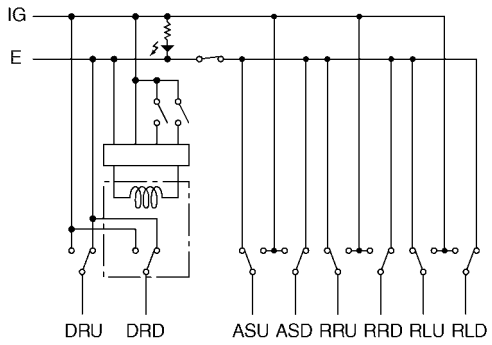
5) Leave repaired heat wire as it is for at least 24 hours before operating the defogger again.

Power Window Main Switch Inspection

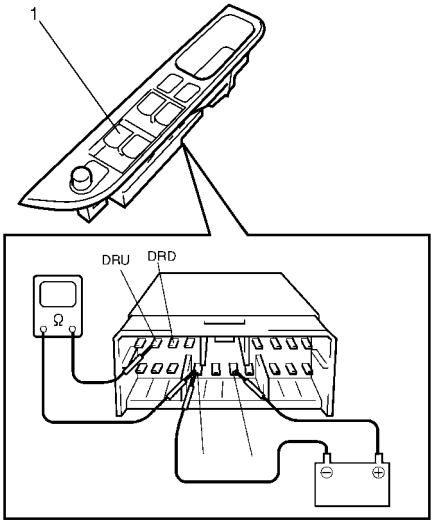
S4RS0A9506019

Switch for driver side window

1) Remove driver side door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation: ”.
2) Remove power window main switch from door trim.
3) Connect 12 V battery positive (+) terminal to terminal “IG” of power window main switch and its negative (–) terminal to terminal “E” of power window main switch.
4) Check for continuity between terminals as shown below.
   If check result is not as specified, replace power window main switch.



	IG	DRU	DRD	E
UP	○	○		
			○	○
OFF		○	○	○
DOWN	○		○	
		○		○



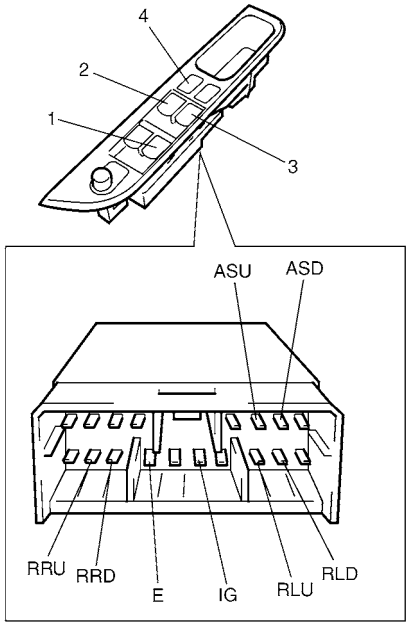
I4RS0A950031-

Switch for other window than driver side

1) Remove driver side door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation: ”.
2) Remove power window main switch from door trim.
3) Check for continuity between terminals as shown below.

If check result is not as specified, replace power window main switch.

		IG	ASU	ASD	E
Passenger side window switch (1)		IG	ASU	ASD	E
Rear right side window switch (2)		IG	RRU	RRD	E
Rear left side window switch (3)		IG	RLU	RLD	E
UNLOCK	UP	○	○		
				○	○
	OFF		○	○	○
	DOWN	○		○	
			○		○
LOCK	UP	○	○		
	OFF		○	○	
	DOWN	○		○	



I4RS0A950032-

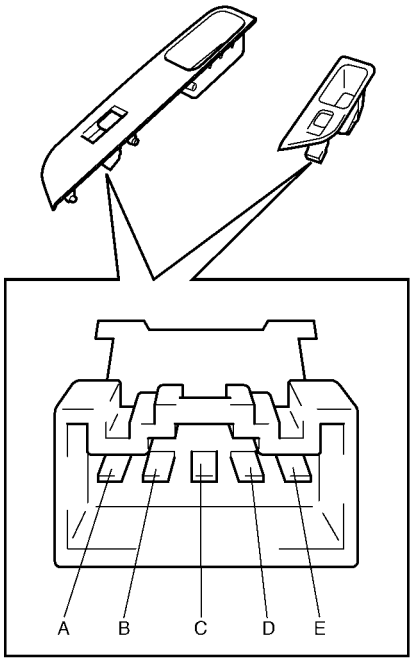
Power Window Sub Switch Inspection

S4RS0A9506020

1) Remove door trim from door panel.
   For front door trim, refer to Step 1) to 3) of “Front Door Glass Removal and Installation: ”
   For rear door trim, refer to Step 1) to 3) of “Rear Door Glass Removal and Installation: ”
2) Remove power window sub switch from door trim.
3) Check for continuity between terminals at each switch condition.

If check result is not as specified, replace switch.

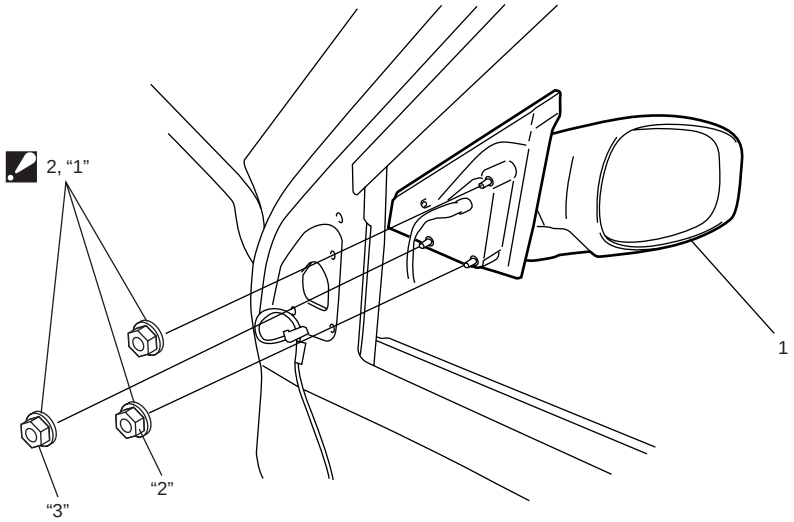
Switch Position \ Terminal	A	B	C	D	E
UP	○	○		○	○
OFF	○	○			
DOWN			○	○	○



I4RS0A950033-

Door Mirror Components

S4RS0A9506021



I4RS0A950034-

	1. Door mirror
✎	2. Door mirror mounting nut :Tighten nuts in such order as indicated in the figure.

Door Mirror Removal and Installation

S4RS0A9506022

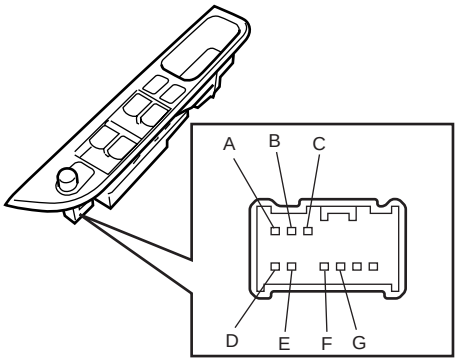
When removing or installing door mirror, refer to the figure in “Door Mirror Components: ”.

Power Door Mirror Switch Inspection

S4RS0A9506023

1) Remove driver side door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation: ”.
2) Remove power window main switch from door trim.
3) Check for continuity between terminals at each switch position.
   If check result is not as specified, replace door mirror switch.

L / R	A / B	C	D	E / F	G
Up		○	○	○	○
Down		○	○	○	○
Left	○	○	○	○	
Right	○	○	○	○	



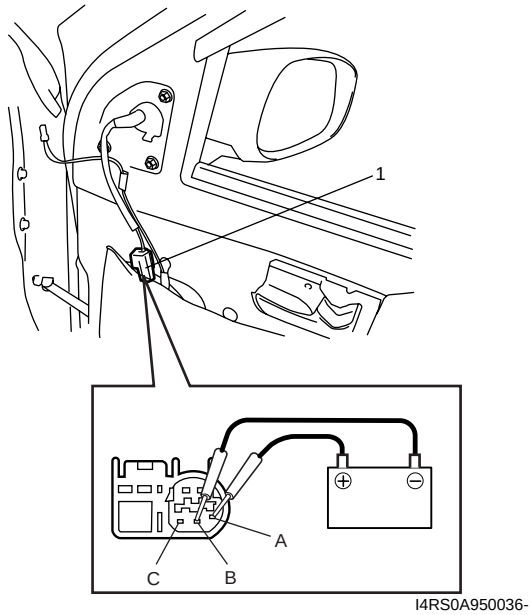
I4RS0A950035-

Power Door Mirror Actuator Inspection

S4RS0A9506024

1) Remove door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation: ”.
2) Disconnect door mirror coupler (1).
3) Check that door mirror operates properly when battery voltage is applied to connector terminals.
4) Connect battery positive (+) and negative (–) terminal to the door mirror terminals as shown.
   If it does not follow the table’s operation, replace door mirror assembly.

Terminal / Operation	A	B	C
Up	⊕	⊖	
Down	⊖	⊕	
Left		⊖	⊕
Right		⊕	⊖



I4RS0A950036-

Special Tools and Equipment

Recommended Service Material

S4RS0A9508001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞

NOTE:

Required service material is also described in the following.
“Front Door Window Components: ”
“Rear Door Window Components: ”

Security and Locks

General Description

Key Coding Construction

S4RS0A9601001

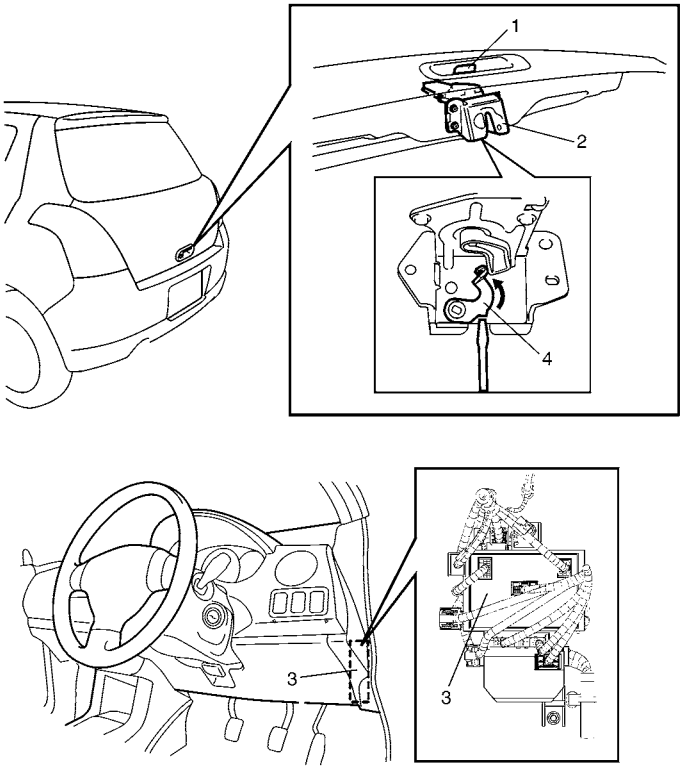
Key Usage and Identification

Key is used for ignition and door lock cylinder. Keys are cut on both edges to make them reversible.
Key identification is obtained from five character key code stamped on key code tag. Using this key code, key code cutting combination can be determined from a code list (available to owners of key cutting equipment from suppliers).
If key codes are not available from records or tags, key code can be obtained from the right hand door lock cylinder (if lock has not been replaced). Lock cylinders supplied by the factory as service parts are unmarked.
If original key is available, key code cutting combination can be determined by laying key.

Rear End Door Opener System Description

S4RS0A9601002

Rear end door opener system consists of rear end door opener switch (1), rear end door opener relay (in BCM), rear end door lock assembly (2) and BCM (3) (in junction block assembly).
Rear end door opener system is activated by pushing rear end door opener switch after all doors are unlocked by manual door switch, key cylinder switch or keyless entry transmitter.
When rear end door opener switch pushed rear end door opener relay is ON. Then, BCM releases latch of rear end door lock assembly from striker and rear end door can be opened.
In addition, in case that rear end door cannot be opened by rear end door opener switch, rear end door can be opened by emergency lever (4) in rear end door lock assembly.

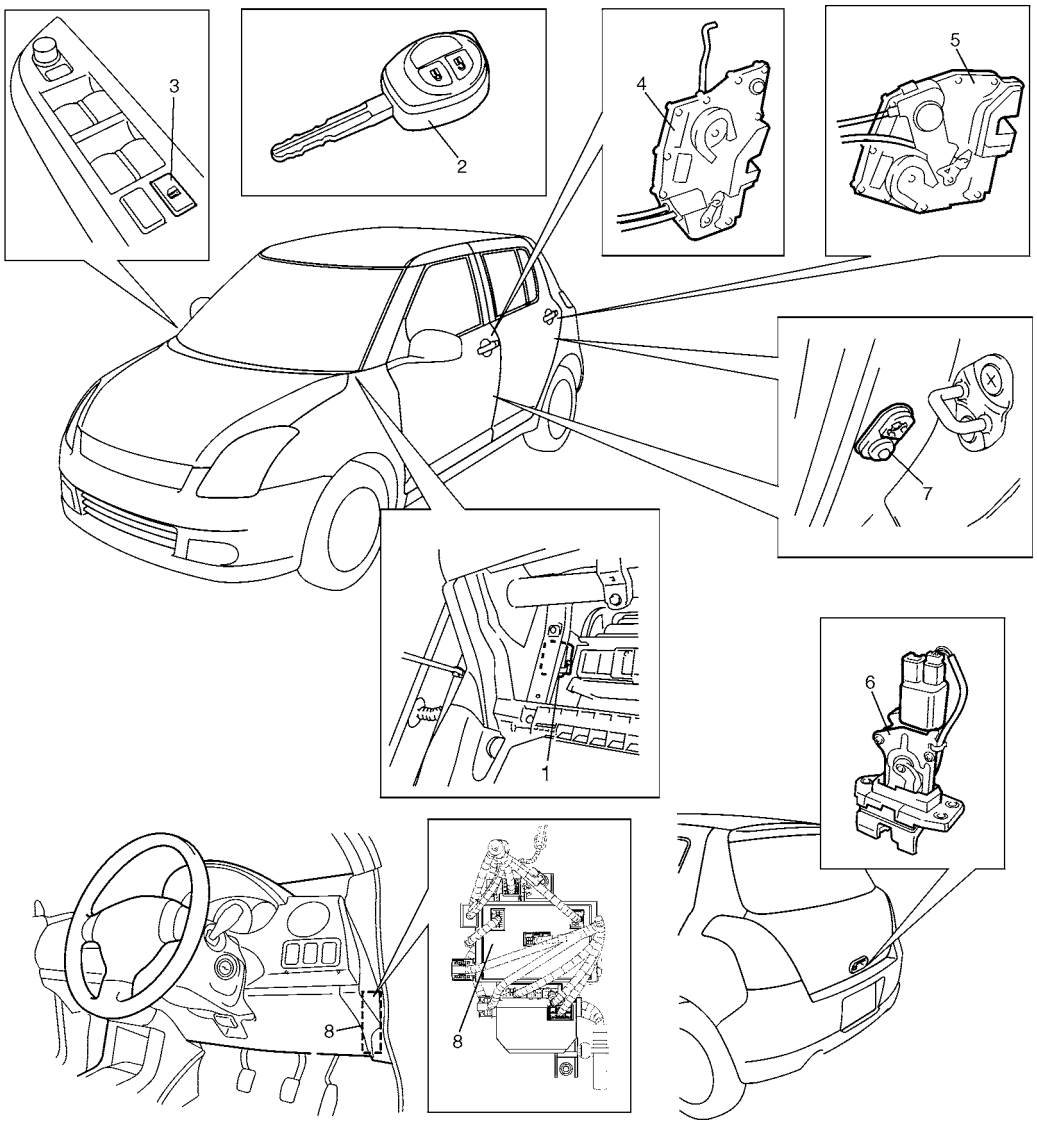


I4RS0A960025-

Component Location

Power Door Lock and Keyless Entry System Component Location

S4RS0A9603001



I4RS0A960001-

1. Keyless entry receiver	3. Power door lock switch	5. Rear door actuator	7. Door switch
2. Transmitter	4. Front door actuator	6. Rear end door actuator	8. BCM (included in junction block assembly)

Diagnostic Information and Procedures

Power Door Lock System Symptom Diagnosis

S4RS0A9604001

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
All door can not be locked / unlocked by all of switches	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
All door can not be locked / unlocked by only power door lock switch	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Power door lock switch faulty	*Check power door lock switch referring to "Power Door Lock Switch Inspection: ".*
	Wiring harness connected to power door lock switch faulty	*Repair.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
All door can not be locked / unlocked by only key cylinder switch	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Key cylinder switch faulty	*Check key cylinder switch referring to "Door Key Cylinder Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Only one door can not be locked / unlocked	Power door lock actuator faulty	*Check actuator referring to "Power Door Lock Actuator Inspection: ".*
	Wiring harness connected to applicable door lock actuator faulty	*Repair.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Power Door Lock System Operation Inspection

S4RS0A9604002

1) Check the following operation:

a) Turn the driver side key cylinder to LOCK position with door key once, check all doors lock.

b) Turn the driver side door key cylinder to UNLOCK position with door key twice, check all doors unlock.

If malfunction is found, go to "Power Door Lock System Symptom Diagnosis: ".

Keyless Entry System Symptom Diagnosis

S4RS0A9604004

NOTE:

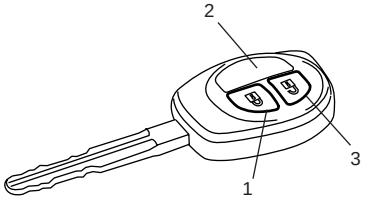
- **Confirm that power door lock system is in good condition before referring to the following possible causes.**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
All door can not be locked / unlocked by only keyless entry transmitter	Transmitter battery dead	*Replace battery referring to "Replacement of Transmitter Battery: ".*
	Door switch faulty	*Check door switch referring to "Door Switch (Front / Rear Door) Inspection: in Section 9C" and/or "Rear End Door Switch Inspection: in Section 9C".*
	Key remainder switch in ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection: in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*
	Transmitter faulty	*Replace transmitter.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Turn signal lights can not be flashed when doors are locked / unlocked by keyless entry transmitter	Turn signal and hazard warning relay faulty	*Check turn signal and hazard warning relay referring to "Turn Signal and Hazard Warning Relay Inspection: in Section 9B".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Interior light does not light when doors are unlocked by keyless entry transmitter	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Transmitter code can not be programmed to BCM	Wiring or grounding faulty	*Repair circuit.*
	Door switch faulty	*Check door switch referring to "Door Switch (Front / Rear Door) Inspection: in Section 9C" and/or "Rear End Door Switch Inspection: in Section 9C".*
	Keyless entry receiver faulty	*Check keyless entry receiver referring to "Keyless Entry Receiver and Its Circuit Inspection: ".*
	Key reminder switch in ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection: in Section 9C".*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Keyless Entry System Operation Inspection

S4RS0A9604005

1) Confirm that power door lock system operates normally, refer to "Power Door Lock System Operation Inspection: ".
2) All doors are closed and unlocked.
3) Check the following operation:
   a) Push "lock" button (1) on transmitter (2) once, and check all doors lock and hazard waning lights flash once.
   b) Push "unlock" button (3) on transmitter (2) twice, and check all doors unlock and hazard waning lights flash twice and interior light turns on several seconds with the interior light switch in the middle position.



I3RH0A960005-

If malfunction is found, go to "Keyless Entry System Symptom Diagnosis: ".

Rear End Door Opener System Symptom Diagnosis

S4RS0A9604007

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Rear end door can not be opened	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Rear end door opener switch faulty	*Check rear end door opener switch referring to "Rear End Door Opener Switch Inspection: ".*
	Rear end door actuator faulty	*Check rear end door actuator referring to "Power Door Lock Actuator Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Rear End Door Opener System Operation Inspection

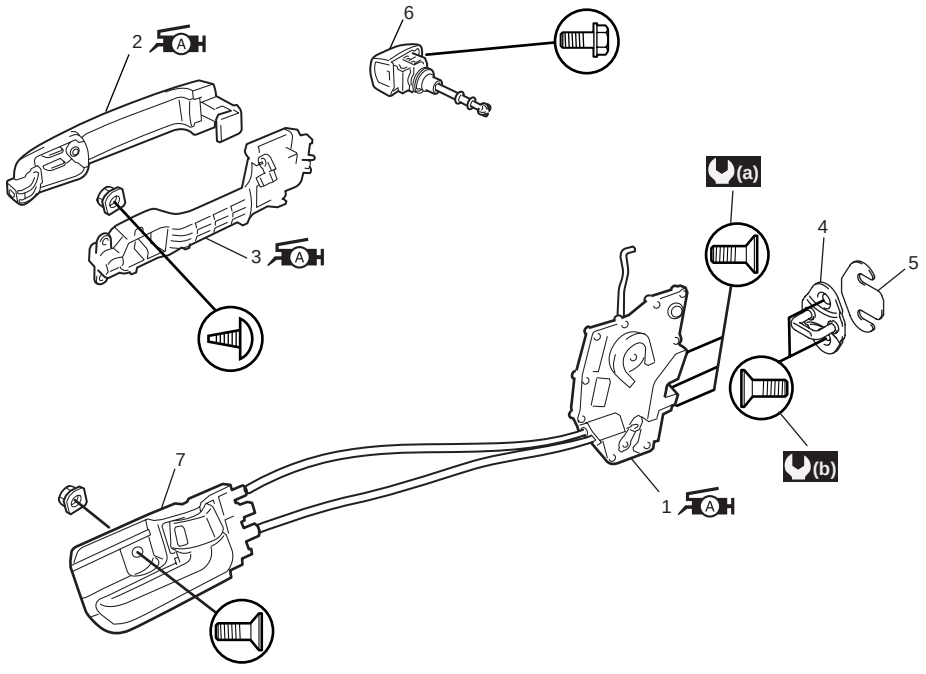
S4RS0A9604008

1) Unlock all doors by using manual lock switch, keyless entry transmitter, or key cylinder switch.
2) Make sure that latch of rear end door is released from striker when rear end door opener switch is pushed. If malfunction is found, go to "Rear End Door Opener System Symptom Diagnosis: ".

Repair Instructions

Front Door Lock Assembly Components

S4RS0A9606001



I4RS0A960002-

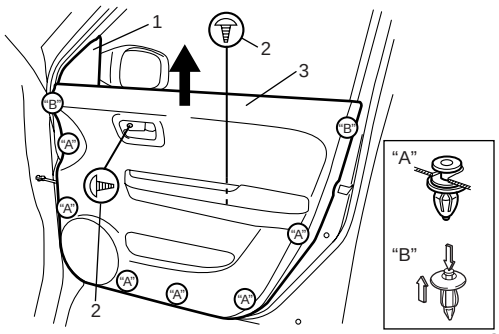
(A) 1. Front door latch assembly : Apply lithium grease 99000-25010 to sliding and rotating parts and spring if any.	4. Latch striker	7. Inside handle bezel
(A) 2. Outside handle : Apply lithium grease 99000-25010 to sliding part.	5. Shim	(a) : 5.0 N·m (0.5 kg-m, 4.0 lb-ft)
(A) 3. Outside handle frame : Apply lithium grease 99000-25010 to sliding part and spring.	6. Key cylinder	(b) : 10 N·m (1.0 kg-m, 7.5 lb-ft)

Front Door Lock Assembly Removal and Installation

S4RS0A9606018

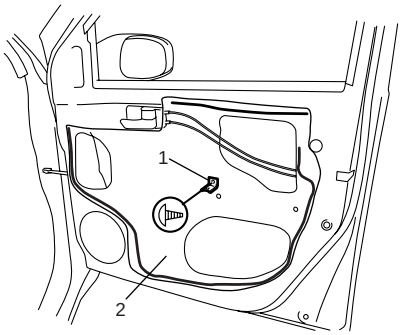
Removal

1) Remove door mirror trim (1).
2) Remove door trim (3) after removing screws (2) and clips “A” and “B”.



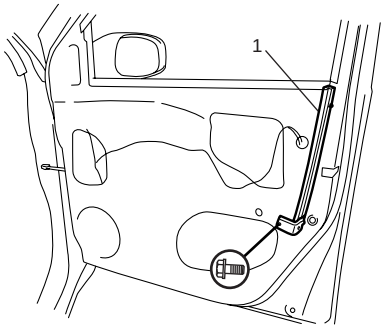
I4RS0A960003-

3) Disconnect power window switch and mirror switch lead wire at coupler.
4) Remove door trim bracket (1).
5) Remove door sealing cover (2).



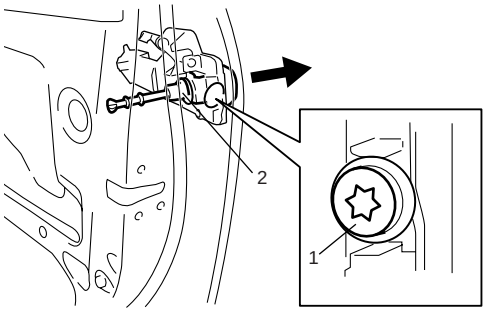
I4RS0A960004-

6) Raise window all the way up.
7) Remove door sash (1).



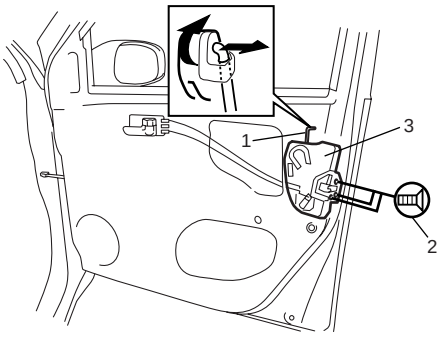
I4RS0A960007-

8) Remove key cylinder mounting bolt (1), and then remove key cylinder (2).



I4RS0A960005-

9) Disconnect door opening control rod (1) from outside handle.
10) Disconnect door lock motor lead wire at coupler.
11) Remove door latch screws (2) and remove door lock assembly (3).



I4RS0A960006-

Installation

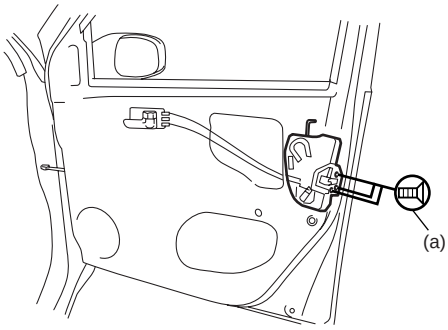
Reverse removal procedure to install front door lock assembly noting the following instructions.

- Apply grease to sliding parts of door latch assembly.

  : Grease 99000–25010

- Tighten door latch screws to specified torque.

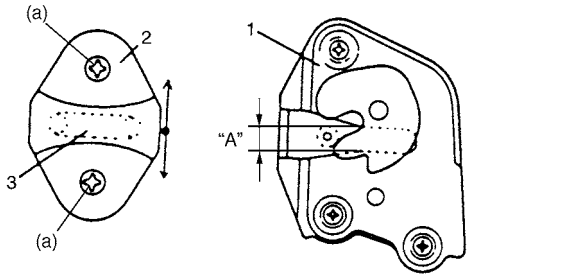
Tightening torque
Door latch screw (a): 5.0 N·m (0.5 kg-m, 4.0 lb-ft)



I4RS0A960008-

- Move door latch striker (2) up or down so its center aligns with the center of groove “A” on the door lock assembly (1) as shown.
  Striker should be moved vertically and placed level.
  Do not adjust door lock.

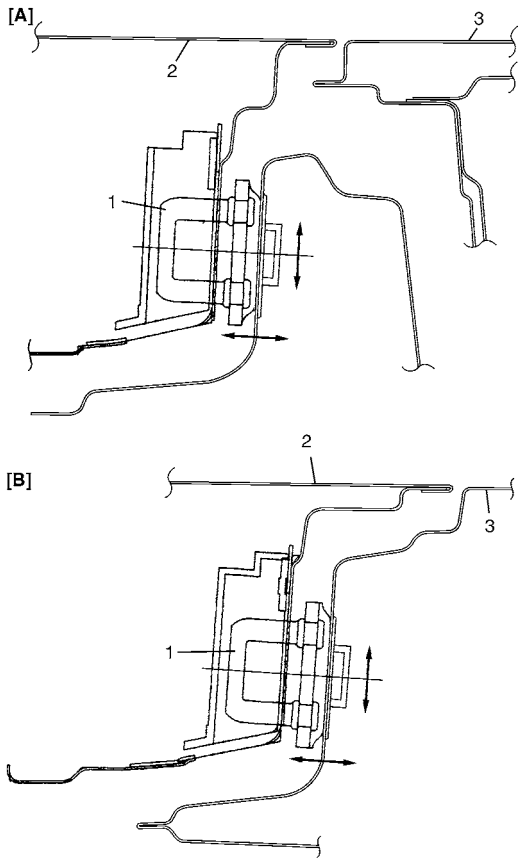
Tightening torque
Door latch striker screw (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A960029-

3. Shaft

- Move door latch striker (1) sideways to adjust door outer panel surface (2) flush with rear door outer panel or body outer panel surface (3) as shown.
  In order to correctly obtain door lock operation increase or decrease number of shims inserted between body and striker (1) to adjust it.



I3RM0A960013-

[A]: Front door
[B]: Rear door

Front Door Lock Assembly Inspection

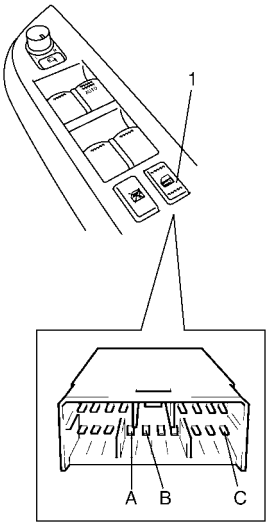
S4RS0A9606019

- Check that door open and closes smoothly and properly.
- Check that door stops in the secondary latched position properly (preventing door from opening freely) and that door closed completely in the fully latched position.
- Adjust door latch striker position, if necessary.

Power Door Lock Switch Inspection

S4RS0A9606003

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Switch \ Terminal	A	B	C
LOCK	○		○
OFF			
UNLOCK	○	○	

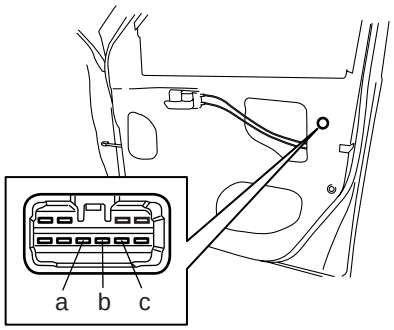
I4RS0A960009-

1. Power door lock switch

Door Key Cylinder Switch Inspection

S4RS0A9606004

1) Remove front door trim referring to Step 1) to 3) of “Front Door Glass Removal and Installation: in Section 9E”
2) Check for continuity between terminals at each switch position. If check result is not as specified, replace door lock assembly.



Terminal / Key Position	a	b	c
LOCK	○		○
OFF			
UNLOCK	○	○	

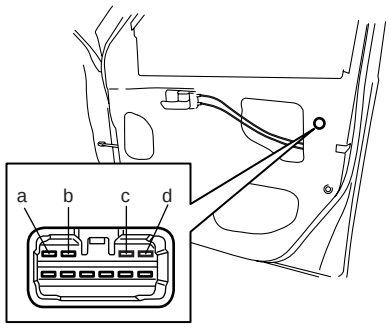
I4RS0A960010-

Power Door Lock Actuator Inspection

S4RS0A9606005

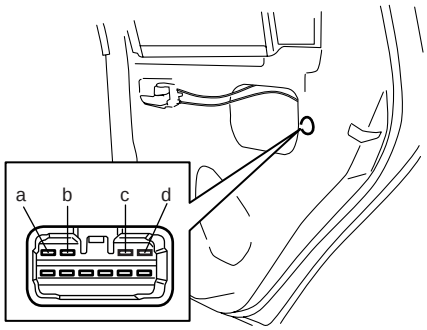
1) Remove door trim from door panel.
   For front door, refer to Step 1) to 3) of “Front Door Glass Removal and Installation: in Section 9E”.
   For rear door, refer to Step 1) to 3) of “Rear Door Glass Removal and Installation: in Section 9E”.
   For rear end door, refer to Step 1) of “Rear End Door Assembly Removal and Installation: in Section 9J”.
2) Disconnect power door lock actuator coupler.
3) Connect battery positive (+) and negative (–) terminals to the door lock actuator terminals (a, b, c, d) as shown in figure.
   If it does not operate as specified in the following table, replace door lock assembly.

[A]



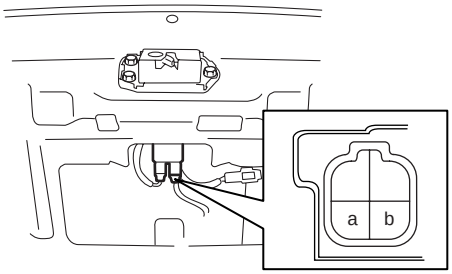
			d	b
Right side switch terminals			d	b
Left side switch terminals			a	c
Unlock	→	Lock	⊖	⊕
Lock	→	Unlock	⊕	⊖

[B]



			a	c
Right side switch terminals			a	c
Left side switch terminals			d	b
Unlock	→	Lock	⊖	⊕
Lock	→	Unlock	⊕	⊖

[C]



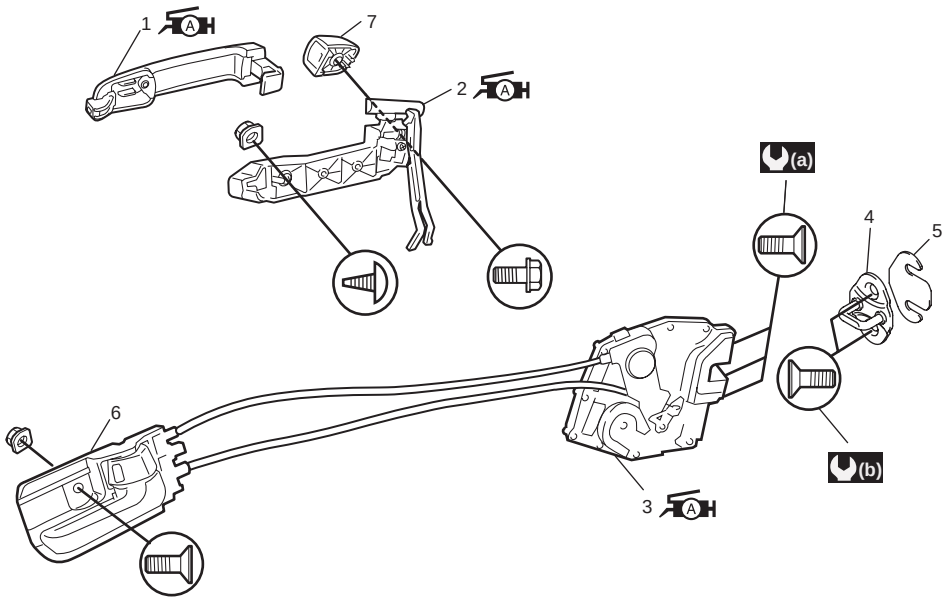
			a	b
Lock	→	Unlock	⊕	⊖

I4RS0A960011-

[A]: Front door
[B]: Rear door
[C]: Rear end door

Rear Door Lock Assembly Components

S4RS0A9606007



I4RS0A960012-

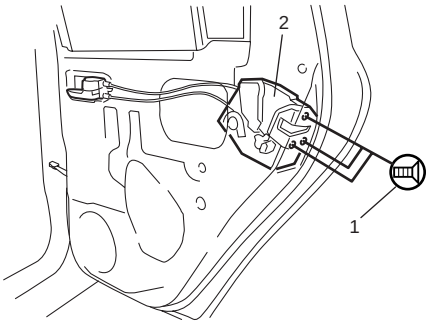
1. Outside handle : Apply lithium grease 99000-25010 to sliding part.	4. Latch striker	7. Out side handle cap
2. Outside handle frame : Apply lithium grease 99000-25010 to sliding part and spring.	5. Shim	(a) : 5.0 N·m (0.5 kg-m, 4.0 lb-ft)
3. Rear door latch assembly : Apply lithium grease 99000-25010 to sliding part.	6. Inside handle bezel	(b) : 10 N·m (1.0 kg-m, 7.5 lb-ft)

Rear Door Lock Assembly Removal and Installation

S4RS0A9606008

Removal

1) Remove rear door glass referring to “Rear Door Glass Removal and Installation: in Section 9E”.
2) Disconnect door lock motor lead wire.
3) Remove door latch mounting screws (1) and remove door latch assembly (2).



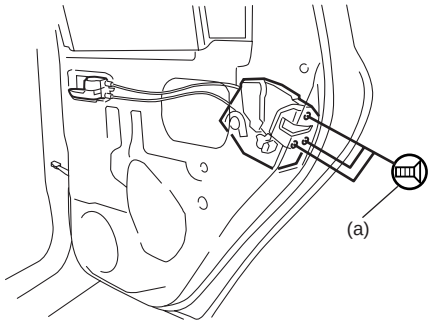
I4RS0A960013-

Installation

Reverse removal procedure to install rear door lock assembly referring to the following instruction and “Front Door Lock Assembly Removal and Installation: ”.

- Tighten door latch screw to specified torque.

Tightening torque
Door latch screw (a): 5.0 N·m (0.5 kg-m, 4.0 lb-ft)



I4RS0A960014-

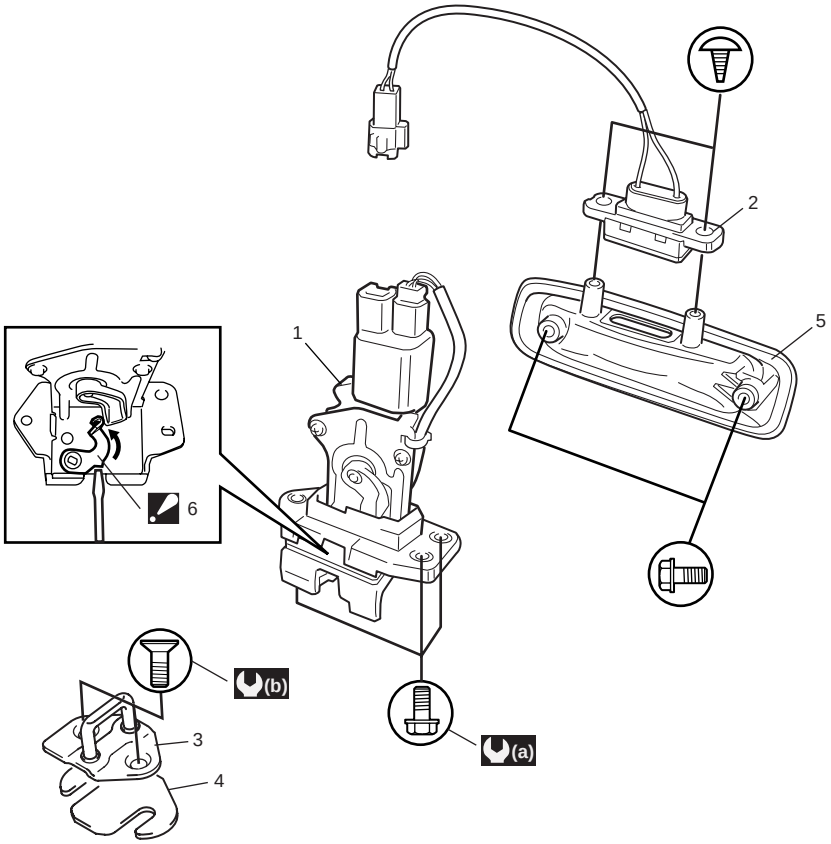
Rear Door Lock Assembly Inspection

S4RS0A9606009

- Check that door opens and closes smoothly and properly.
- Check that door stops in the secondary latched position properly (preventing door from opening freely) and that door closes completely in the fully latched position.
- Adjust door latch striker position, if necessary.

Rear End Door Lock Assembly Components

S4RS0A9606010



I4RS0A960015-

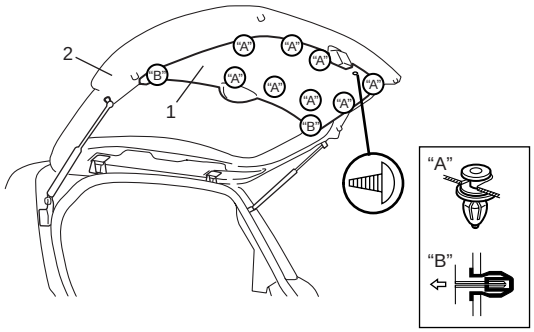
1. Rear end door latch assembly (including in rear end door switch)	3. Latch striker	5. Door handle	(a) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
2. Rear end door opener switch	4. Shim	6. Emergency lever : Rear end door is unlocked by pushing emergency lever with flat head driver if rear end door lock can not be released by door opener switch.	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

Rear End Door Lock Assembly Removal and Installation

S4RS0A9606011

Removal

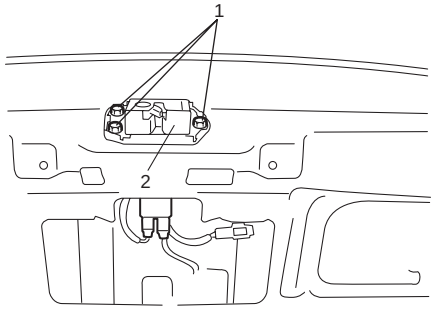
1) Remove door trim (1) from rear end door panel (2).



I4RS0A960016-

2) Disconnect door lock motor lead wire.

3) Loosen door latch bolts (1) and remove door latch assembly (2).



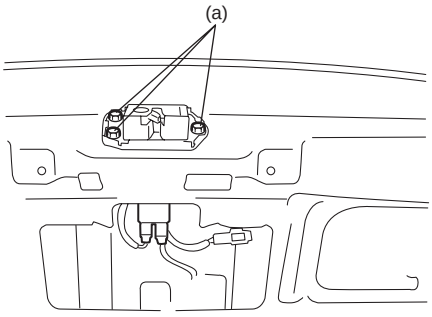
I4RS0A960017-

Installation

Reverse removal procedure to install rear end door lock assembly noting the following instruction.

- Tighten rear end door latch bolt to specified torque.

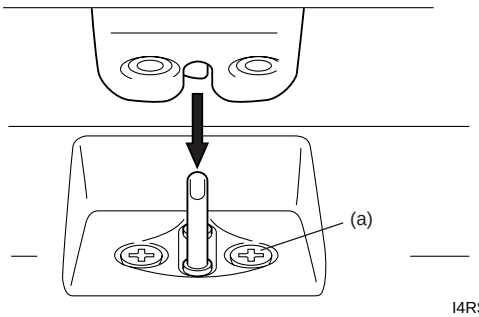
  Tightening torque
  Rear end door latch bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A960018-

- Adjust door latch striker so that its center aligns with the center of groove in door latch base.

  Tightening torque
  Rear end door striker screw (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A960019-

Rear End Door Lock Assembly Inspection

S4RS0A9606012

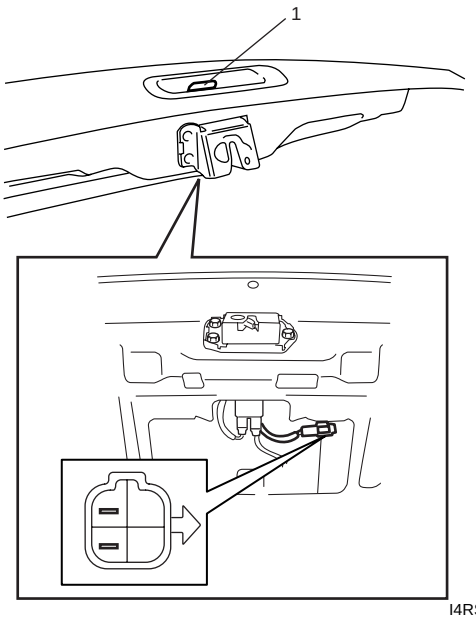
- Check that door opens and closes smoothly and properly.
- Check that door stops in the secondary latched position properly (preventing door from opening freely) and that door closes completely in the fully latched position.
- Adjust door latch striker position, if necessary.

Rear End Door Opener Switch Inspection

S4RS0A9606020

1) Remove rear end door trim.
2) Disconnect rear end door switch coupler.
3) Check that there is continuity between terminals when rear end door opener switch (1) is pushed.
4) Check that there is no continuity between terminals when rear end door opener switch (1) is not pushed.

If check result is not as specified, replace switch.



I4RS0A960020-

Replacement of Transmitter Battery

S4RS0A9606016

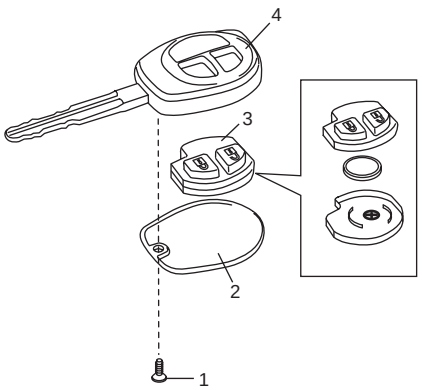
If transmitter becomes unreliable, replace transmitter battery as follows.

1) Remove screw (1) and transmitter cover (2).
2) Remove transmitter (3) from transmitter holder (4).

CAUTION:

Use care not to allow grease or dirt to be attached on the printed circuit board and the battery.

3) With tip of flat blade screwdriver put in slot of transmitter, pry it open.
4) Replace the battery (lithium disc-type CR 1620 or equivalent battery) so its (+) terminal faces “+” mark on transmitter.
5) Fit together transmitter (3) and install it into transmitter holder (4).
6) Install transmitter cover (2) and screw (1).
7) Make sure that door locks can be operated with transmitter.



I4RS0B960014-

NOTE:

- **To prevent theft, be sure to break the transmitter before discarding it.**
- **Dispose of the used battery properly according to applicable rules or regulations. Do not dispose of lithium batteries with ordinary household trash.**

Programming Transmitter Code

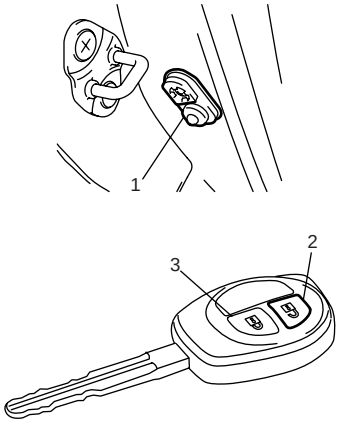
S4RS0A9606017

NOTE:

- **Three transmitter codes can be registered.**
- **When a new transmitter code is registered, the oldest one will be cleared.**

If transmitter or BCM (included in junction block assembly) is replaced with a new one or additional transmitter(s) is necessary, program transmitter code(s).

1) Confirm that all doors are closed and ignition key is out of ignition key cylinder
2) Open driver side door.
3) Turn ignition switch to ON position, and then drawn ignition key from ignition key cylinder within 10 seconds after that.
4) Push and release driver side door switch (1) at 3 times by hand within 20 seconds after removing ignition key from ignition key cylinder.
5) Turn ignition switch to ON position, and then drawn ignition key from ignition key cylinder within 10 seconds after that. All doors automatically lock and unlock once.
   With this, registration mode.
6) Push “UNLOCK” button (2) on transmitter (3) within 20 seconds after Step 5). All doors automatically lock and unlock once.
   With this, code registration is completed.
7) If an additional transmitter, needs to be programed repeat the procedure of Step 1).



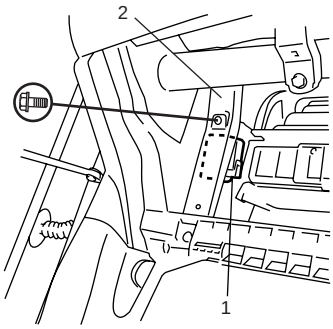
I4RS0A960021-

Keyless Entry Receiver Removal and Installation

S4RS0A9606021

Removal

1) Disconnect negative cable at battery.
2) Remove grove box referring to Step 6) of “Instrument Panel Removal and Installation: in Section 9C”.
3) Disconnect keyless entry receiver coupler.
4) Remove keyless entry receiver (1) from steering support member (2).



I4RS0A960022-

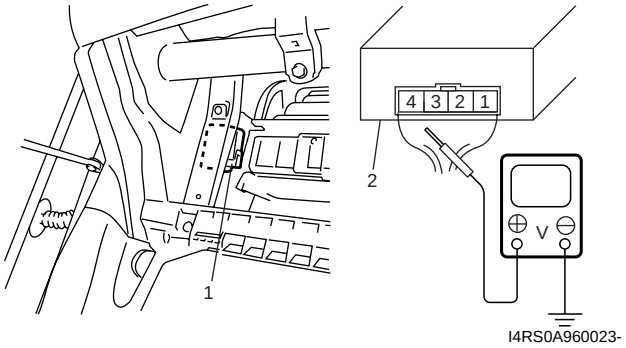
Installation

Reverse removal procedure.

Keyless Entry Receiver and Its Circuit Inspection

S4RS0A9606022

1) Check that the voltage between the following terminals and body ground are specifications under each conditions. If check result is not as specified, check applicable circuit for open or short. If circuit is normal, proceed to next step.



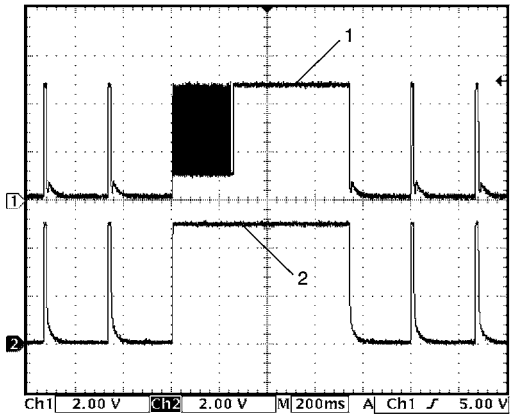
I4RS0A960023-

1. Keyless entry receiver
2. Keyless entry receiver connector (view from harness side)

Terminal	Wire color	Circuit	Specification	Condition
G02-1	LT GRN	Power source	Figure [A]	Push “Lock” or “Unlock” button on transmitter.
			0-1 V	Except the above-mentioned condition.
G02-3	PNK	Lock/Unlock output signal circuit	Figure [A]	Push “Lock” or “Unlock” button on transmitter.
			0-1 V	Except the above-mentioned condition.
G02-4	BRN/WHT	Ground	0-1 V	—

Oscilloscope setting
CH1: 2V/DIV
CH2: 2V/DIV
TIME: 200 ms/DIV

[A]



I4RS0A960024-

1. Lock/Unlock out put signal
2. Power source

1) Recheck keyless entry receiver as follows.
   a) Substitute a known-good keyless entry receiver.
   b) Record key code referring to “Programming Transmitter Code: ”.
   c) Recheck keyless entry receiver system.

Specifications

Tightening Torque Specifications

S4RS0A9607001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Door latch screw	5.0	0.5	4.0	☞ / ☞
Door latch striker screw	10	1.0	7.5	☞
Rear end door latch bolt	10	1.0	7.5	☞
Rear end door striker screw	23	2.3	17.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Door Lock Assembly Components: ”
“Rear Door Lock Assembly Components: ”
“Rear End Door Lock Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A9608001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞

NOTE:

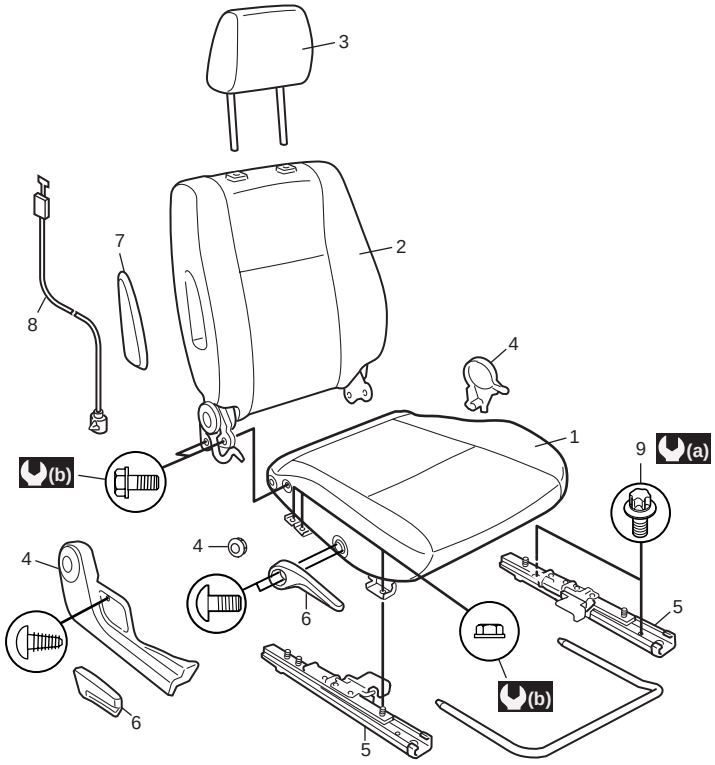
Required service material is also described in the following.
“Front Door Lock Assembly Components: ”
“Rear Door Lock Assembly Components: ”

Seats

Repair Instructions

Front Seat Components

S4RS0A9706001



I4RS0A970001-

1. Seat cushion	4. Cover	7. Side air bag module (if equipped)	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
2. Seat back	5. Seat adjuster	8. Side air bag harness (if equipped)	(b) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
3. Headrest	6. Knob	9. Seat mounting bolt	

Front Seat Removal and Installation

S4RS0A9706002

Removal

1) Disable air bag system referring to“Disabling Air Bag System: in Section 8B”
2) Disconnect seat harness coupler and side air bag coupler, if equipped.
3) Remove 4 mounting bolts to remove seat assembly.
4) Disassemble and repair seat as necessary.

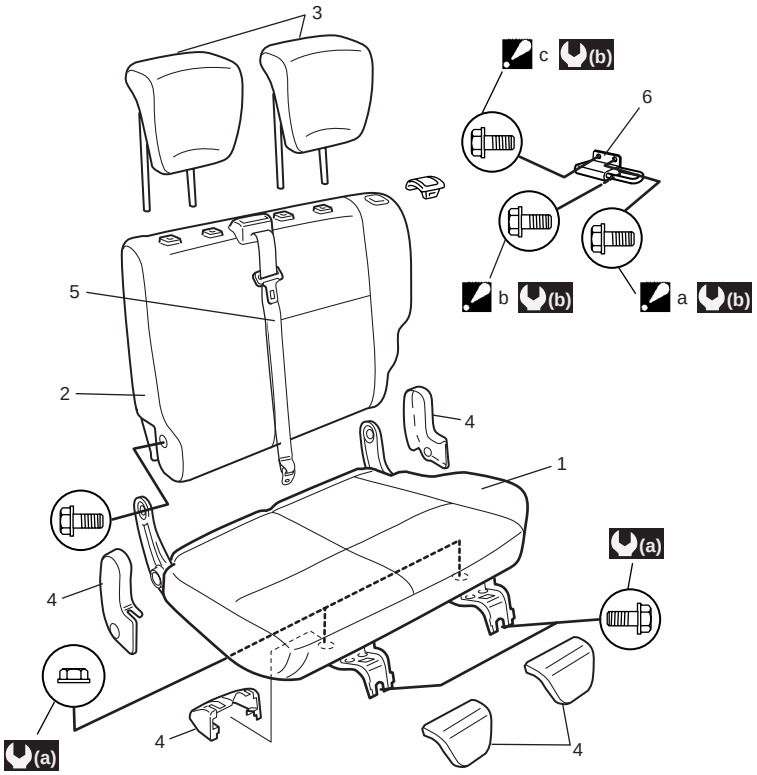
Installation

Reverse removal procedure to install front seat.

- Torque to specifications as shown in “Front Seat Components: ”.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Rear Seat Components

S4RS0A9706003



I4RS0A970002-

1. Seat cushion	4. Cover	(a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)	a, b, c: Seat back striker mounting bolt
2. Seat back	5. Rear center seat belt	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)	: Tightening order (Left side): a→b→c
3. Head rest	6. Seat back striker		: Tightening order (Right side): b→a→c

Rear Seat Removal and Installation

S4RS0A9706004

Removal

1) Fold rear seat back forward.
2) Remove seat mounting bolts and nuts to remove seat assembly.
3) Disassemble and repair seat as necessary.

Installation

Reverse removal procedure to install rear seat.

- Torque to specifications in “Rear Seat Components: ”.

Specifications

Tightening Torque Specifications

S4RS0A9707001

NOTE:

The specified tightening torque is also described in the following.
“Front Seat Components: ”
“Rear Seat Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Interior Trim

Repair Instructions

Floor Carpet Removal and Installation

S4RS0A9806001

Removal

1) Remove front seats and rear seats.
2) Remove seat belt lower anchor bolt.
3) Remove dash side trims, front side sill scuffs, center pillar inner lower trims, rear side lower trims and rear side sill scuffs.
4) Remove console box.
5) Remove floor carpet.

Installation

Reverse removal sequence to install front floor carpet, noting the following instruction.

- For tightening torque of rear seat mounting bolt, refer to “Rear Seat Components: in Section 9G”.
- For tightening torque of front seat mounting bolt, refer to “Front Seat Components: in Section 9G”.

Head Lining Removal and Installation

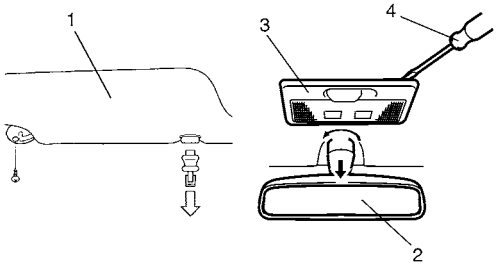
S4RS0A9806002

WARNING:

Refer to “Air Bag Warning: in Section 00” before starting service work.

Removal

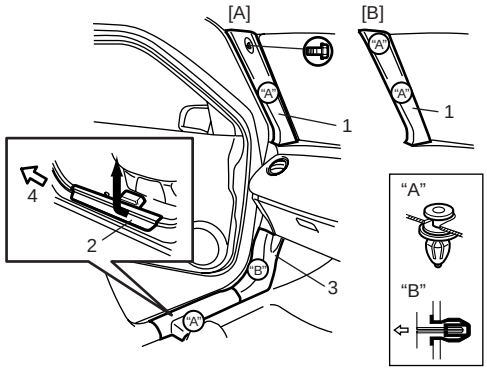
1) Remove sun visor (1).
2) Remove room mirror (2).
3) Remove dome light (3).



I4RS0A980011-

4. Flat head driver

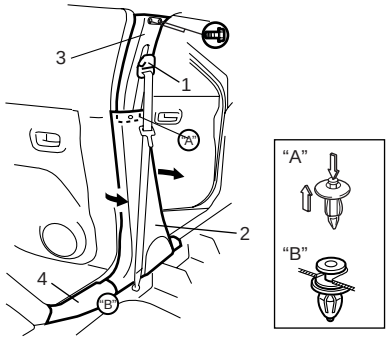
4) Remove front pillar trim (1), front side sill scuff (2) and dash side trim (3).



I4RS0A980001-

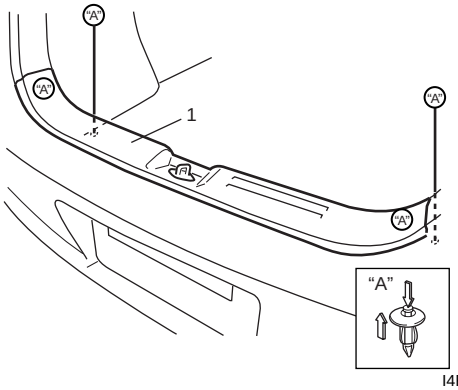
[A]: With curtain air bag
[B]: Without curtain air bag
4. Forward

5) Remove front seat belt upper anchor (1), center pillar inner trim (2), center pillar inner upper trim (3) and rear side sill scuff (4).



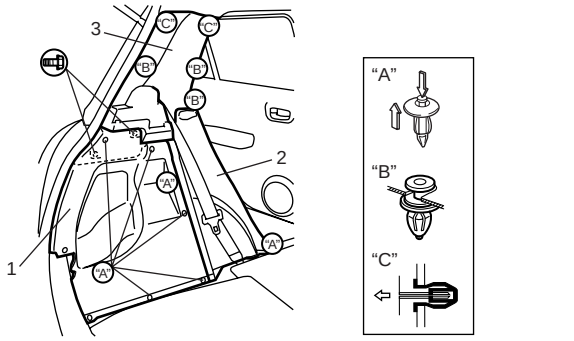
I4RS0A980002-

6) Remove tail end member trim (1).



I4RS0A980003-

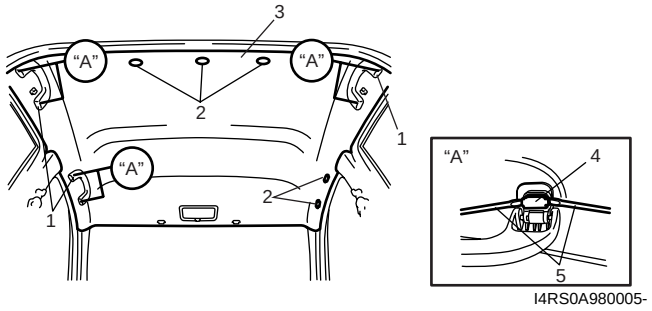
7) Remove rear inner trim (1), rear side lower trim (2) and rear pillar trim (3).



I4RS0A980004-

8) Remove assistant grip (1).

9) Remove head lining clips (2) and remove head lining (3).



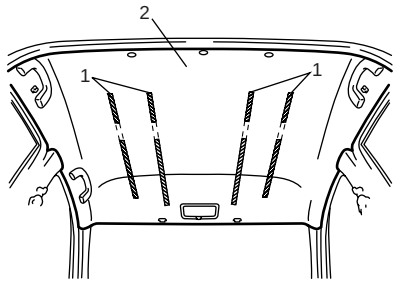
I4RS0A980005-

4.	Clip
5.	Flat head driver

Installation

Reverse removal procedure noting the following.

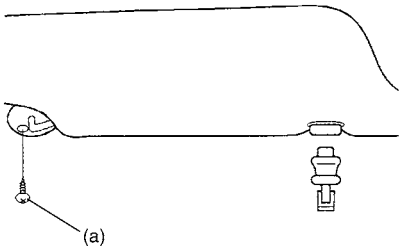
- Apply adhesive (1) to head lining (2) as shown in the figure, and then install head lining (2).



I4RS0A980006-

- Tighten sun visor screw to specified torque.

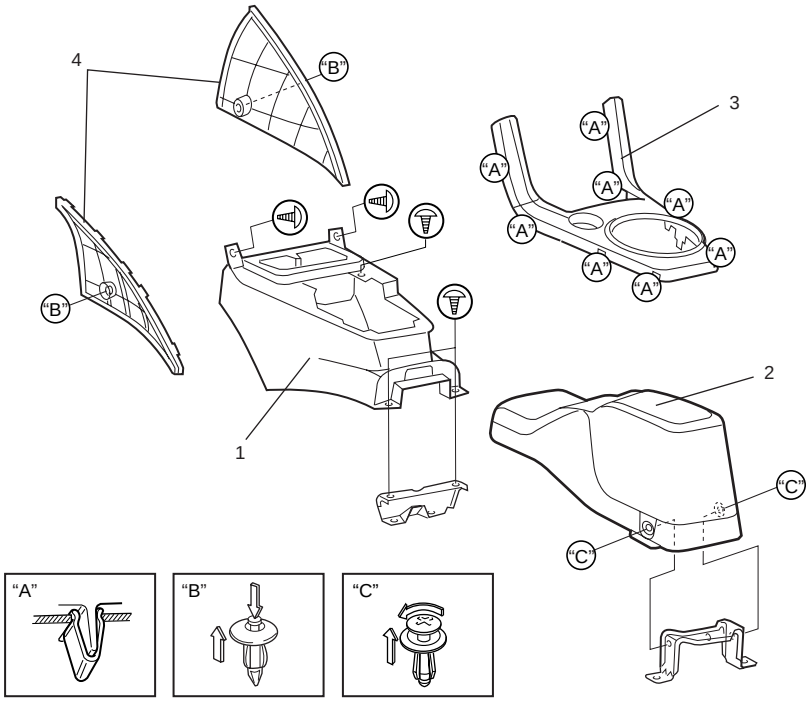
Tightening torque
Sun visor screw (a): 4 N·m (0.4 kg-m, 3.0 lb-ft)



I4RS0A980007-

Console Box Components

S4RS0A9806003

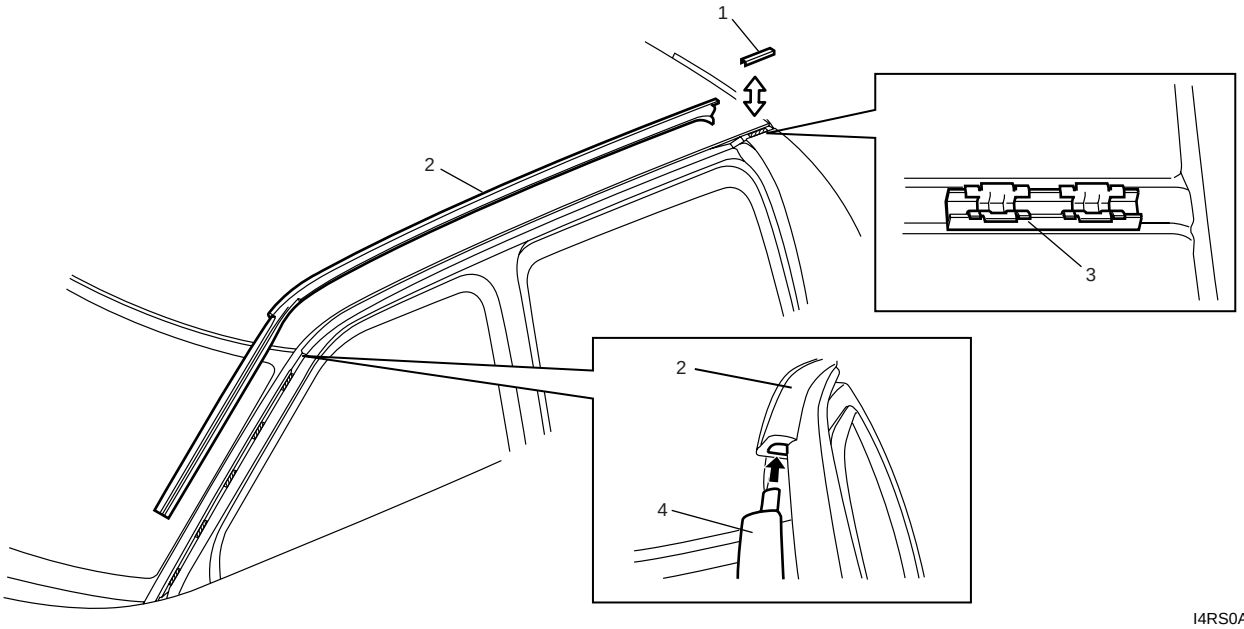


I4RS0A980008-

1.	Front console box	3.	Front console box garnish
2.	Rear console box	4.	Console side cover

Roof Molding Components

S4RS0A9806004

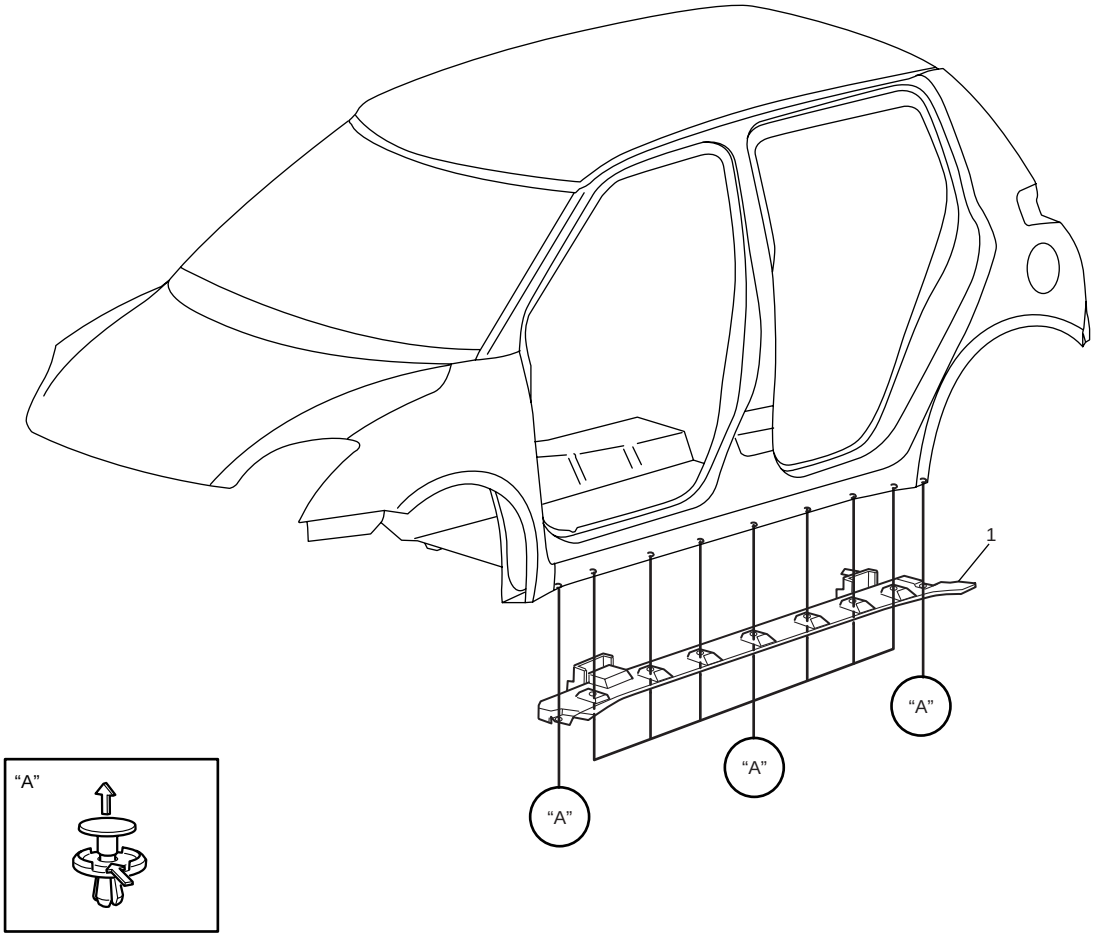


I4RS0A980009-

1. Roof molding	3. Roof molding clip (Push-in type)
2. Roof side weather-strip	4. Windshield side garnish

Splash Guard (If Equipped) Components

S4RS0A9806005



I4RS0A980010-

1. Side sill splash guard

Specifications

Tightening Torque Specifications

S4RS0A9807001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Sun visor screw	4	0.4	3.0	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Hood / Fenders / Doors

Repair Instructions

Hood Removal and Installation

S4RS0A9A06001

Removal

CAUTION:

Place cloth to prevent body from any damage.

1) Remove hood silencer (4).
2) Disconnect window washer hose (1) from hood.
3) Remove 4 mounting bolts (3) to detach hood (2).

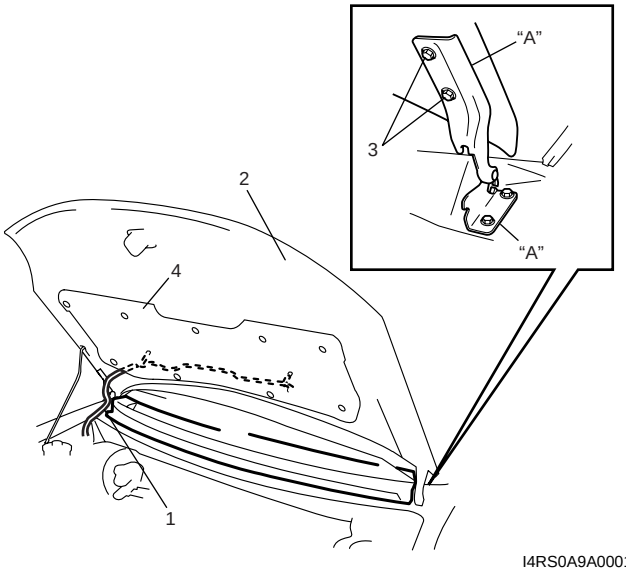
Installation

Reverse removal procedure noting the following.

- Apply sealant to contact face “A” of hood hinge.
  Specified sealant.

  “A”: Sealant 99000–31110

- Adjust hood lock position if necessary referring to “Hood Inspection and Adjustment”.



I4RS0A9A0001-

Hood Inspection and Adjustment

S4RS0A9A06002

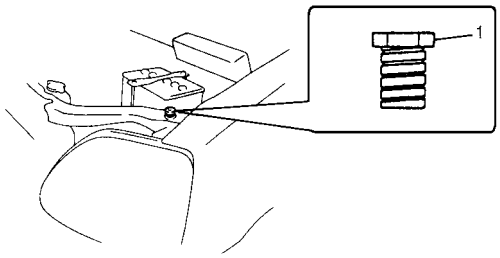
Inspection

- Check that hood opens and closes smoothly and properly. Lubricate if necessary.
- Check that hood stops in the secondary latched position properly (preventing hood from opening freely) and that hood closes completely in the fully latched position.
- Adjust hood locks position, if necessary.

Adjustment

Adjust the following point:

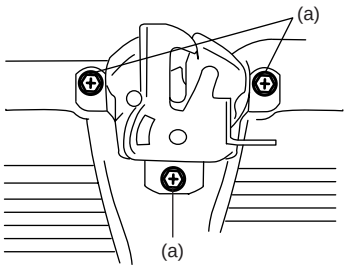
- Hood position adjustment.
  Fore-and-aft and right-and-left adjustment.
  Adjust hood clearance by loosening hood mounting bolts. Refer to “Panel Clearance: in Section 9K”.
- Vertical adjustment
  If only one side (right or left) of hood is not level with front fender, make it level by tightening or loosening hood cushion (1).



I2RH019A0022-

- Hood lock position adjustment
  a. Loosen hood lock bolts.
  b. Adjust hood lock height position so the hood is locked without looseness.
  c. Tighten hood latch bolts to specified torque.

     Tightening torque
     Hood latch bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

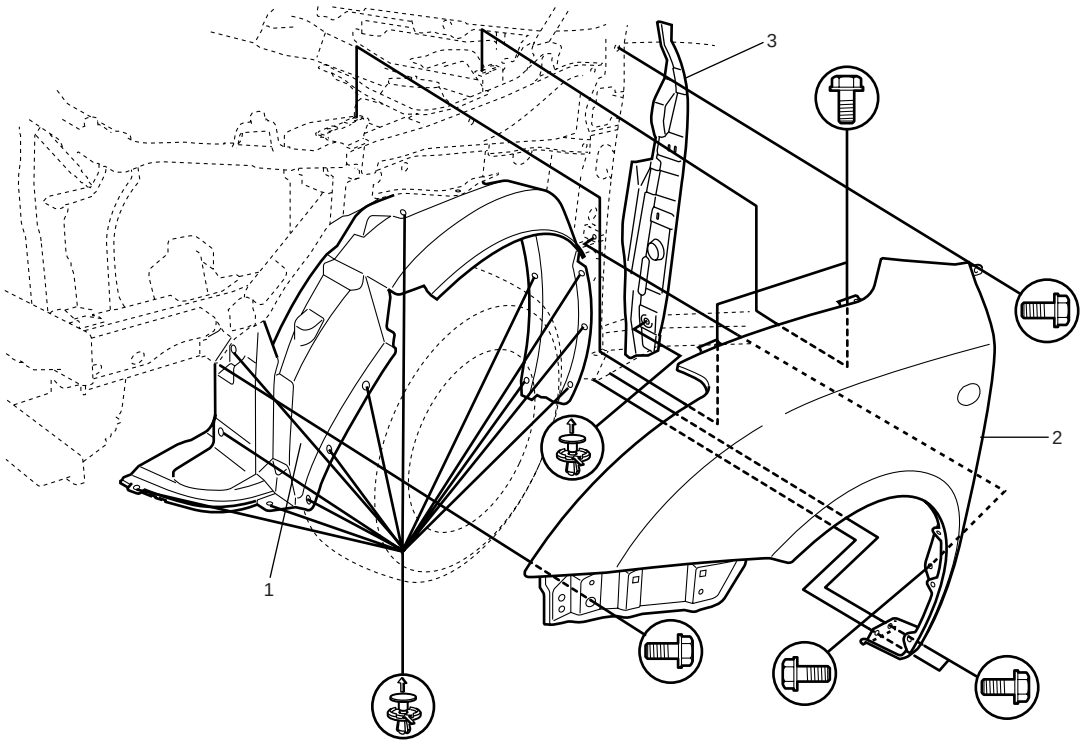


I4RS0A9A0002-

  d. Make sure the hood is locked smoothly and securely.

Front Fender Components

S4RS0A9A06003



I4RS0A9A0003-

1. Front fender lining	2. Front fender	3. Front fender cover

Front Fender Removal and Installation

S4RS0A9A06004

Removal

1) Remove splash guard (if equipped) referring to “Splash Guard (If Equipped) Components: in Section 9H”.
2) Remove front fender lining.
3) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
4) Remove headlight assembly referring to “Headlight Housing Removal and Installation: in Section 9B”.
5) Disconnect connector from side turn signal lamp.
6) Remove front fender cover.
7) Remove front fender.

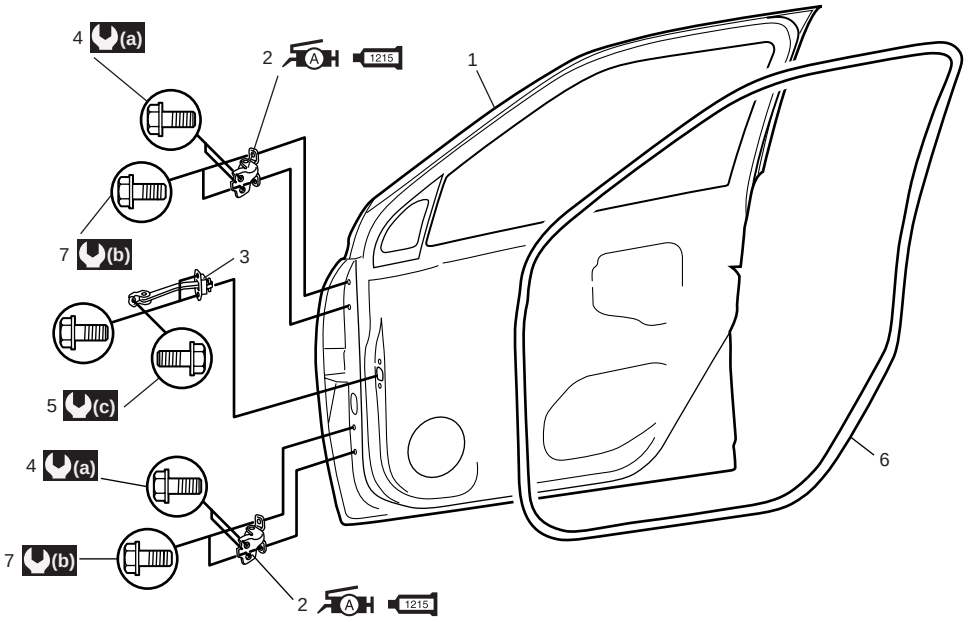
Installation

Reverse removal procedure to install front fender noting the following instruction.

- If paint on fender bolt is peeled off, be sure to apply paint again.
- Adjust panel clearance referring to “Panel Clearance: in Section 9K”.

Front Door Assembly Components

S4RS0A9A06005



I4RS0A9A0004-

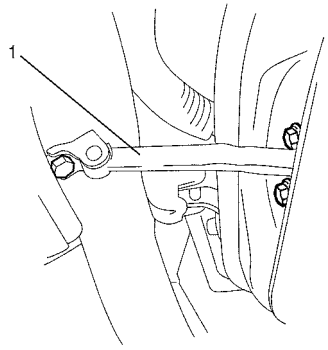
1. Door panel	5. Door open stopper bolt	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
A 1215 2. Door hinge : Apply lithium grease 99000-25010 to rotating part. : Apply sealant 99000-31110 to contact face.	6. Front door opening weather-strip	(c) : 21 N·m (2.1 kg-m, 15.5 lb-ft)
3. Door open stopper	7. Front door hinge bolt (door side)	
4. Front door hinge bolt (body side)	(a) : 27 N·m (2.7 kg-m, 19.5 lb-ft)	

Front Door Assembly Removal and Installation

S4RS0A9A06006

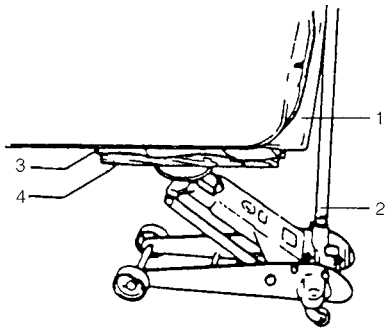
Removal

1) Remove front fender referring to “Front Fender Components: ”.
2) Disconnect door harness lead wires at each coupler.
3) Remove door open stopper (1).



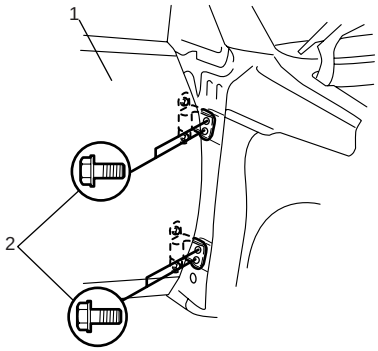
I4RS0A9A0005-

4) Support door panel (1) using a jack (2) with rags (3) and a piece of wood (4) placed between jack (2) and panel (1) as shown.



I2RH019A0003-

5) Remove door assembly (1) by loosening hinge mounting bolts (2).



I4RS0A9A0006-

Installation

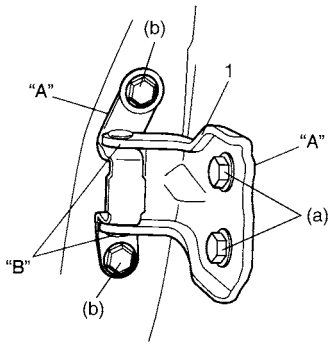
Reverse removal procedure to install door assembly noting the following instructions.

- When replacing door, coat replacement door inside with wax for proper anti-corrosion treatment. Refer to “Sealant Application Areas: in Section 9L”.
- Apply sealant to contact face “A” of hinge (1) and apply grease to rotating part “B” of hinge (1). Specified sealant and grease.

  “A”: Sealant 99000–31110
  “B”: Grease 99000–25010

- Tighten hinge bolt to specified torque.

  Tightening torque
  Door hinge mounting bolt (body side) (a): 27 N·m (2.7 kg-m, 19.5 lb-ft)
  Door hinge mounting bolt (door side) (b): 23 N·m (2.3 kg-m, 17.0 lb-ft)



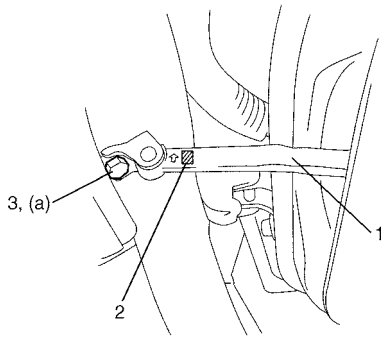
I4RS0A9A0007-

- When door open stopper (1) is installed, be careful make sure punch mark (2) comes to the top.

  Door open stopper installing direction
  Left side door: L punch mark is upward
  Right side door: R punch mark is upward

- Tighten door open stopper bolt (3) to specified torque.

  Tightening torque
  Door open stopper bolt (a): 21 N·m (2.1 kg-m, 15.5 lb-ft)

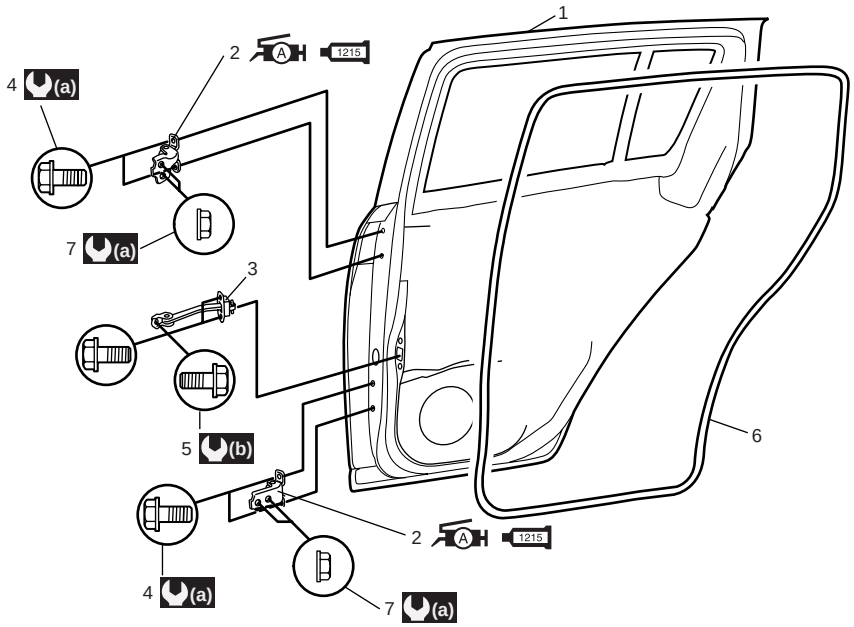


I4RS0A9A0008-

- Adjust door latch striker position referring to “Front Door Lock Assembly Removal and Installation: in Section 9F”.
- Adjust front door cushion so that door becomes flush with side body.
- After installation, open and close the door to check looseness.

Rear Door Assembly Components

S4RS0A9A06007



I4RS0A9A0009-

1. Door panel	4. Rear door hinge bolt	7. Rear door hinge nut
A H 1215 2. Door hinge : Apply lithium grease 99000-25010 to rotating part. : Apply sealant 99000-31110 to contact face.	5. Door open stopper bolt	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
3. Door open stopper	6. Rear door opening weather-strip	(b) : 21 N·m (2.1 kg-m, 15.5 lb-ft)

Rear Door Assembly Removal and Installation

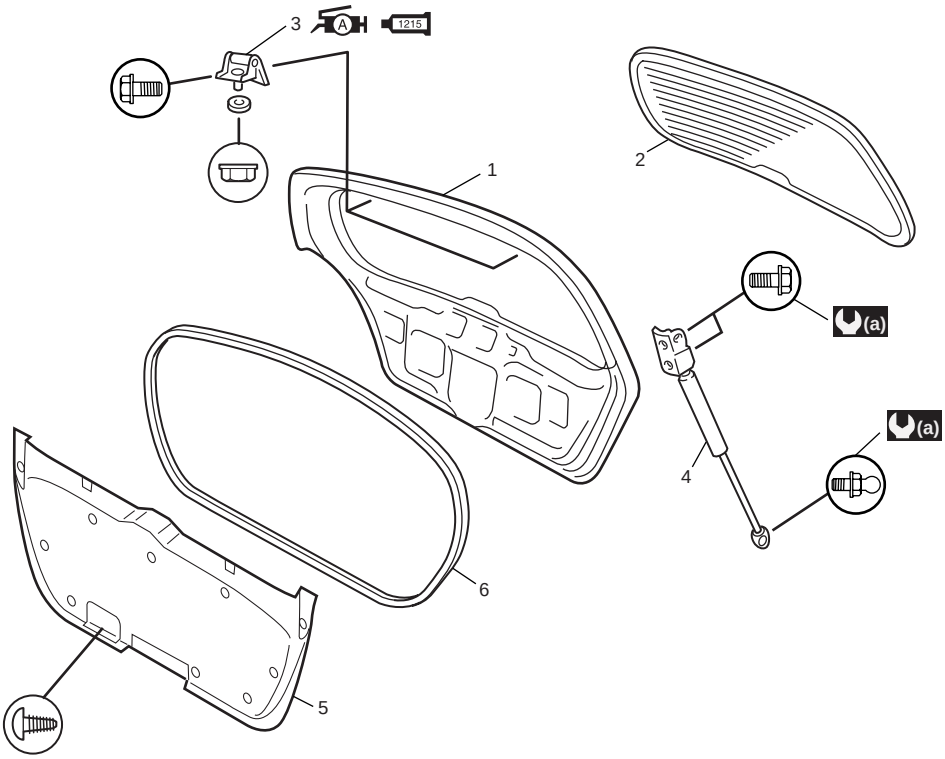
S4RS0A9A06008

Refer to “Front Door Assembly Removal and Installation: ” as removal and installation procedures are basically the same. However, note the following.

- Tighten rear door hinge bolts and nuts to specified torque referring to “Rear Door Assembly Components”.

Rear End Door Assembly Components

S4RS0A9A06009



I4RS0A9A0010-

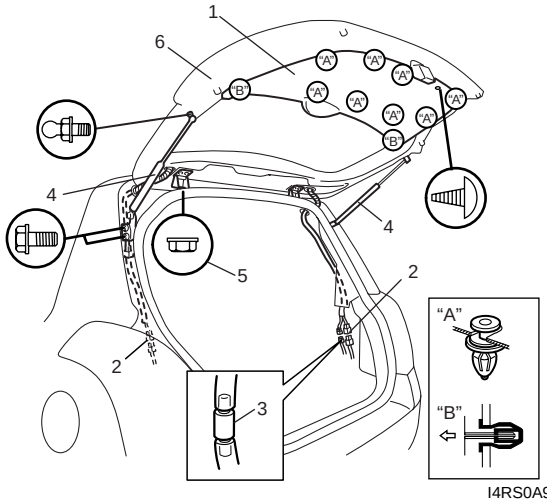
1. Rear end door panel assembly	4. Rear end door balancer	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
2. Rear end door window glass	5. Rear end door trim	
A 1215 3. Rear end door hinge : Apply lithium grease 99000-25010 to door hinge moving section. : Apply sealant 99000-31110 to contact face.	6. Rear end door opening wether-strip	

Rear End Door Assembly Removal and Installation

S4RS0A9A06010

Removal

1) Remove rear end door trim (1).
2) Remove related section of head lining and rear trim.
3) Disconnect rear end door harness couplers (2) and washer hose (3).
4) Remove rear end door balancers (4).
5) Remove door hinge nuts (5) and remove rear end door assembly (6).



I4RS0A9A0011-

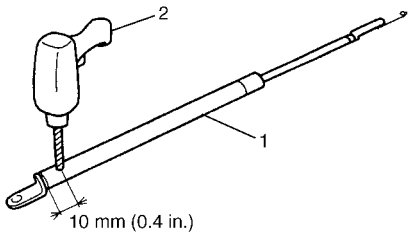
WARNING:

Handling of Rear End Door Balancer (Damper)

- **Handle balancer carefully. Do not scar or scratch exposed surface of its piston rod, and never allow any paint or oil to stick to its surface.**
- **Do not turn piston rod with balancer fully extended.**
- **Do not disassemble balancer (1) because its cylinder is filled with gas.**

Discarding of Rear End Door Balancer (Damper)

- **The gas itself in balancer is harmless but it may issue out of the hole together with chips generated by the drill (2). Therefore, be sure to wear goggle when drilling.**
- **Using a 2 to 3 mm (0.08 to 0.12 in.) drill (2), make a hole to remove gas inside as shown before discarding.**



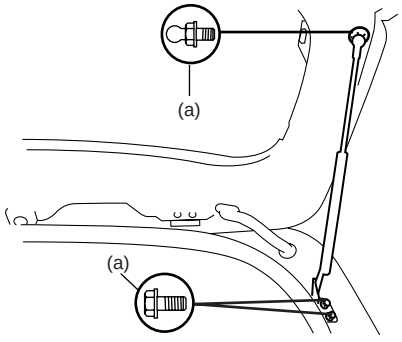
I2RH019A0010-

Installation

Reverse removal procedure noting the following.

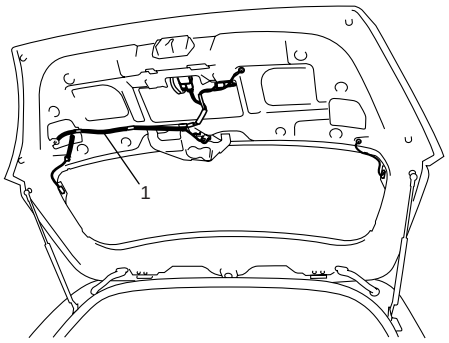
- Tighten rear end door balancer bolt to specified torque.

Tightening torque
Rear end door balancer bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A9A0013-

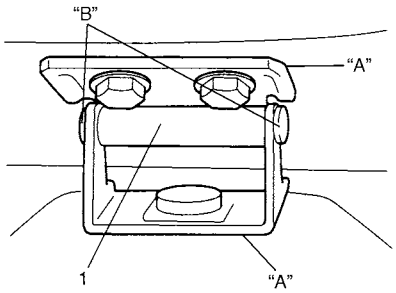
- Secure wiring harness (1).



I4RS0A9A0012-

- Adjust door latch striker position by referring to “Rear End Door Lock Assembly Removal and Installation: in Section 9F”.
- Adjust door cushion so that door contacts body when closed.
- Apply sealant to contact face “A” of door hinge (1) and apply grease to rotating part “B” of hinge (1). Specified sealant and grease.

“A”: Sealant 99000–31110
“B”: Grease 99000–25010



I2RH019A1012-

Specifications

Tightening Torque Specifications

S4RS0A9A07001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Hood latch bolt	10	1.0	7.5	☞
Door hinge mounting bolt (body side)	27	2.7	19.5	☞
Door hinge mounting bolt (door side)	23	2.3	17.0	☞
Door open stopper bolt	21	2.1	15.5	☞
Rear end door balancer bolt	23	2.3	17.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Door Assembly Components: ”
“Rear Door Assembly Components: ”
“Rear End Door Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A9A08001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞
Sealant	SUZUKI Bond No.1215	P/No.: 99000–31110	☞ / ☞ / ☞

NOTE:

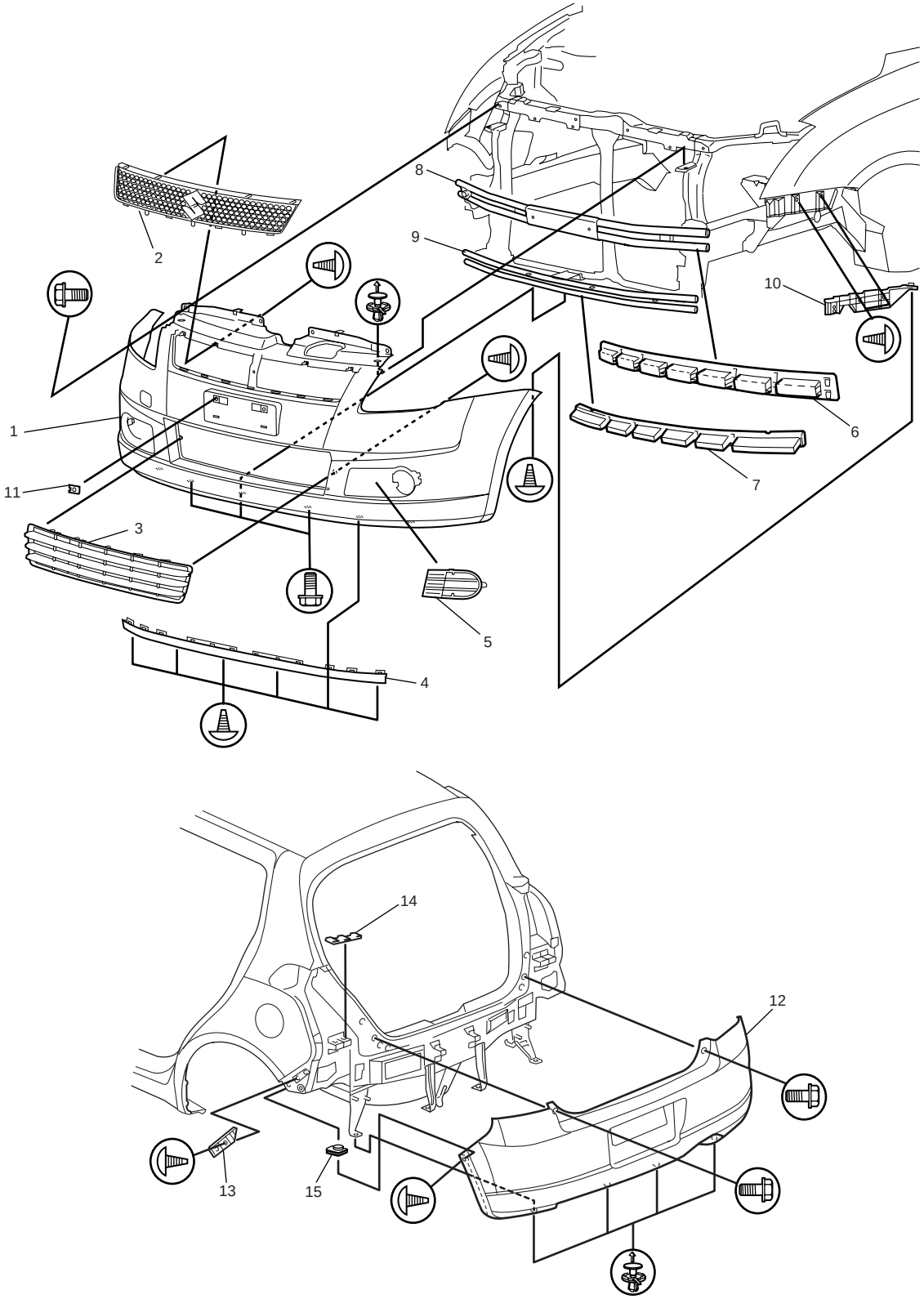
Required service material is also described in the following.
“Front Door Assembly Components: ”
“Rear Door Assembly Components: ”
“Rear End Door Assembly Components: ”

Body Structure

Repair Instructions

Front Bumper and Rear Bumper Components

S4RS0A9B06001



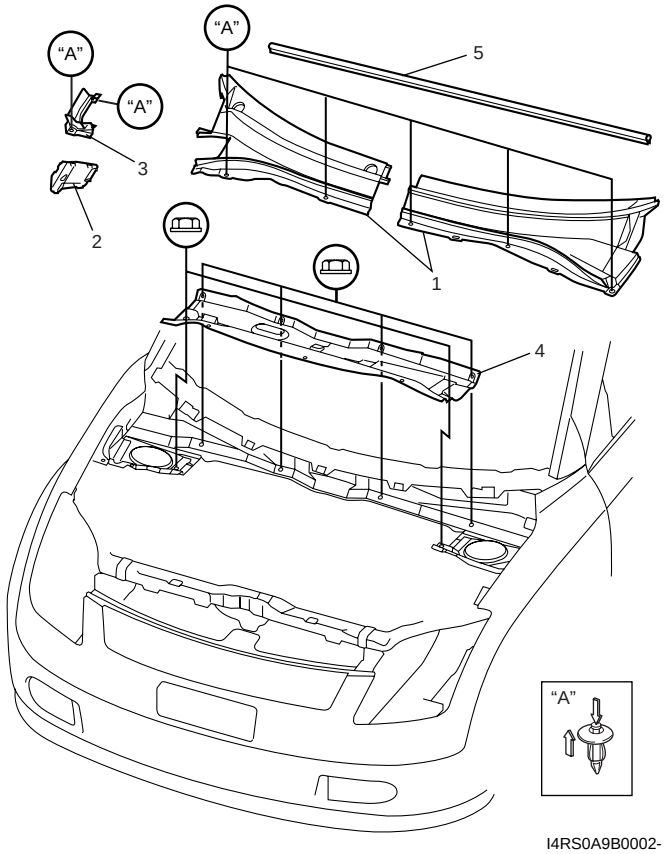
I4RS0A9B0001-

1. Front bumper	5. Front fog lamp cap	9. Front bumper lower member	13. Rear bumper holder
2. Radiator upper grill	6. Front bumper upper absorber	10. Front bumper holder	14. Rear lamp holder

3. Radiator lower grill	7. Front bumper lower absorber	11. License plate nut	15. Plastic nut
4. Front air dam skirt	8. Front bumper upper member	12. Rear bumper	

Cowl Top Components

S4RS0A9B06003



I4RS0A9B0002-

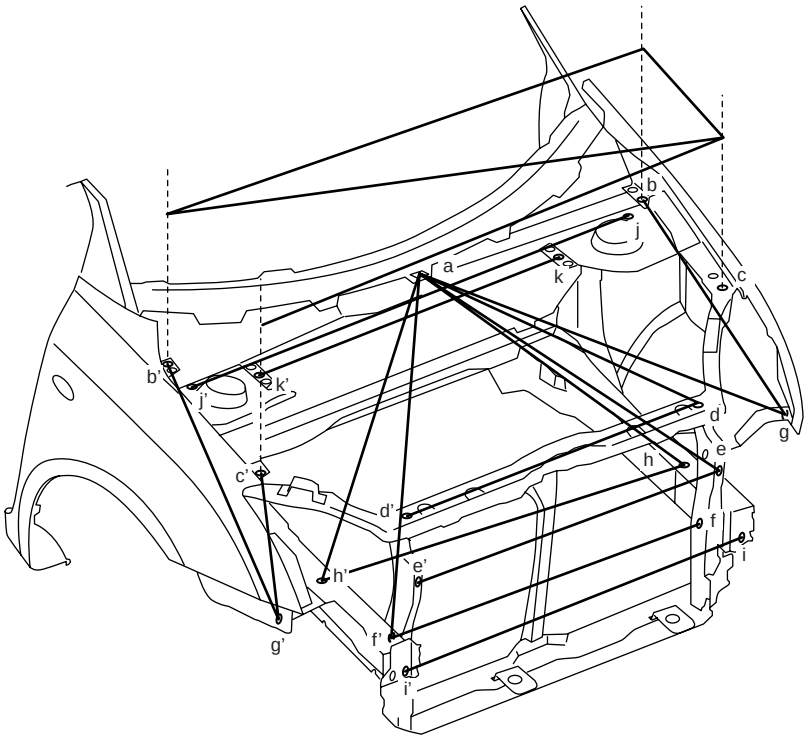
1. Cowl top cover	3. Cowl top side garnish	5. Hood rear seal
2. Cowl the cover lid	4. Cowl top panel	

Specifications

Body Dimensions

S4RS0A9B07001

Engine Room



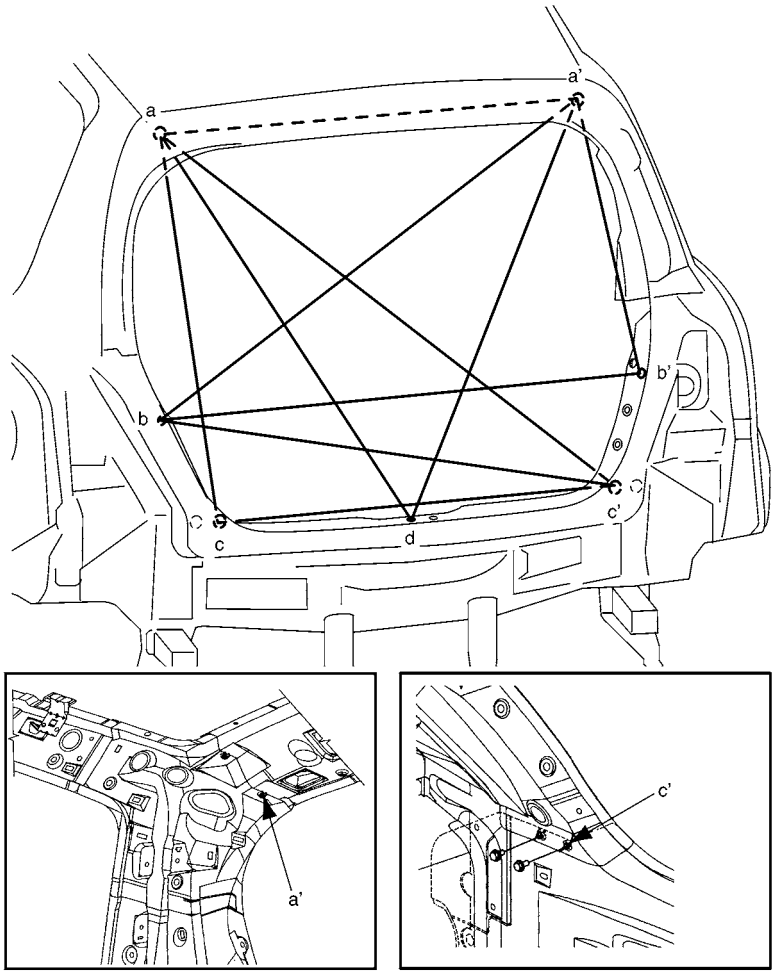
I4RS0A9B0003-

a. Cowl top installation center hole	e (e'). Headlight installation hole	i (i'). Front bumper upper member installation hole
b (b'). Front fender installation hole	f (f'). Jig hole (ϕ 8 mm)	j (j'). Jig hole (ϕ 8 mm)
c (c'). Headlight installation hole	g (g'). Front fender installation hole	k (k'). Jig hole (ϕ 7 mm)
d (d'). Hood lock member installation hole (when hood lock member removed)	h (h'). Engine mounting installation front hole	

Hole to hole distance

a-d: 675 mm (26.57 in.)	**b-c: 343 mm (13.50 in.)**	**e-e': 851 mm (33.50 in.)**
a-e: 816 mm (32.13 in.)	**b-g: 625 mm (24.61 in.)**	**f-f': 817 mm (32.17 in.)**
a-g: 943 mm (37.13 in.)	**b'-c: 1364 mm (53.70 in.)**	**h-h': 950 mm (37.40 in.)**
a-h: 784 mm (30.87 in.)	**b'-g': 647 mm (25.47 in.)**	**i-i': 937 mm (36.89 in.)**
a-f': 864 mm (34.02 in.)	**c-c': 1310 mm (51.57 in.)**	**j-j': 1249 mm (49.17 in.)**
a-h': 743 mm (29.25 in.)	**c'-g': 324 mm (12.76 in.)**	**k-k': 886 mm (34.88 in.)**
b-b': 1317 mm (51.85 in.)	**d-d': 800 mm (31.50 in.)**	

Rear End Door



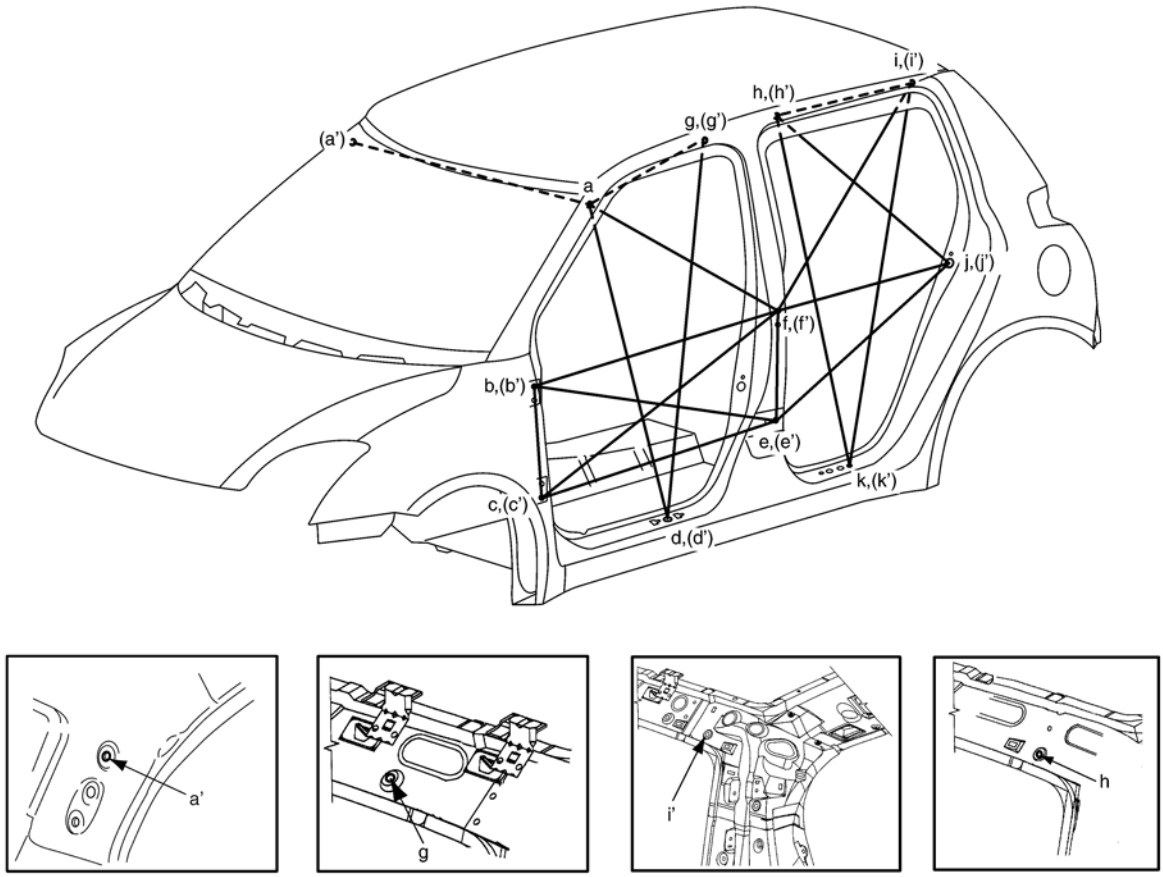
I4RS0A9B0004-

a (a'). Roof back member bolt installation hole	c (c'). Back panel bolt installation hole
b (b'). Jig hole	d. Rear end door striker installation left side hole

Hole to hole distance

a-a': 759 mm (29.88 in.)	**a'-b: 1037 mm (40.83 in.)**	**b-c': 985 mm (38.78 in.)**
a-c: 762 mm (30.00 in.)	**a'-d: 904 mm (35.59 in.)**	**c-c': 850 mm (33.46 in.)**
a-d: 887 mm (34.92 in.)	**a'-b': 528 mm (20.79 in.)**	
a-c': 1107 mm (43.58 in.)	**b-b': 1051 mm (41.38 in.)**	

Side Body



I4RS0A9B0005-

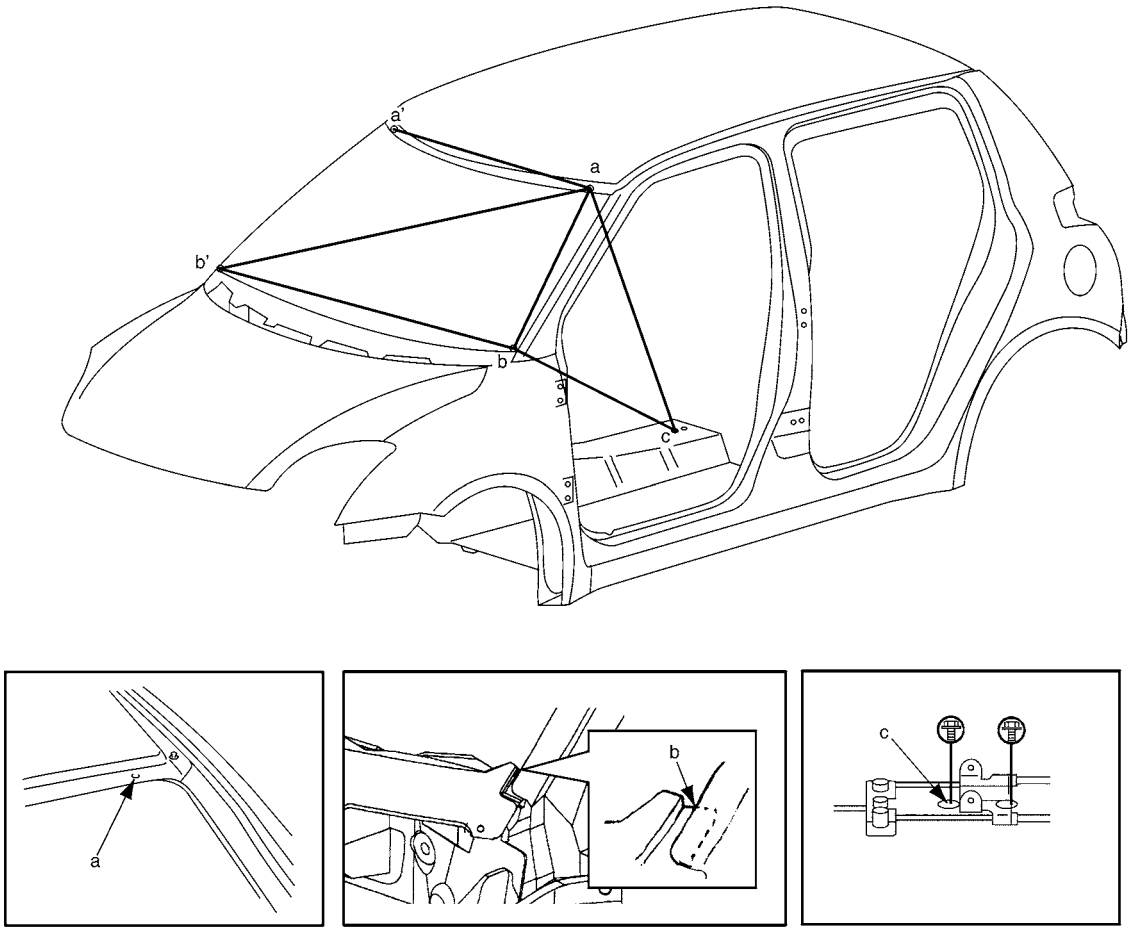
a (a'). Jig hole (ϕ 8 mm)	e (e'). Rear door lower hinge installation rear hole	i (i'). Jig hole (ϕ 10 mm)
b (b'). Front door upper hinge installation upper hole	f (f'). Rear door upper hinge installation upper hole	j (j'). Rear door switch installation hole (large hole)
c (c'). Front door lower hinge installation lower hole	g (g'). Jig hole (ϕ 10 mm)	k (k'). Rear side sill scuff installation hole
d (d'). Bleeding hole	h (h'). Curtain air bag clip installation hole	( ). Body right side

Hole to hole distance

a-d: 1055 mm (41.54 in.)	**c-e: 1021 mm (40.20 in.)**	**f-j: 835 mm (32.87 in.)**
a-f: 747 mm (29.41 in.)	**c-f: 1123 mm (44.21 in.)**	**h-i: 601 mm (23.66 in.)**
a-g: 378 mm (14.88 in.)	**d-g: 1129 mm (44.45 in.)**	**h-j: 817 mm (32.17 in.)**
b-c: 383 mm (15.08 in.)	**e-f: 354 mm (13.94 in.)**	**h-k: 1097 mm (43.19 in.)**
b-e: 1085 mm (42.72 in.)	**e-j: 946 mm (37.24 in.)**	**i-k: 1153 mm (45.39 in.)**
b-f: 1061 mm (41.77 in.)	**f-i: 926 mm (36.46 in.)**	

Hole to hole distance

a-a': 1039 mm (40.91 in.)	**e-e': 1474 mm (58.03 in.)**	**i-i': 1009 mm (39.72 in.)**
b-b': 1461 mm (57.52 in.)	**f-f': 1468 mm (57.80 in.)**	**j-j': 1327 mm (52.24 in.)**
c-c': 1489 mm (58.62 in.)	**g-g': 1018 mm (40.08 in.)**	**k-k': 1472 mm (57.95 in.)**
d-d': 1472 mm (57.95 in.)	**h-h': 1022 mm (40.24 in.)**	



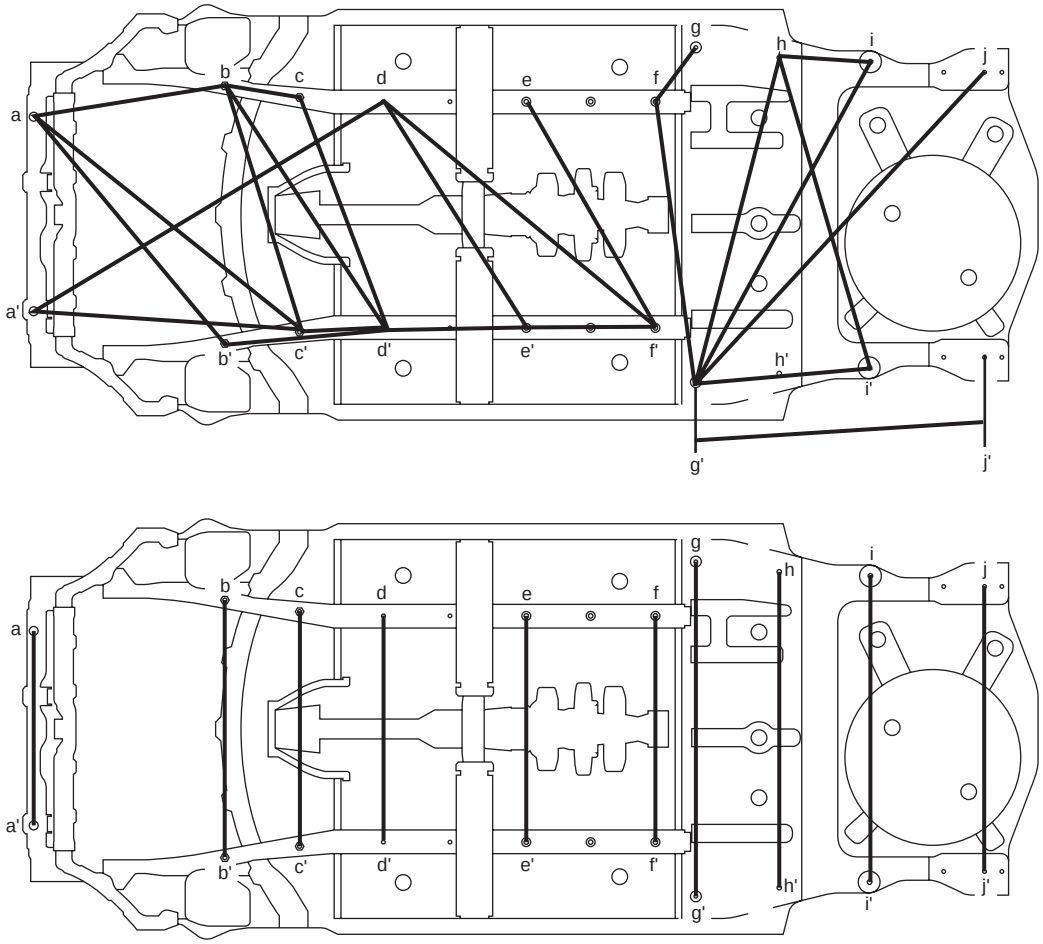
I4RS0A9B0006-

a (a'). Jig hole (ϕ 6.5 mm)	b (b'). Panel cross point	c. Parking brake cable bracket installation front hole

Hole to hole distance

a-b: 638 mm (25.12 in.)	**a-b': 1194 mm (47.01 in.)**
a-c: 1293 mm (50.91 in.)	**b-c: 1422 mm (55.98 in.)**
a-a': 800 mm (31.50 in.)	**b-b': 1272 mm (50.08 in.)**

Under Body



I4RS0A9B0007-

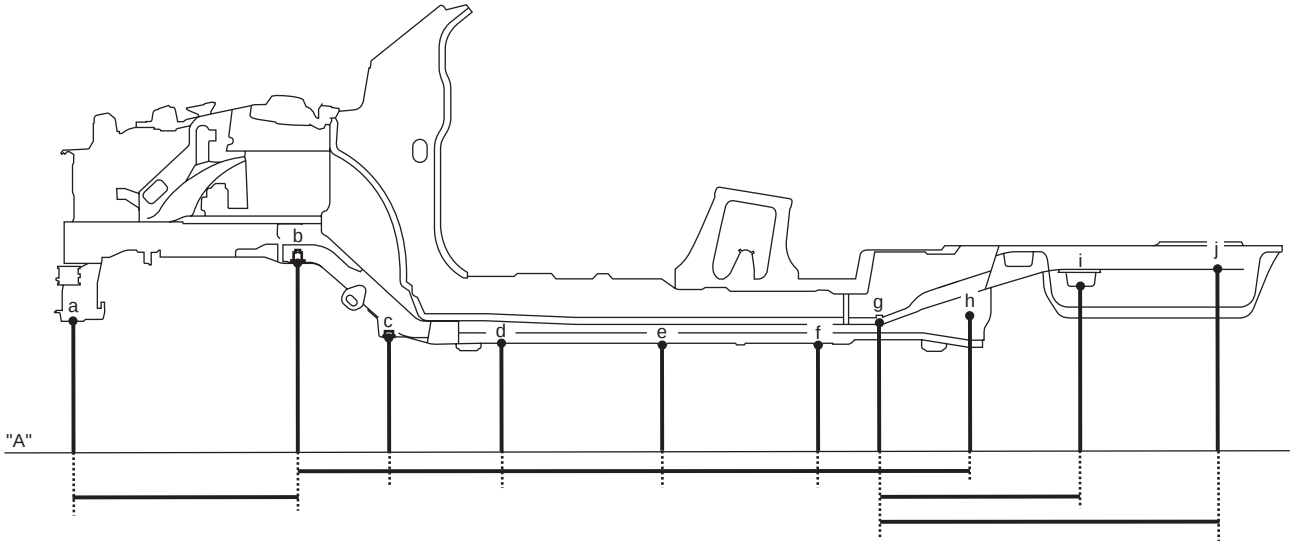
a (a'). Jig hole (ϕ 20 mm)	e (e'). Jig hole (ϕ 15 mm)	i (i'). Drain hole (ϕ 10 mm)
b (b'). Front suspension frame installation hole	f (f'). Jig hole (ϕ 15 mm)	j (j'). Jig hole (ϕ 16 mm)
c (c'). Front suspension frame installation hole	g (g'). Jig hole (ϕ 25 mm)	
d (d'). Jig hole (ϕ 10 mm)	h (h'). Rear axle housing installation inside hole	

Hole to hole distance

a-b: 674 mm (26.54 in.)	**c-d': 836 mm (32.91 in.)**	**g'-h: 1135 mm (44.69 in.)**
a-b': 1018 mm (40.08 in.)	**c'-d': 288 mm (11.34 in.)**	**g'-i: 1229 mm (48.39 in.)**
a-c': 1163 mm (45.79 in.)	**d-e': 911 mm (35.87 in.)**	**g'-i': 612 mm (24.09 in.)**
a'-d: 1391 mm (54.76 in.)	**d-f': 1205 mm (47.44 in.)**	**g'-j: 1433 mm (65.42 in.)**
a'-c': 908 mm (35.75 in.)	**d'-e': 488 mm (19.21 in.)**	**g'-j': 971 mm (38.23 in.)**
b-c: 335 mm (13.19 in.)	**e-f': 887 mm (34.92 in.)**	**h-i: 324 mm (12.76 in.)**
b-c': 904 mm (35.59 in.)	**e'-f': 440 mm (17.32 in.)**	**h-i': 1070 mm (42.13 in.)**
b-d': 1016 mm (40.00 in.)	**f-g: 240 mm (9.45 in.)**	
b'-d': 594 mm (23.39 in.)	**f-g': 969 mm (38.15 in.)**	

Hole to hole distance

a-a': 660 mm (25.98 in.)	**e-e': 770 mm (30.31 in.)**	**i-i': 992 mm (39.06 in.)**
b-b': 881 mm (34.69 in.)	**f-f': 770 mm (30.31 in.)**	**j-j': 970 mm (38.19 in.)**
c-c': 800 mm (31.50 in.)	**g-g': 1144 mm (45.04 in.)**	
d-d': 770 mm (30.31 in.)	**h-h': 1048 mm (41.26 in.)**	



I4RS0A9B0008-

a. Jig hole (ϕ 20 mm)	e. Jig hole (ϕ 15 mm)	i. Drain hole (ϕ 10 mm)
b. Front suspension frame installation hole	f. Jig hole (ϕ 15 mm)	j. Jig hole (ϕ 16 mm)
c. Front suspension frame installation hole	g. Jig hole (ϕ 25 mm)	
d. Jig hole (ϕ 10 mm)	h. Rear axle housing installation inside hole	

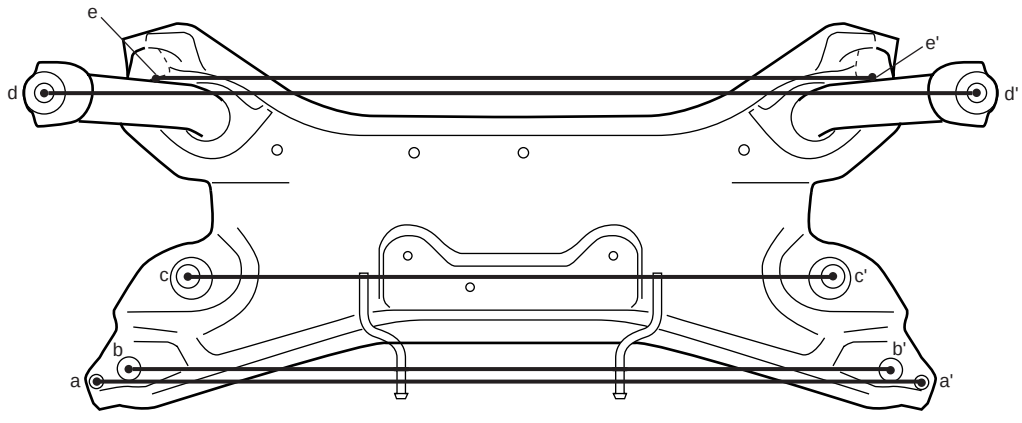
Hole to hole distance

a-b: 644 mm (25.35 in.)	**d-e: 488 mm (19.21 in.)**	**g-h: 293 mm (11.54 in.)**
b-c: 260 mm (10.24 in.)	**e-f: 440 mm (17.32 in.)**	**g-i: 597 mm (23.50 in.)**
c-d: 288 mm (11.34 in.)	**f-g: 138 mm (5.43 in.)**	**g-j: 956 mm (37.64 in.)**

Projection dimension from standard line “A”

a: 73 mm (2.87 in.)	**e: 10 mm (0.39 in.)**	**i: 181 mm (7.13 in.)**
b: 236 mm (9.29 in.)	**f: 10 mm (0.39 in.)**	**j: 221 mm (8.70 in.)**
c: 29 mm (1.14 in.)	**g: 68 mm (2.68 in.)**	
d: 12 mm (0.47 in.)	**h: 72 mm (2.83 in.)**	

Front Suspension Frame

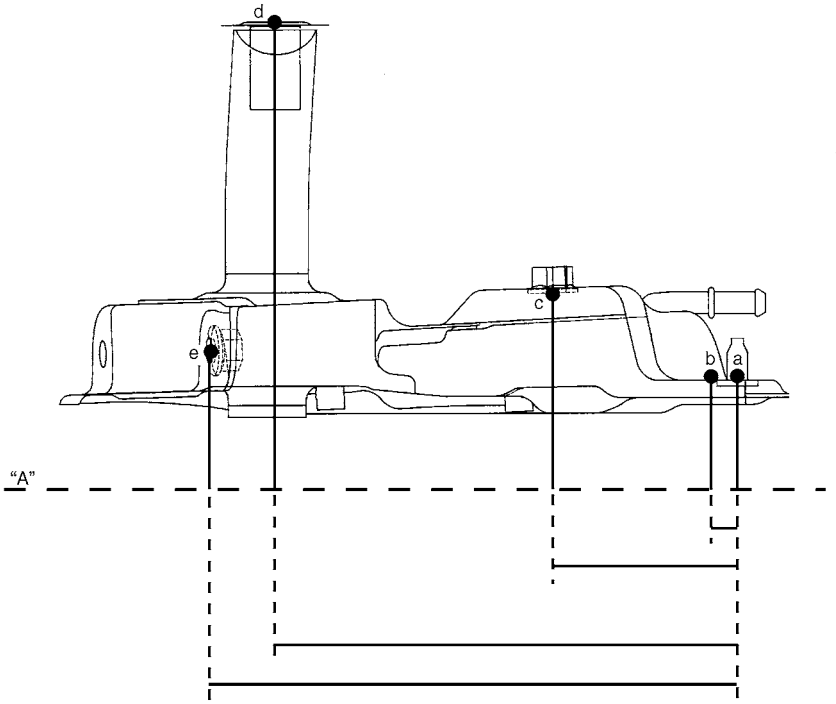


I4RS0A9B0009-

a (a’). Stud	d (d’). Front suspension frame installation hole
b (b’). Front suspension frame installation hole	e (e’). Front suspension control arm installation hole
c (c’). Front suspension control arm installation hole	

Hole to hole distance

a-a’: 896 mm (35.28 in.)	**d-d’: 881 mm (34.68 in.)**
b-b’: 800 mm (31.50 in.)	**e-e’: 765 mm (30.12 in.)**
c-c’: 666 mm (26.22 in.)	



I4RS0A9B0010-

a. Stud	d. Front suspension frame installation hole
b. Front suspension frame installation hole	e. Front suspension control arm installation hole
c. Front suspension control arm installation hole	

Hole to hole distance

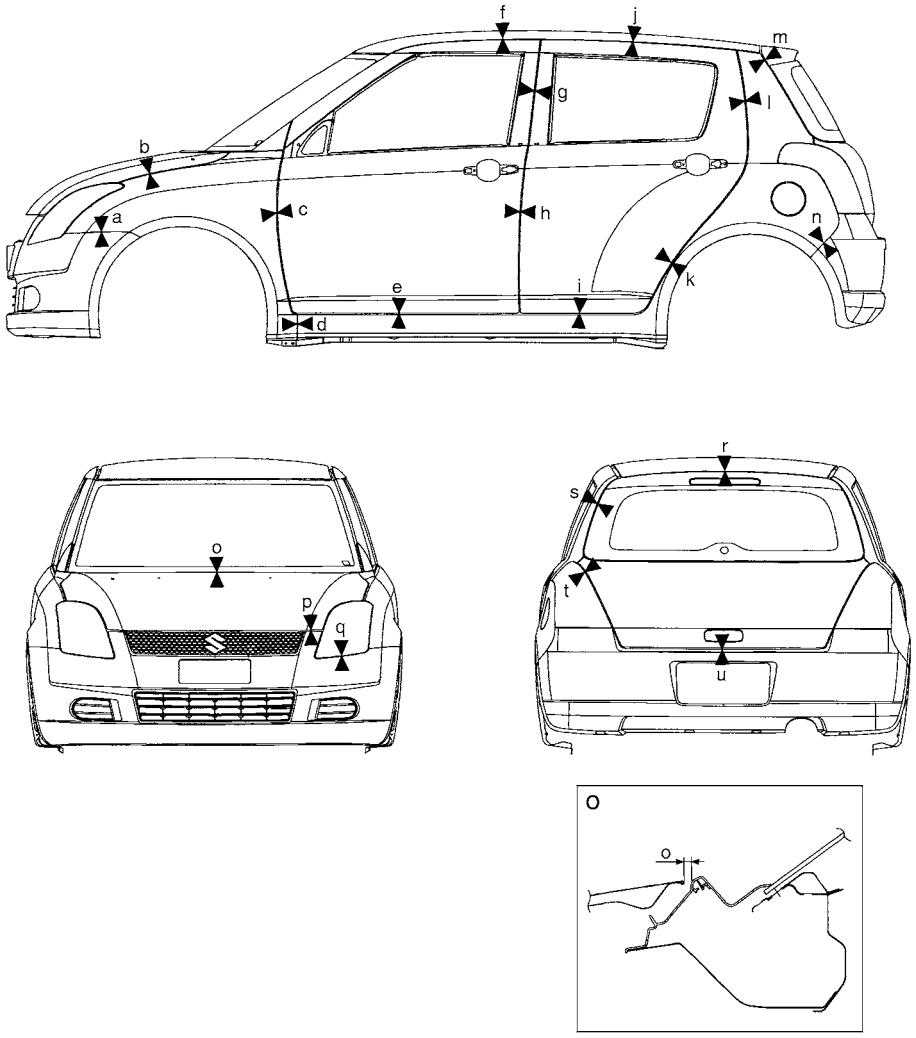
a-b: 10 mm (0.39 in.)	**a-d: 270 mm (10.63 in.)**
a-c: 108 mm (4.25 in.)	**a-e: 309 mm (12.17 in.)**

Projection dimension from standard line “A”

a: 50 mm (1.97 in.)	**d: 258 mm (10.16 in.)**
b: 50 mm (1.97 in.)	**e: 66 mm (2.60 in.)**
c: 97 mm (3.82 in.)	

Panel Clearance

S4RS0A9B07002



I4RS0A9B0011-

Panel to panel distance

a: 0-1 mm (0-0.039 in.)	h: 3.1-5.1 mm (0.122-0.201 in.)	o: 8.1 mm (0.319 in.)
b: 2.3-4.3 mm (0.091-0.169 in.)	i: 4.7-6.7 mm (0.185-0.263 in.)	p: 6.1-8.1 mm (0.240-0.319 in.)
c: 3.1-5.1 mm (0.122-0.201 in.)	j: 15.4-18.4 mm (0.606-0.724 in.)	q: 2.3 mm (0.091 in.)
d: 1.1-3.1 mm (0.043-0.122 in.)	k: 3.0-5.0 mm (0.118-0.197 in.)	r: 7.2-8.7 mm (0.283-0.343 in.)
e: 4.7-6.7 mm (0.185-0.263 in.)	l: 3.1-5.1 mm (0.122-0.201 in.)	s: 3.5-5.5 mm (0.138-0.217 in.)
f: 14.7-17.7 mm (0.579-0.697 in.)	m: 3.5-5.5 mm (0.138-0.217 in.)	t: 3.4-5.4 mm (0.134-0.213 in.)
g: 3.1-5.1 mm (0.122-0.201 in.)	n: 0.5-1.0 mm (0.020-0.039 in.)	u: 5.0-7.0 mm (0.197-0.276 in.)

Paint / Coatings

General Description

Anti-Corrosion Treatment Construction

S4RS0A9C01001

WARNING:

Standard shop practices, particularly eye protection, should be followed during the performance of the following operations to avoid personal injury.

As rust proof treatment, steel sheets are given corrosion resistance on the interior and/or exterior.
These corrosion resistance steel sheet materials are called one of two-side galvanized steel sheets.
It is for the sake of rust protection that these materials are selected and given a variety of treatments as described blow.

- Steel sheets are treated with cathodic electro primer which is excellent in corrosion resistance.
- Rust proof wax coatings are applied to door and side sill insides where moisture is liable to stay.
- Vinyl coating is applied to body underside and wheel housing inside.
- Sealer is applied to door hem, engine compartment steel sheet-to-steel sheet joint, and the like portions to prevent water penetration and resulting in rust occurrence.

In panel replacement or collision damage repair, leaving the relevant area untreated as it is in any operation which does disturb the rust proof treatment will cause corrosion to that area. Therefore, it is the essential function of any repair operation to correctly recoat the related surfaces of the relevant area.
All the metal panels are coated with metal conditioners and primer coating during vehicle production. Following the repair and/or replacement parts installation, every accessible bare metal surface should be cleaned and coated with rust proof primer. Perform this operation prior to the application of sealer and rust proof wax coating.
Sealer is applied to the specific joints of a vehicle during production. The sealer is intended to prevent dust from entering the vehicle and serves also as an anticorrosion barrier. The sealer is applied to the door and hood hem areas and between panels. Correct and reseal the originally sealed joints if damaged. Reseal the attaching joints of a new replacement panel and reseal the hem area of a replacement door or hood.
Use a quality sealer to seal the flanged joints, overlap joints and seams. The sealer must have flexible characteristics and paint ability after it's applied to repair areas.
For the sealer to fill open joints, use caulking material. Select a sealer in conformance with the place and purpose of a specific use. Observe the manufacturer's label-stand instructions when using the sealer.
In many cases, repaired places require color painting. When this is required, follow the ordinary techniques specified for the finish preparation, color painting and undercoating build-up.
Rust proof wax, a penetrative compound, is applied to the metal-to-metal surfaces (door and side sill insides) where it is difficult to use ordinary undercoating material for coating. Therefore, when selecting the rust proof wax, it may be the penetrative type.
During the undercoating (vinyl coating) application, care should be taken that sealer is not applied to the engine-related parts and shock absorber mounting or rotating parts. Following the under coating, make sure that body drain holes are kept open.
The sequence of the application steps of the anti-corrosion materials are as follows:

1) Clean and prepare the metal surface.
2) Apply primer.
3) Apply sealer (all joints sealed originally).
4) Apply color in areas where color is required such as hem flanges, exposed joints and under body components.
5) Apply anticorrosion compound (penetrative wax).
6) Apply undercoating (rust proof material).

Plastic Parts Finishing

S4RS0A9C01002

Paintable plastic parts are ABS plastic parts.

Painting

Rigid or hand ABS plastic needs no primer coating. General acrylic lacquers can be painted properly over hard ABS plastic in terms of adherence.

1) Use cleaning solvent for paint finish to wash each part.
2) Apply conventional acrylic color lacquer to part surface.
3) Follow lacquer directions for required drying time. (Proper drying temperature range is 60 – 70 °C (140 – 158 °F)).

Reference

Plastic parts employ not only ABS (Acrylonitrile Butadiene Styrene) plastic but also polypropylene, vinyl, or the like plastic. Burning test method to identify ABS plastic is described below.

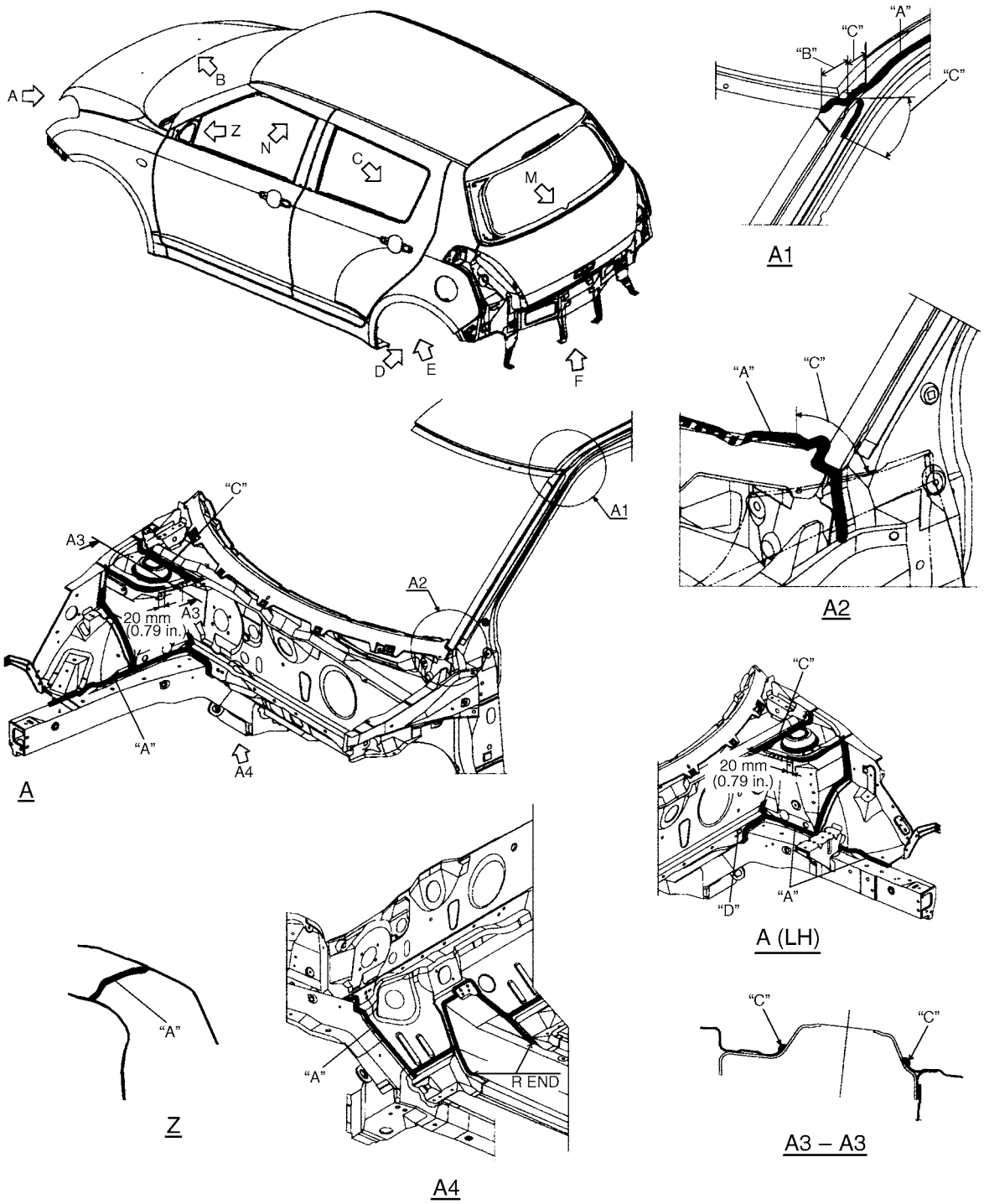
1) Use a sharp blade to cut off a plastic sliver from the part at its hidden backside.
2) Hold sliver with pincers and set it on fire.
3) Carefully observe condition of the burning plastic.
4) ABS plastic must raise readily distinguishable back smoke while burning with its residue suspended in air temporarily.

5) Polypropylene must raise no readily distinguishable smoke while burning.

Component Location

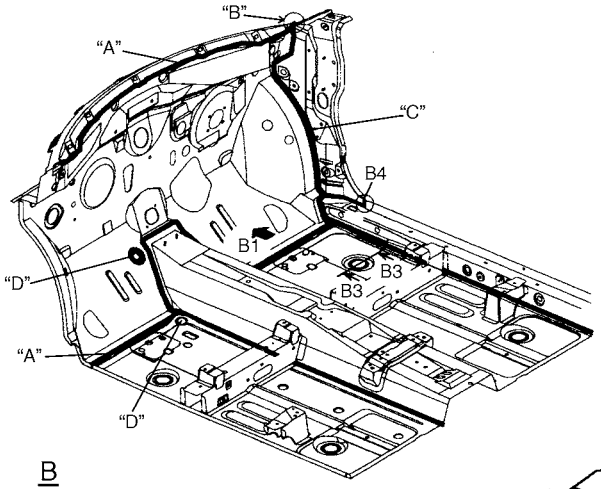
Sealant Application Areas

S4RS0A9C03001

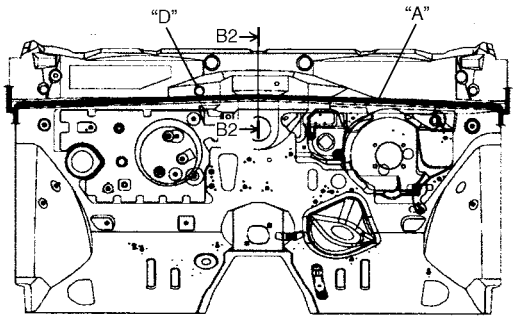


I4RS0A9C0001-

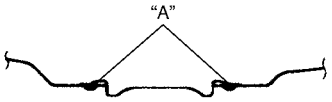
"A": Apply sealant.	"C": Smooth out sealant with a brush.
"B": Wipe off excess sealant after application.	"D": Do not apply sealant



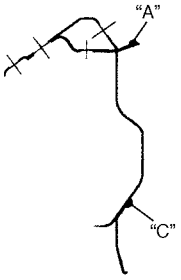
B



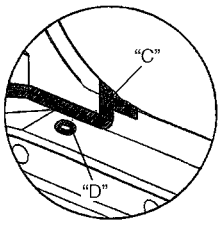
B1



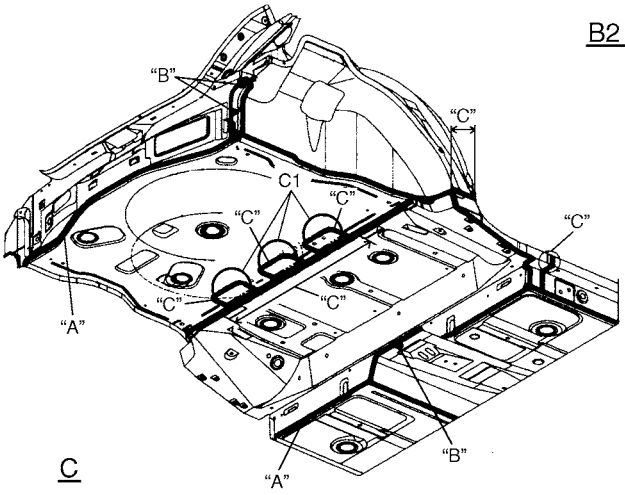
B3 – B3



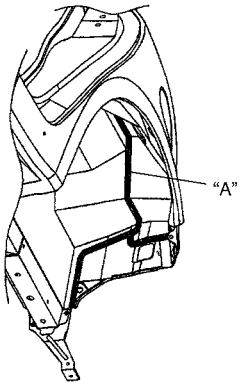
B2 – B2



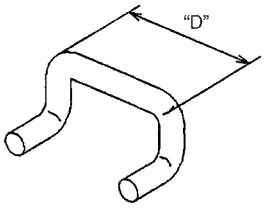
B4



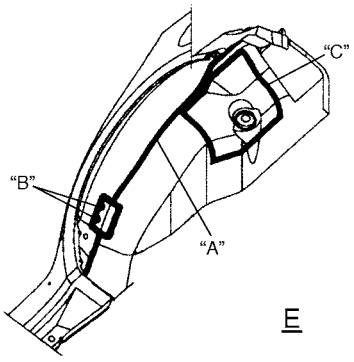
C



D



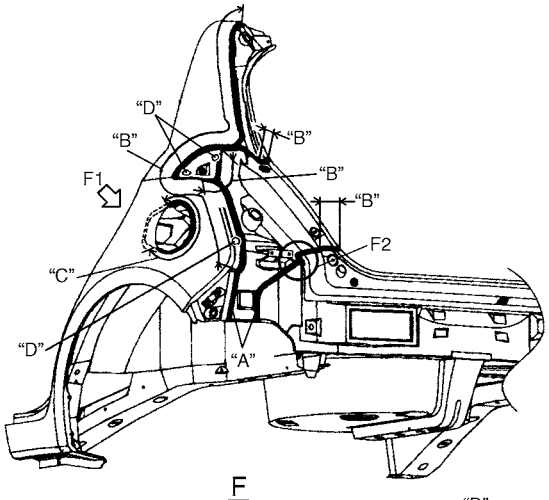
C1



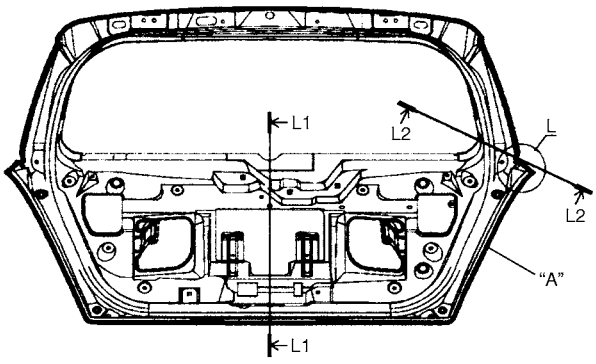
E

I4RS0A9C0002-

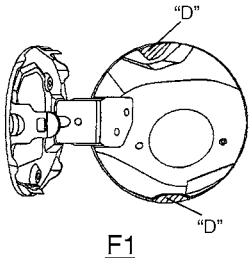
"A": Apply sealant.	"C": Smooth out sealant with a brush.
"B": Fill gap / hole with sealant.	"D": Do not apply sealant.



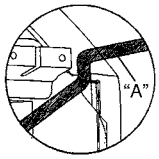
F



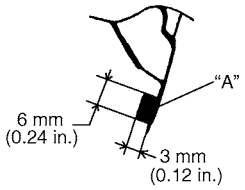
M



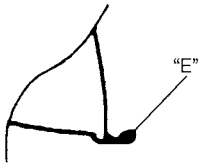
F1



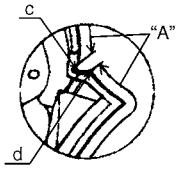
F2



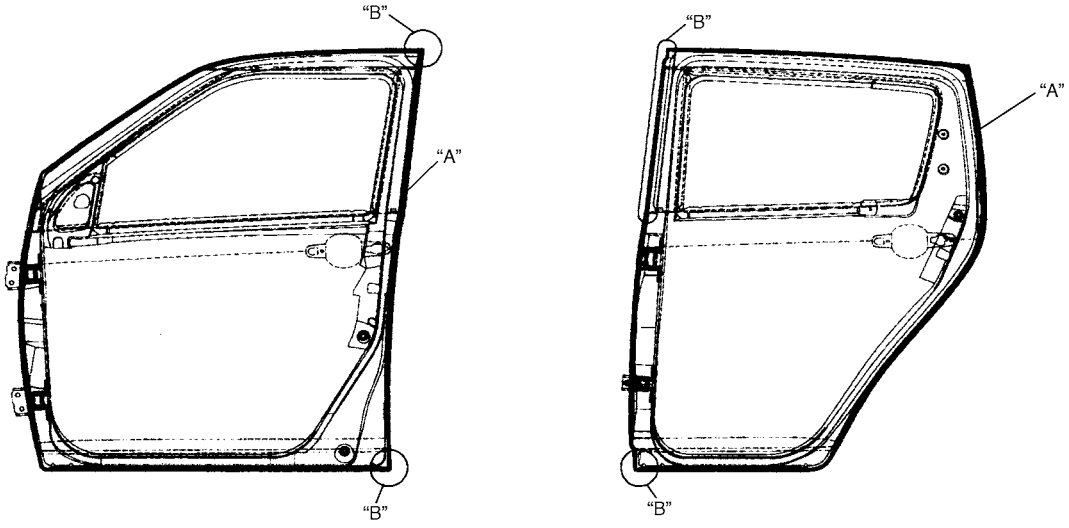
L1 – L1



L2 – L2



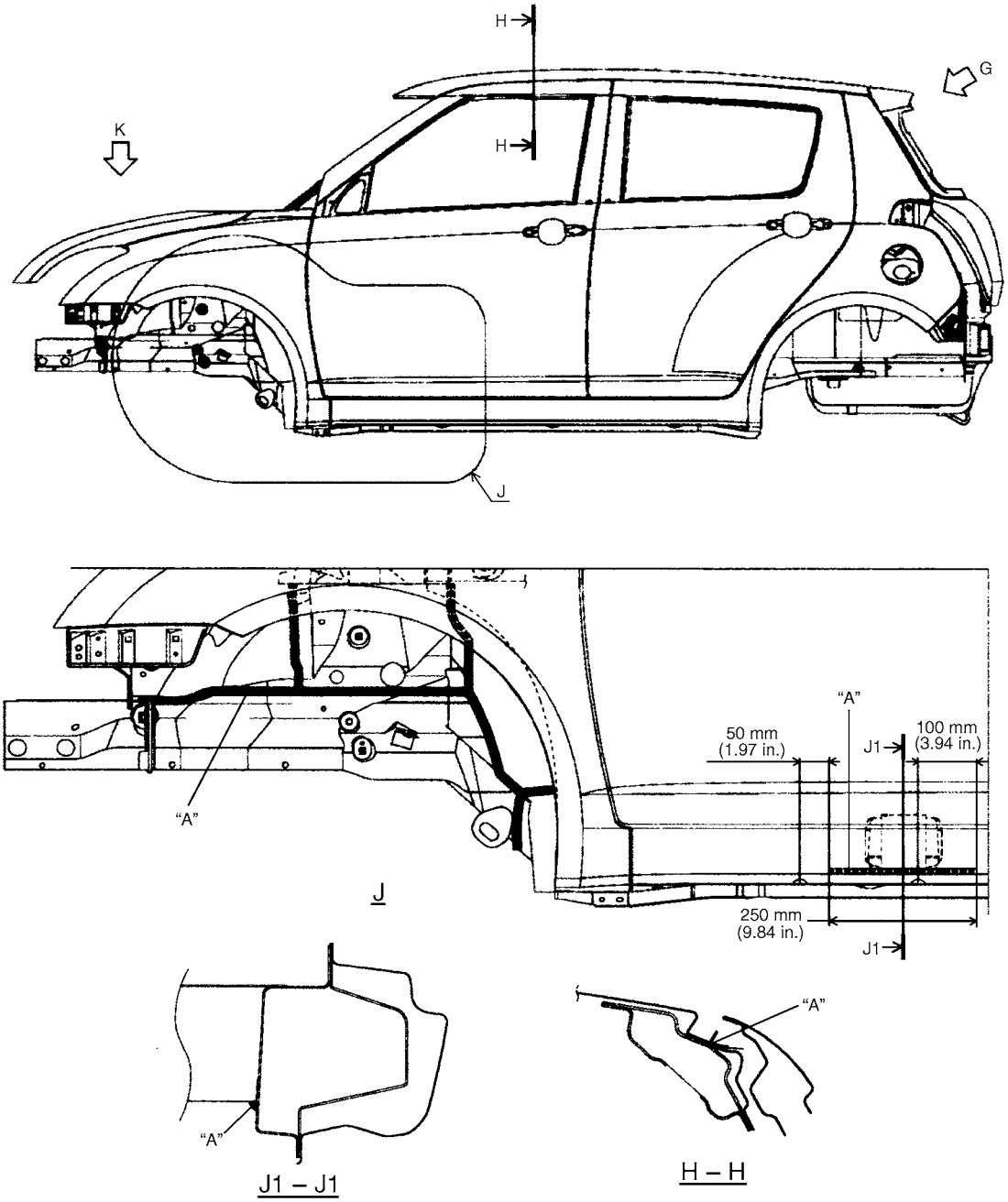
L



N

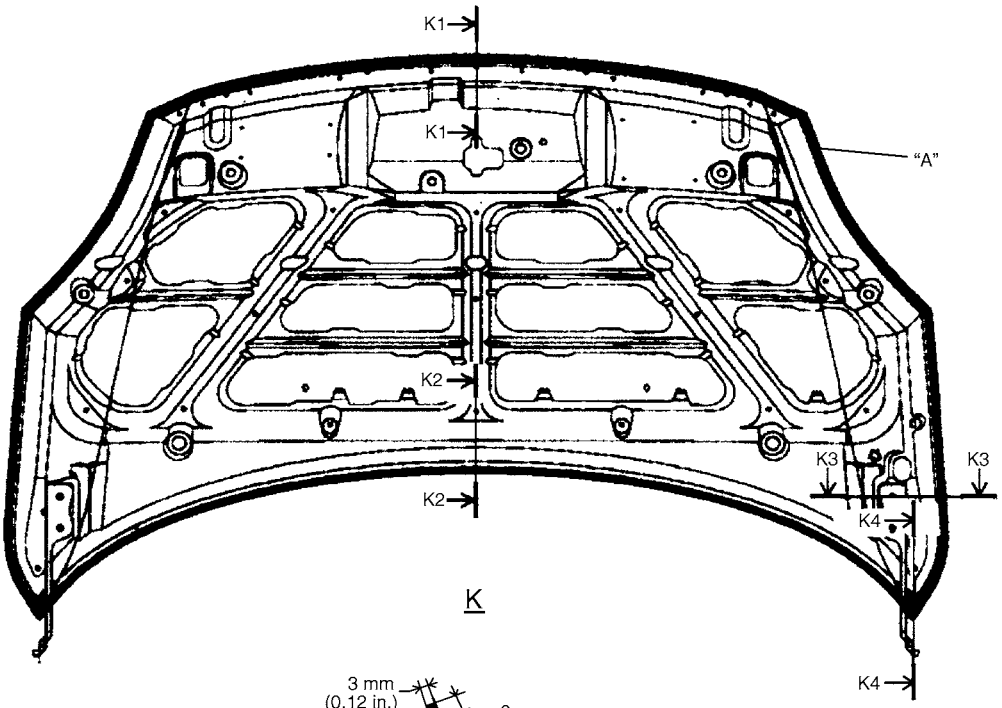
I4RS0A9C0003-

"A": Apply sealant.	"C": Smooth out sealant with a brush.	"E": Apply sealant covering flange end (between "c" and "d").
"B": Wipe off excess sealant after application.	"D": Do not apply sealant.	

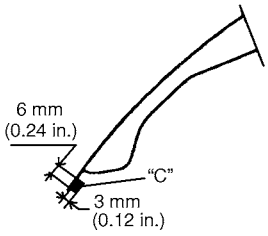


I4RS0A9C0004-

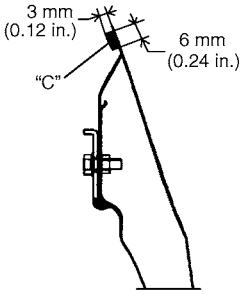
"A": Apply sealant



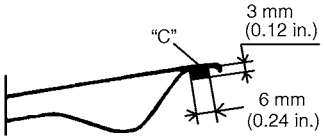
K



K1 – K1

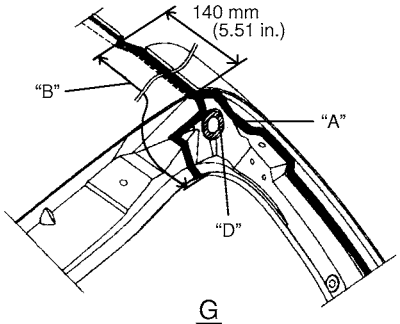


K3 – K3



K2 – K2

K4 – K4



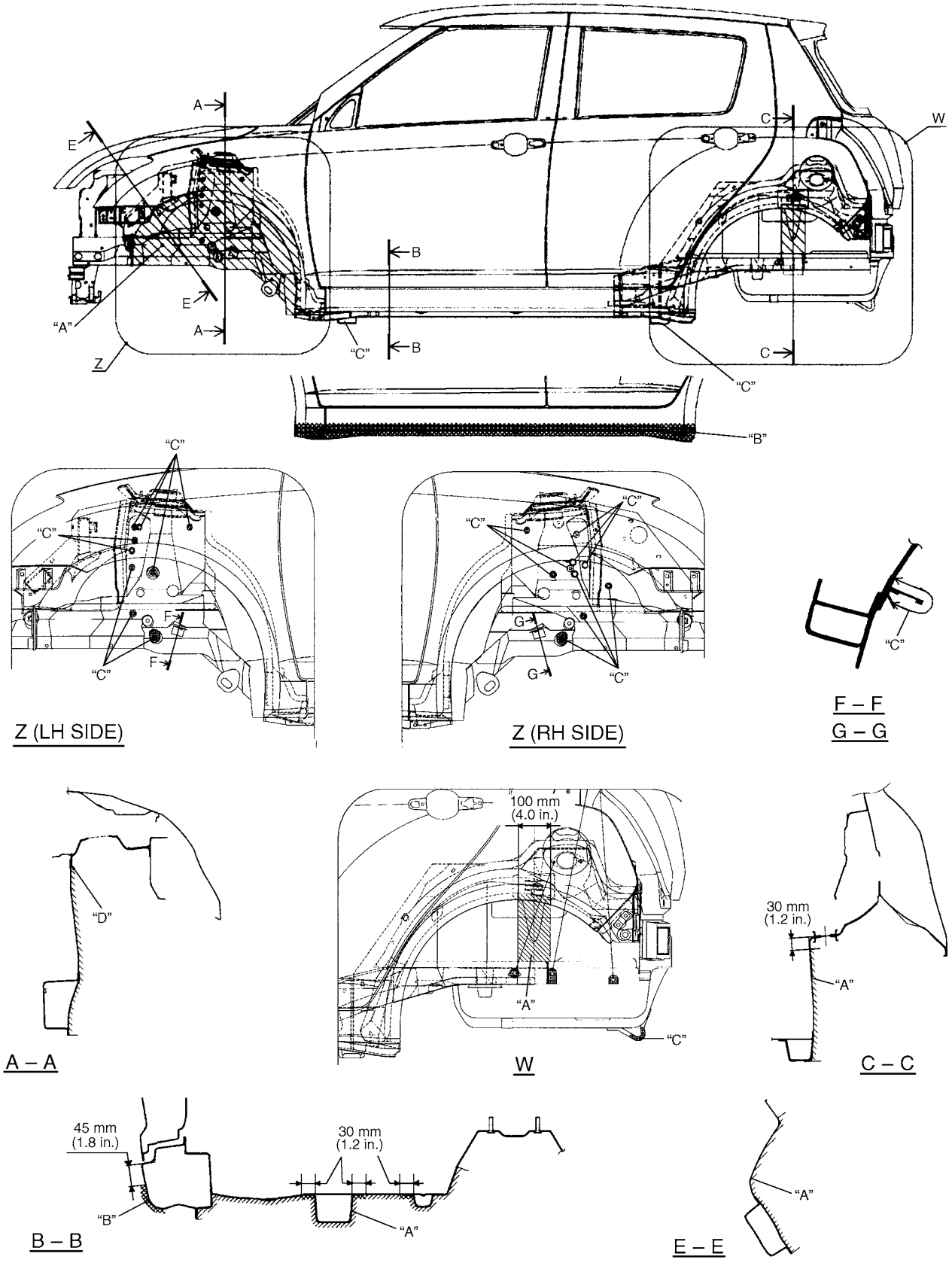
G

I4RS0A9C0005-

"A": Apply sealant.	"C": Apply sealant covering flange end.
"B": Wipe off excess sealant after application.	"D": Do not apply sealant.

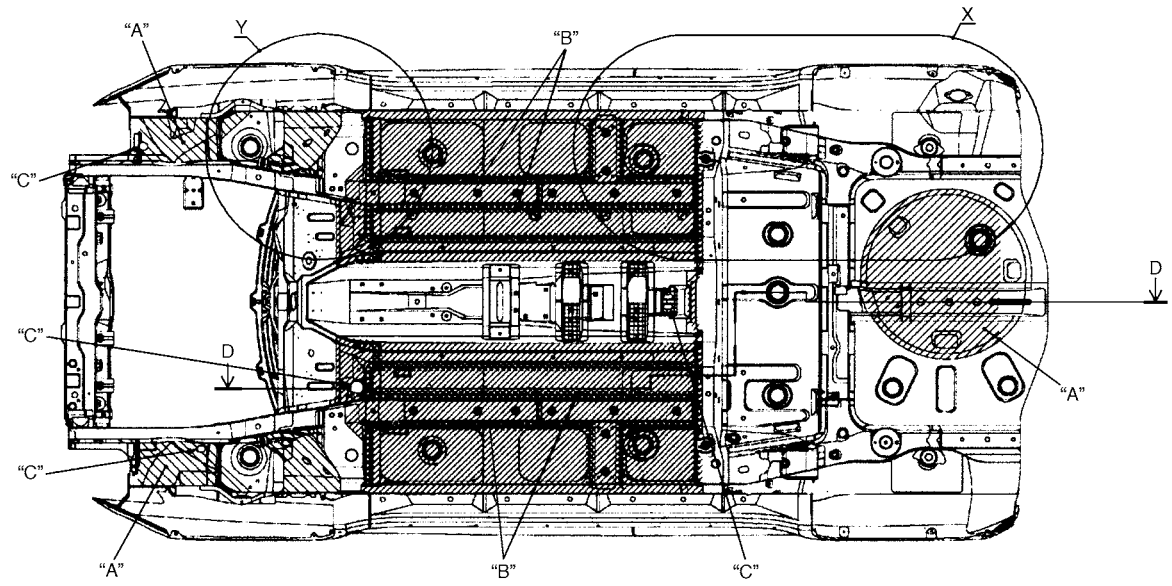
Under Coating Application Areas

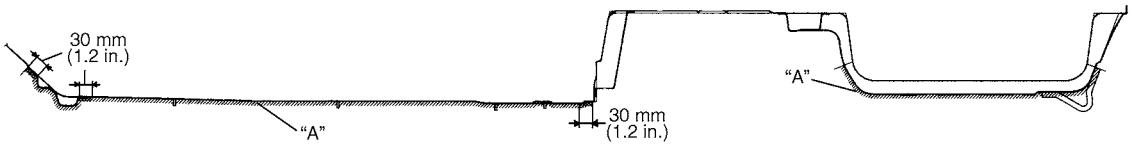
S4RS0A9C03002



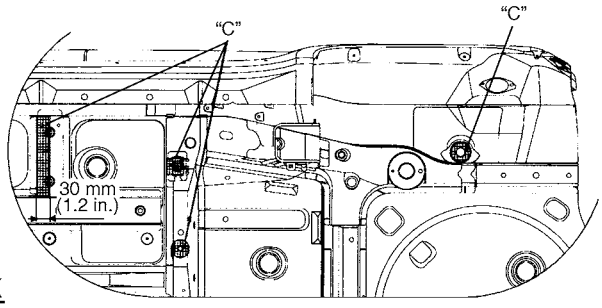
I4RS0A9C0006-

"A": Apply undercoating (PVC, 400 μm or more).	"C": Do not apply undercoating.
"B": Apply anti-chip coat (300 μm or more).	"D": Apply undercoating (PVC, 400 μm or more) covering flange end.

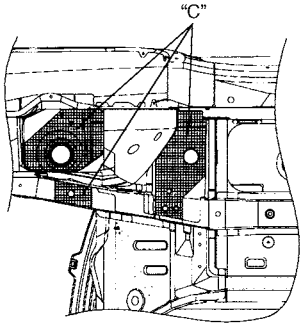




D-D



X



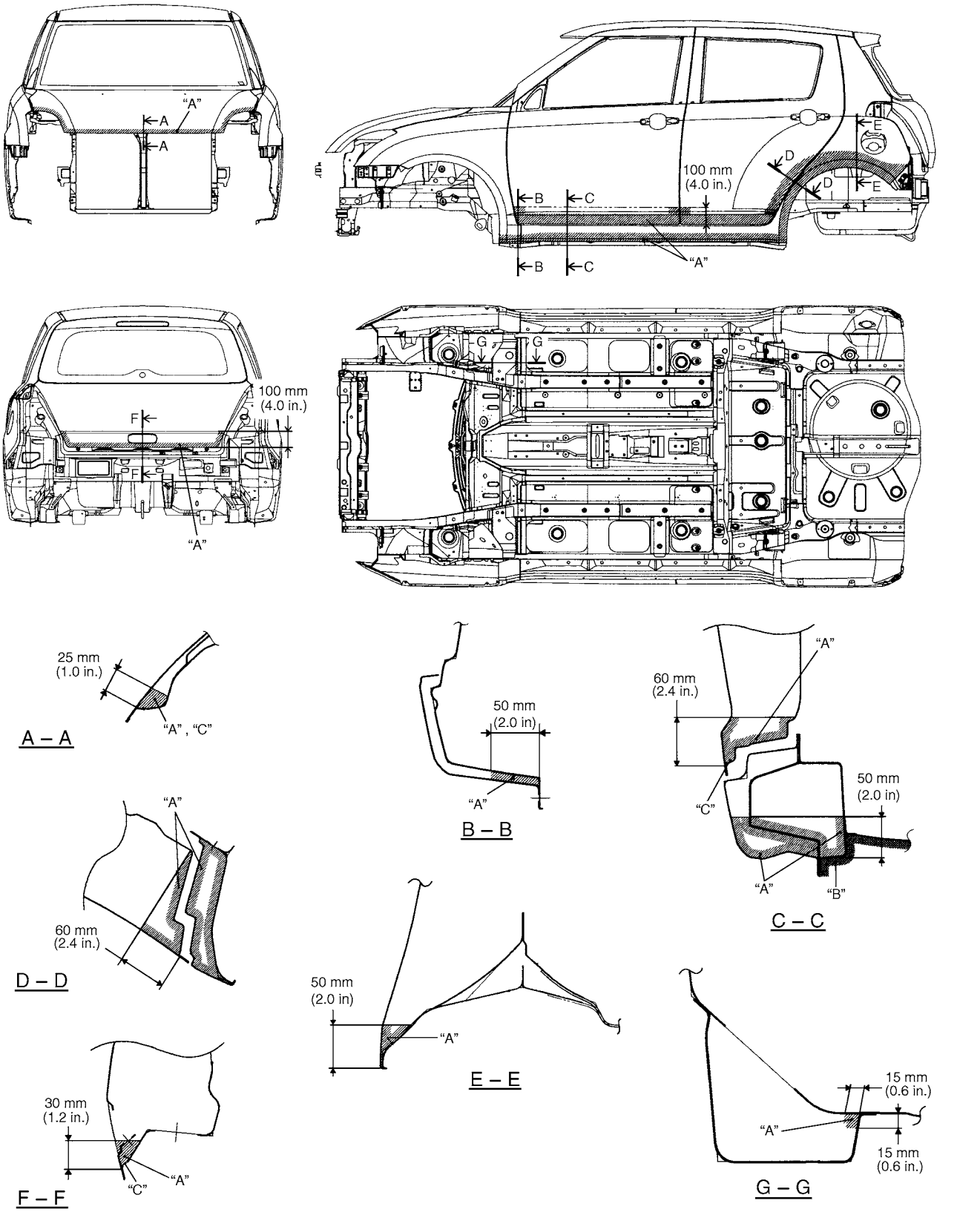
Y

I4RS0A9C0007-

"A": Apply undercoating (PVC, 400 μm or more).	"C": Do not apply undercoating.
"B": Apply undercoating (PVC, 600 μm or more).	

Anti-Corrosion Compound Application Area

S4RS0A9C03003



I4RS0A9C0008-

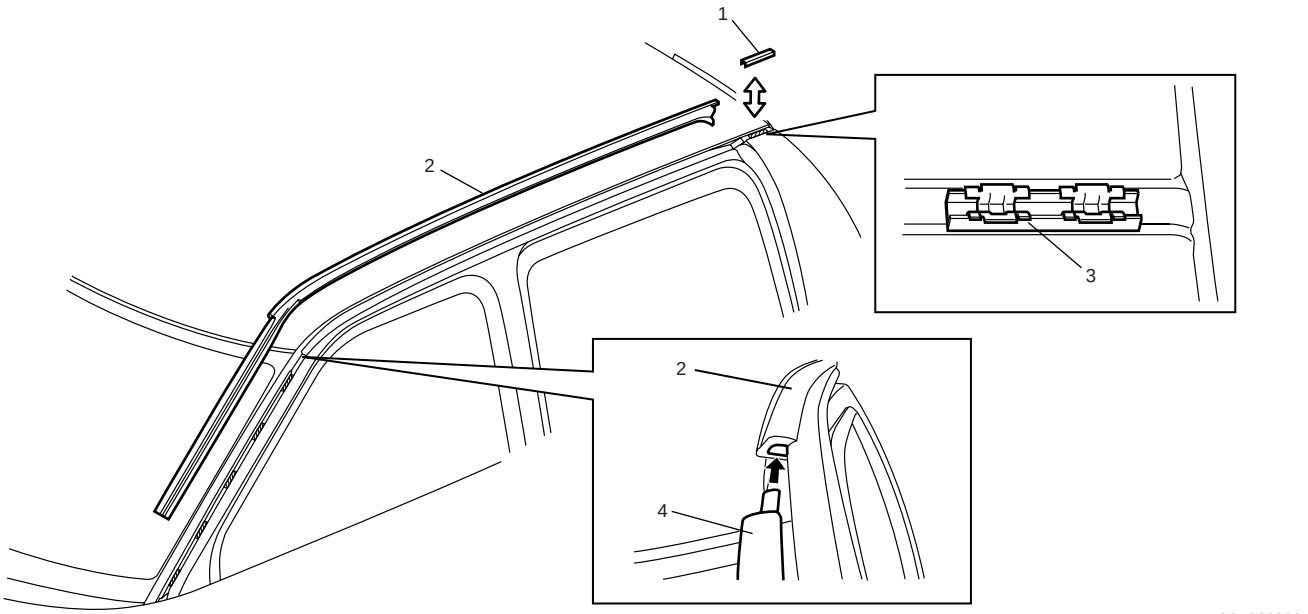
"A":	Apply rust proof wax (hot wax 50 μm or more).
"B":	Apply rust proof wax (high viscosity wax 50 μm or more).
"C":	Never fill up drain holes with rust proof wax.

Exterior Trim

Repair Instructions

Roof Molding Components

S4RS0A9D06005

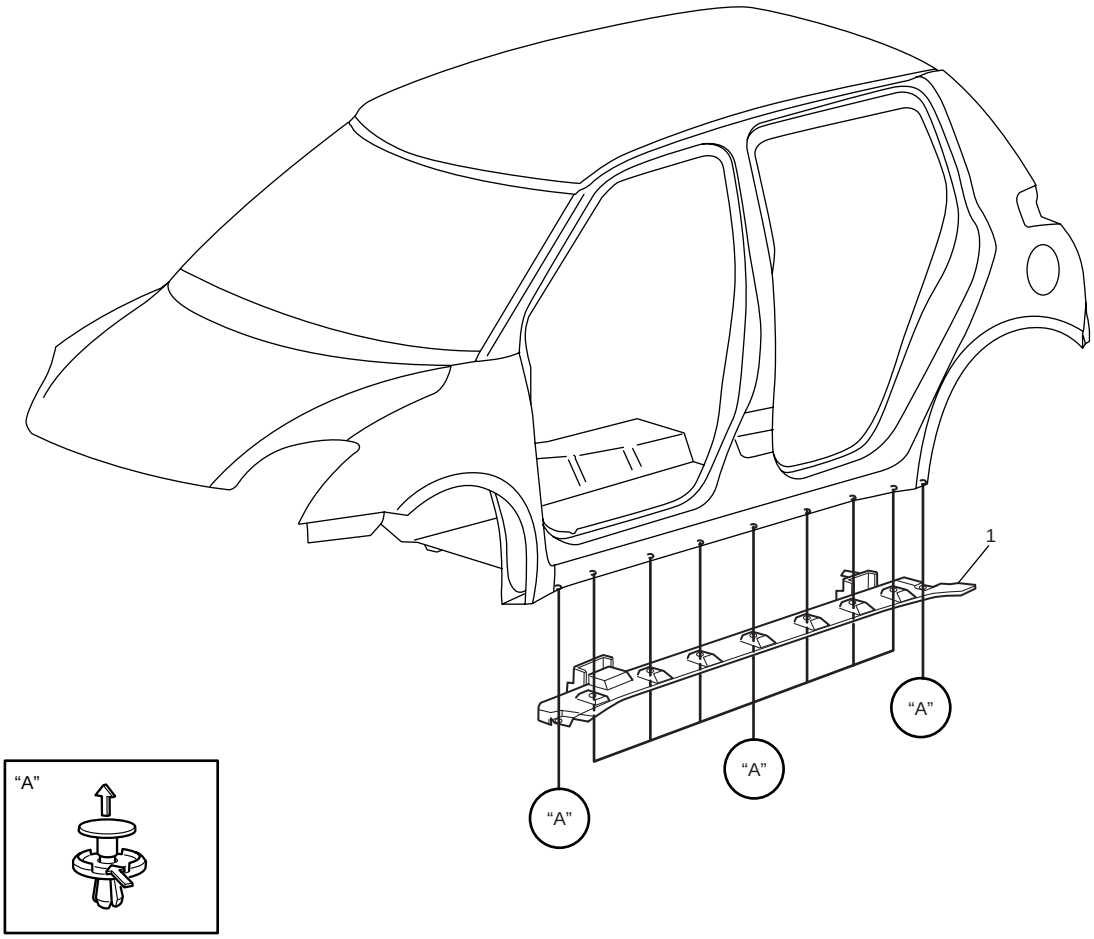


I4RS0A980009-

1. Roof molding	3. Roof molding clip (Push-in type)
2. Roof side weather-strip	4. Windshield side gamish

Splash Guard (If Equipped) Components

S4RS0A9D06006



I4RS0A980010-

1. Side sill splash guard

Section 10

Control systems

CONTENTS

Precautions 10-1
Precautions 10-1
Precautions for Control Systems 10-1

Body Electrical Control System 10B-1
Precautions 10B-1
Precautions in Diagnosing Trouble 10B-1
General Description 10B-1
BCM General Description 10B-1
CAN Communication System Description 10B-2
Schematic and Routing Diagram 10B-3
Body Electrical Control System Wiring Circuit Diagram 10B-3
Connector Layout Diagram of BCM and Junction Block Assembly 10B-6
Component Location 10B-7
BCM and Related System Component Location 10B-7
Diagnostic Information and Procedures 10B-8
BCM Self-Diagnosis Function 10B-8
Body Electrical Control System Check 10B-9
Scan Tool Data 10B-11
DTC Table 10B-13
DTC Check 10B-13
DTC Clearance 10B-15
BCM Power Circuit and Ground Circuit Check 10B-15
DTC B1133 (DTC No.1133): Battery Voltage Too High 10B-17
DTC B1141 / DTC B1142 / DTC B1143 (No.1141 / No. 1142/ No. 1143) Outside Air Temperature (Ambient Temp.) Sensor Circuit Malfunction 10B-18
DTC B1150 (No. 1150): Air Bag Communication Circuit Malfunction 10B-20
DTC B1157 (No.1157) Air Bag Deployment Signal Input 10B-22
DTC B1170 (No. 1170): EEPROM access error 10B-22
DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error) ... 10B-23
DTC U1073 (No. 1073): Control Module Communication Bus Off 10B-25
DTC U1100 (No.1100): Lost communication with ECM 10B-27
DTC U1101 (No.1101): Lost communication with TCM 10B-29
Inspection of BCM and its Circuits 10B-30
Repair Instructions 10B-39
BCM (Included in Junction Block Assembly) Removal and Installation 10B-39
Outside Air Temperature Sensor Removal and Installation 10B-39
Outside Air Temperature Sensor Inspection ... 10B-39
Special Tools and Equipment 10B-40
Special Tool 10B-40

Immobilizer Control System 10C-1
Precautions 10C-1
Precautions in Diagnosing Troubles 10C-1
Precaution in Replacing ECM 10C-1
Precautions in Handling Immobilizer Control System 10C-1
General Description 10C-2
Immobilizer Control System Introduction 10C-2
Immobilizer Control System Components Location 10C-2
On-Board Diagnostic System Description (Self-diagnosis Function) 10C-3
Schematic and Routing Diagram 10C-3
Immobilizer Control System Wiring Circuit Diagram 10C-3
Diagnostic Information and Procedures 10C-5
Immobilizer Control System Check 10C-5
Diagnostic Trouble Code (DTC) Check 10C-5
Diagnostic Trouble Code (DTC) Clearance 10C-5
Diagnostic Trouble Code (DTC) Table 10C-6
Scan Tool Data 10C-6
DTC P1614 Transponder Response Error 10C-7
DTC P1621 Immobilizer Communication Line Error 10C-8
DTC P1622 EEPROM Error 10C-10
DTC P1623 Unregistered Transponder 10C-10
DTC P1625 Immobilizer Antenna Error 10C-11
Inspection of Immobilizer Control Module and Its Circuit 10C-12
Repair Instructions 10C-14
Immobilizer Control Module Removal and Installation 10C-14
Registration of the Ignition Key 10C-14
Procedure after ECM Replacement 10C-14
Special Tools and Equipment 10C-14
Special Tool 10C-14

Precautions

Precautions

Precautions for Control Systems

S4RS0AA000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Body Electrical Control System

Precautions

Precautions in Diagnosing Trouble

S4RS0AA200001

- Diagnostic information stored in BCM memory can be cleared as well as checked by using SUZUKI scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00" before inspection and observe what is written there.
- Communication of ECM, TCM (if equipped), combination meter and BCM, is established by CAN (Controller Area Network). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System: in Section 00".

General Description

BCM General Description

S4RS0AA201001

The Body electrical Control Module (BCM) is incorporated in junction block assembly. Do not attempt removal of BCM from junction block assembly as it may cause contact failure.
The BCM incorporates relays and controllers which are used for the following systems and controls them.

- Power door lock
- Keyless entry
- Rear wiper
- Combination meter
- Interior light
- Warning buzzer
- Rear end door window defogger
- Rear end door opener
- Alarm indicator lamp

Also, the BCM has a function to cause the interior light and open door warning lamp in the combination meter to turn off when any door is left open for longer than 15 minutes to reduce wasteful battery consumption.
In addition, it is possible to check operation of actuator which is controlled by BCM by using the output test function of SUZUKI scan tool to operate actuator simulatively.

CAN Communication System Description

S4RS0AA201002

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a functionality to detect a communication error automatically.
Each module reads necessary data from the received data and transmits data. BCM communicates with each control module about the following information.

[A]: Data which BCM (1) transmits to ECM (2)

- Air conditioning switch signal
- Electric load (Rear end door window defogger switch signal)
- Ignition switch signal

[B]: Data which BCM receives from ECM

- Vehicle speed signal
- Engine coolant temperature signal
- Fuel consumption signal (Distance kilometers per liter of fuel)

[C]: Data which BCM transmits to TCM (A/T model) (3)

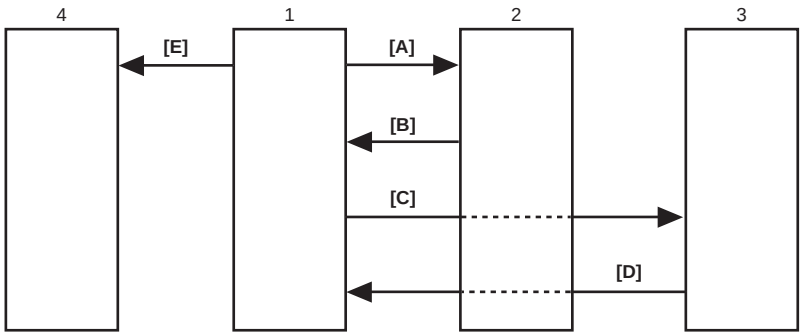
- “3” position switch signal (“2” or “3” range signal of A/T selector lever)

[D]: Data which BCM receives from TCM (A/T model)

- Transmission range sensor signal (A/T select lever position indicator)

[E]: Data which BCM transmits to combination meter (4)

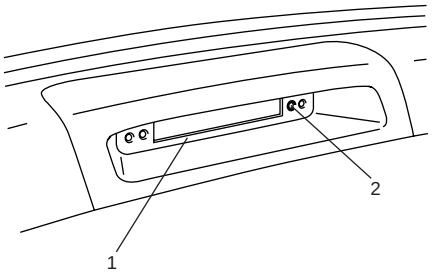
- Brake fluid level switch signal
- Parking brake switch signal
- Driver side seat belt buckle switch signal
- Charging system warning lamp signal
- Engine oil pressure switch signal
- Lighting switch signal
- Door switch signal



I4RS0AA20032-

Alarm Indicator Lamp

The information display (1) of this vehicle includes an alarm indicator lamp (2) for the theft preventive purpose. The BCM makes the alarm indicator lamp flash at certain intervals after the ignition switch is turned off until it is turned on again. Also, to check DTCs stored in BCM without using a SUZUKI scan tool when diagnosing troubles, it is possible to identify them by flashing patters of the alarm indicator lamp.



I4RS0AA20031-

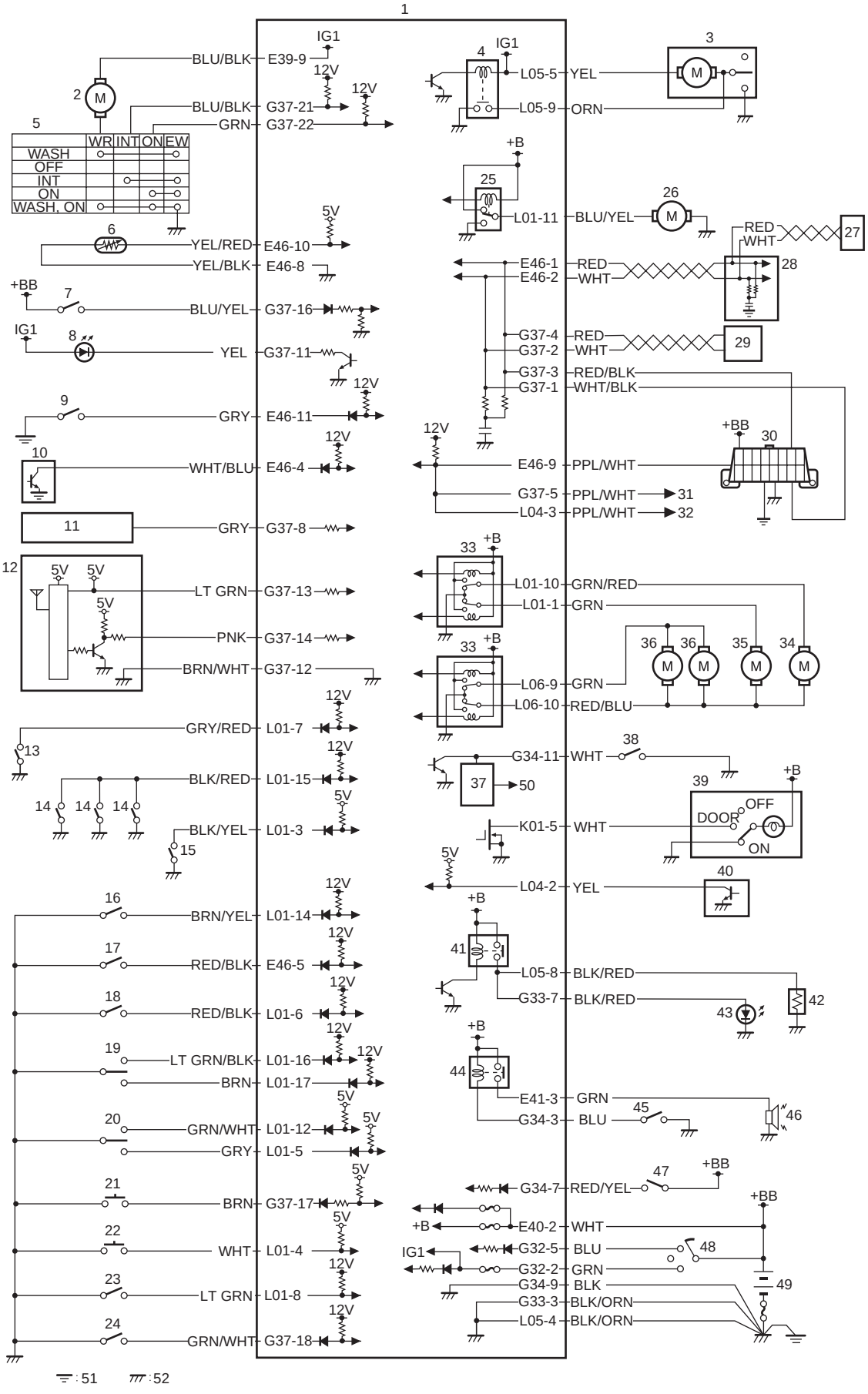
Schematic and Routing Diagram

Body Electrical Control System Wiring Circuit Diagram

S4RS0AA202001

NOTE:

This wiring diagram shows circuits related to only BCM, not the entire circuits of BCM and junction block. Refer to “Power Supply Diagram: in Section 9A” for wiring circuits other than the figure below.



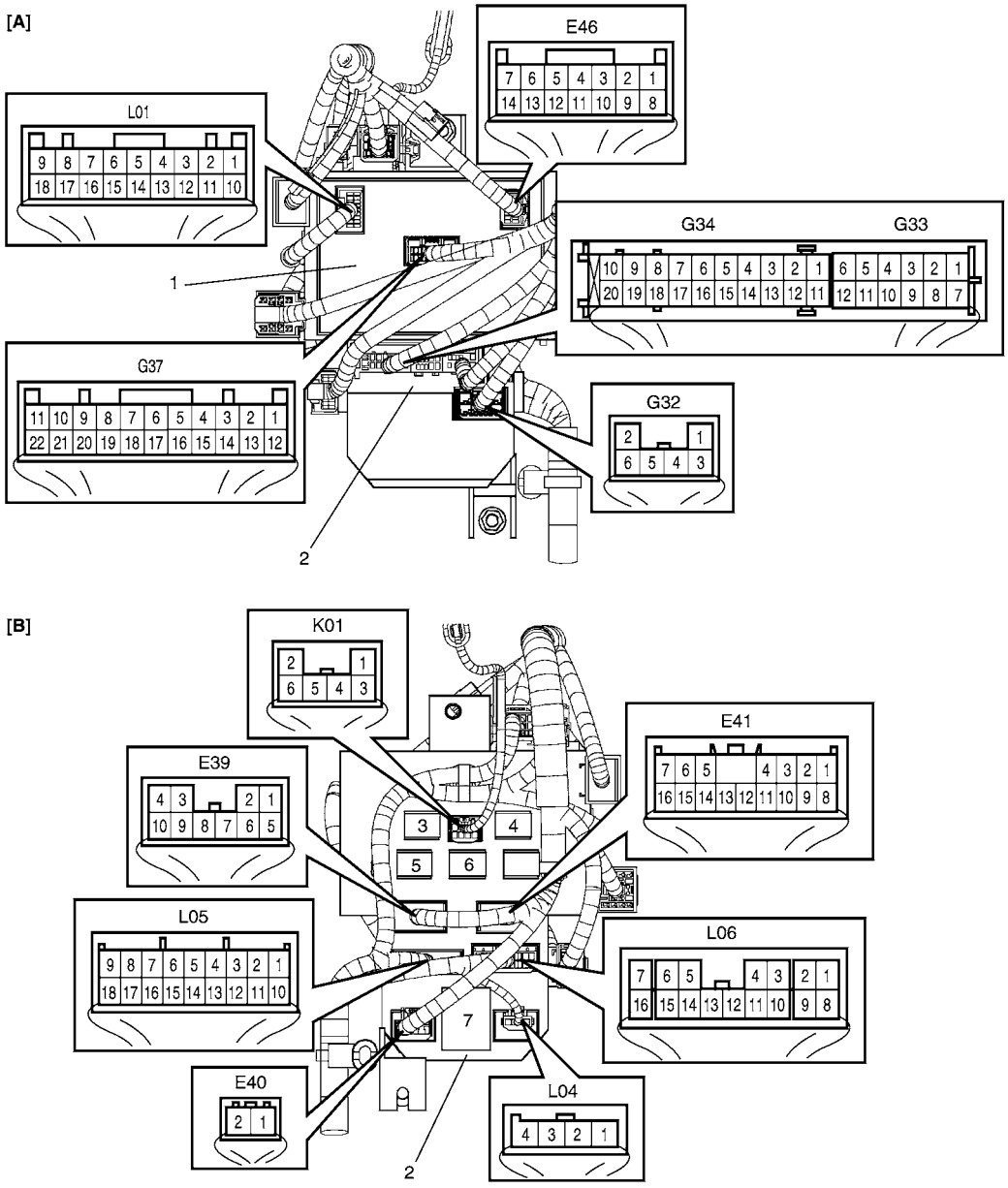
I4RS0AA20002-

1. BCM (included in junction block assembly)	19. Door key cylinder switch (included in door lock actuator)	37. Turn signal and hazard warning relay
2. Rear washer motor	20. Manual door lock switch	38. Hazard warning switch
3. Rear wiper motor	21. Rear end door window defogger switch	39. Interior light
4. Rear wiper relay	22. Rear end door opener switch	40. Air bag control module
5. Rear wiper and washer switch	23. “3” position switch	41. Rear window defogger relay
6. Outside air temperature sensor	24. A/C switch	42. Rear window defogger
7. Ignition key switch	25. Rear end door opener relay	43. Rear window defogger indicator lamp
8. Alarm indicator light	26. Rear end door opener actuator	44. Horn relay
9. Oil pressure switch	27. TCM	45. Horn switch
10. Generator	28. ECM	46. Horn
11. Information display	29. Combination meter	47. Lighting switch
12. Keyless entry receiver	30. Data link connector (DLC)	48. Ignition switch
13. Driver side door switch	31. To ECM	49. Battery
14. Other than driver side door switch	32. To SDM	50. To turn signal light
15. Rear end door switch	33. Door lock motor relay	51. Body ground
16. Driver side seat belt switch	34. Driver side door lock actuator	52. Engine ground
17. Brake fluid level switch	35. Passenger side door lock actuator	
18. Parking brake switch	36. Rear door lock actuator	

Connector Layout Diagram of BCM and Junction Block Assembly

S4RS0AA202002

BCM and junction block assembly connectors (viewed from harness side)



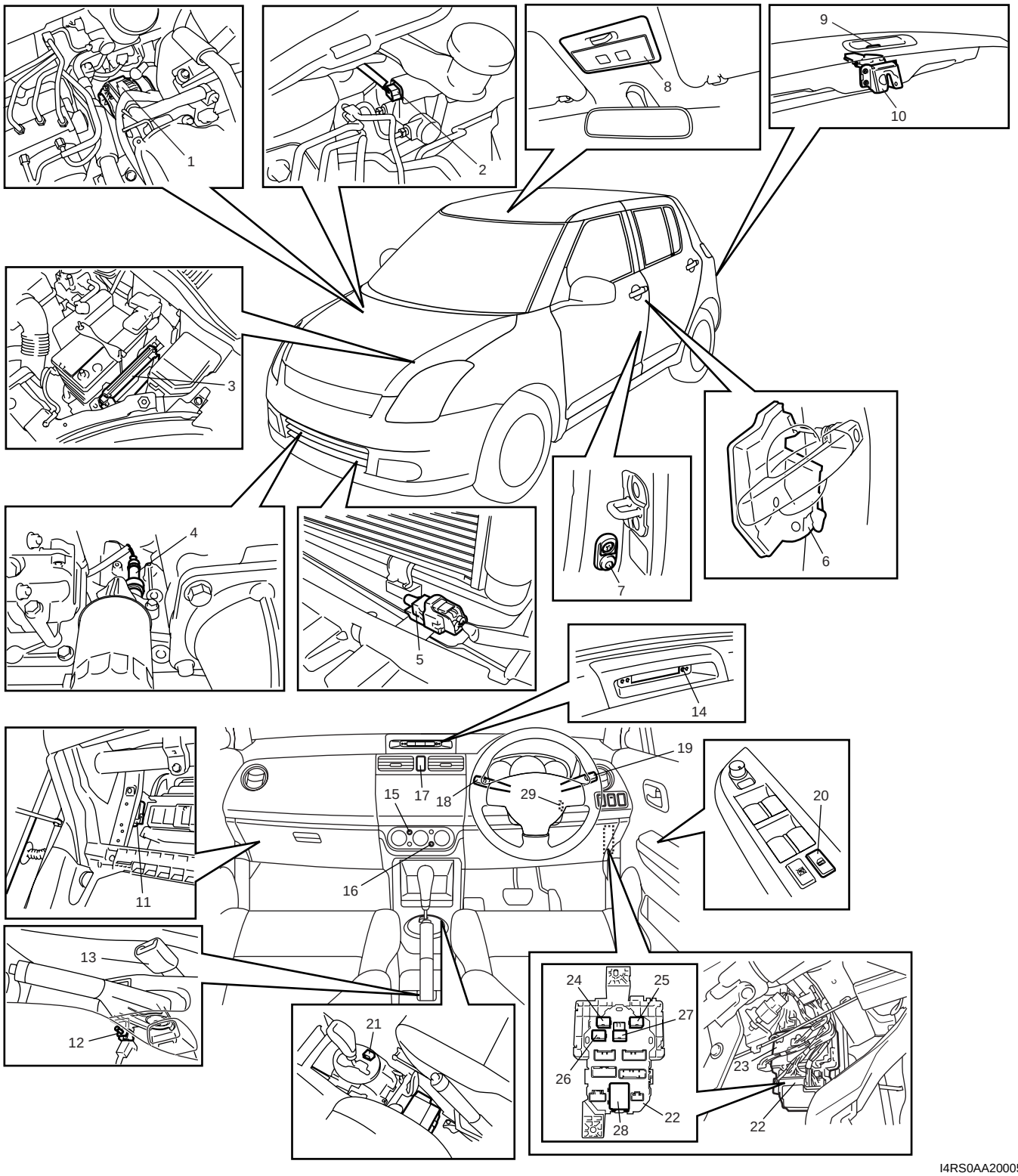
I4RS0AA20004-

[A]: Junction block assembly (viewed from BCM side)	4. Horn relay
[B]: Junction block assembly (viewed from relay side)	5. Rear wiper relay
1. BCM	6. Rear end door window defogger relay
2. Junction block assembly	7. Turn signal and hazard warning relay
3. Heater relay	

Component Location

BCM and Related System Component Location

S4RS0AA203001



I4RS0AA20005-

1. Generator	11. Keyless entry receiver	21. “3” position switch
2. Brake fluid level switch	12. Parking brake switch	22. Junction block switch
3. ECM	13. Seat belt buckle switch	23. BCM
4. Oil pressure switch	14. Alarm indicator lamp	24. Heater relay
5. Outside air temperature sensor	15. Rear end door window defogger switch	25. Horn relay

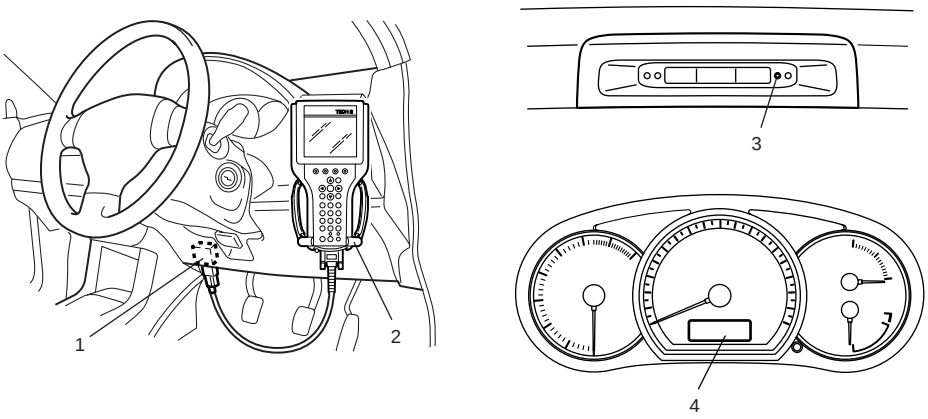
6. Door lock actuator (incorporated in key cylinder switch)	16. A/C switch	26. Rear wiper relay
7. Door switch	17. Hazard warning switch	27. Rear end door window defogger relay
8. Interior light	18. Rear wiper switch	28. Turn signal and hazard warning relay
9. Rear end door opener switch	19. Lighting switch	29. Key reminder switch (included in ignition switch)
10. Rear end door lock actuator (incorporated in door switch)	20. Manual door lock switch	

Diagnostic Information and Procedures

BCM Self-Diagnosis Function

S4RS0AA204001

- BCM monitors conditions of the system components and its circuit with ignition switch turned to ON position. When an abnormality in the system occurs, the area where that abnormality lies is stored in the memory of EEPROM in BCM.
- DTC can be checked in either one of following ways.
  - DTC can be checked by SUZUKI scan tool (2) connected to DTC (1).
  - DTC can be read from flashing pattern of alarm indicator lamp (3). Also, DTC is displayed on combinations meter (4) at the same time.



I4RS0AA20006-

BCM input / output table

Control	Input	Output
Power door lock system	• Key cylinder switch • Manual door lock switch	• Driver side door lock actuator • Other than driver side door lock actuator
Keyless entry system	• Key reminder switch • Keyless entry receiver • Driver side door switch	• Driver side door lock actuator • Other than driver side door lock actuator • Turn signal and hazard warning relay • Interior light
Rear wiper	• Rear wiper INT switch • Rear wiper LO switch	• Rear wiper relay

Control	Input	Output
Combination meter	• Tail light switch • Oil pressure switch • Parking brake switch • Driver side seat belt switch • Brake fluid level switch • Generator • ECM (engine speed signal, vehicle speed signal, engine coolant temperature signal) • TCM (transmission range sensor signal) (for A/T vehicle only)	• Combination meter
Interior light	• Each door switch • Key reminder switch	• Interior light
Warning buzzer	• Key reminder switch • Tail light switch • Driver side door switch	• Warning buzzer (located in BCM)
Rear end door window defogger	• Rear end door window defogger switch • Generator	• Rear end door window defogger relay
Rear end door opener	• Manual door lock switch (unlock signal) • Key cylinder switch (unlock signal) • Keyless entry transmitter (unlock signal) • Rear end door switch	• Rear end door opener relay
Alarm indicator lamp	• Key reminder switch	• Alarm indicator lamp (located in information display)

Body Electrical Control System Check

S4RS0AA204002

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	☞ **Problem symptom confirmation** 1) Perform problem symptom confirmation. *Does trouble recur?*	Go to Step 3.	Go to Step 7.
3	☞ **DTC check** 1) Check DTC. *Is it malfunction code?*	Go to Step 4.	Go to Step 5.
4	☞ **Troubleshooting for DTC** 1) Check and repair according to DTC diag. flow. *Are check and repair completed?*	Go to Step 7.	Check and repair malfunction part(s).
5	☞ **Body electrical control system symptom diagnosis** 1) Perform check and repair referring to “Symptom Diagnosis” of system having a trouble. *Is there faulty condition?*	Repair or replace malfunction part(s).	Go to Step 6.
6	☞ **Check for intermittent problem** 1) Check for intermittent problem. *Is there faulty condition?*	Repair or replace malfunction part(s).	Go to Step 7.

Step	Action	Yes	No
7	☞ **Final confirmation test** 1) Clear DTC referring to “DTC Clearance: ”. 2) Check DTC referring to “DTC Check: ”. *Is there any DTC?*	Go to Step 4.	End.

Customer Complaint Analysis
Record details of the problem (failure, complaint) and how it occurred as described by the customer.
For this purpose, use of such a questionnaire form as shown in the figure will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (example)

Customer’s Name:	Model:	VIN:	
Date of Issue:	Date Reg.	Date of Problem:	Mileage:
Problem Symptoms	• Power door lock system does not operate • Keyless entry system does not operate • Rearend door window defogger does not operate • Rear wiper does not operate • Rearend door opener does not operate • Warning buzzer does not sound • Interior light does not light • Alarm indicator lamp does not flash		
Frequency of Occurrence	• Continuous / Intermittent (_____ times a day, a month) / other_____		
Environmental Condition	• Weather: fair / cloudy / rain / snow / other_____ • Temperature: _____ ° F (_____ ° C)		
Diagnostic Trouble Code	• Normal code / malfunction code(_____)		

I4RS0AA20013-

Problem Symptom Confirmation
Check if what the customer claimed in “Customer Questionnaire” is accurately found in the vehicle. If that symptom is found, check whether the symptom is identified as a failure. (This step should be shared with the customer if possible.)

DTC check
Check DTC stored in BCM memory referring to “DTC Check: ”, record it and then clear it referring to “DTC Clearance: ”. DTC indicates malfunction that occurred in the system but does not indicate whether it exists now or it occurred in the past and the normal condition has been restored now. To check which case applies, clear DTC once and check whether or not any fault exists.

Troubleshooting for DTC
Based on the DTC indicated in Step 3 and referring to applicable DTC flow, locate the cause of the trouble, namely in a sensor, wire harness, connector, BCM or other part and repair or replace faulty parts.

Body Electrical Control System Symptom Diagnosis
Check the parts or system suspected as a possible cause referring to symptom diagnosis of each system.

Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection: in Section 00”.

Final Confirmation Test
Confirm that the problem symptom has gone and the body electrical control system is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, check DTC again and confirm that no DTC is indicated.

Scan Tool Data

S4RS0AA204020

Scan tool Data	Condition	Normal condition / reference value
Vehicle Speed	At stop with ignition switch turned ON	0 km/h
Outside air Temp	Reference value is relative to outside air temperature	–40 °C – 70 °C (–40 °F – 158 °F)
Battery Voltage	At specified idle speed after warming up	10 – 14 V
Coolant Temp	At specified idle speed after warming up	80 °C – 100 °C (176 °F – 212 °F)
Engine Speed	Engine idling with no load applied after warming up	Desired idle speed ± 50 rpm
Fuel Consumption	At specified idle speed after warming up	0.0 km/l
Key Reminder Sw	Ignition key inserted in ignition key cylinder	Key in
	Ignition key pulled out from ignition key cylinder	Pulled
Rear Wiper Sw	Rear wiper switch at ON position and ignition switch turned ON	ON
	Rear wiper switch at INT position and ignition switch turned ON	INT
	Rear wiper switch at OFF position and ignition switch turned ON	OFF
Door key Sw	Key cylinder switch of driver side door at lock position	LOCK
	Key cylinder switch of driver side door not turned	Neutral
	Key cylinder switch of driver side door at unlock position	Unlock
Door Lock Sw	Lock side of manual door lock switch pressed	LOCK
	Manual door lock switch not pressed	Neutral
	Unlock side of manual door lock switch pressed	Unlock
Driv Door Sw	Driver side door open	Open
	Driver side door closed	Close
Pass Door Sw	Doors other than driver side door open	Open
	Doors other than driver side door closed	Close
Brake Fluid Level	Brake fluid level at MIN level or higher	Normal
	Brake fluid level lower than MIN level	Low
Parking Brake Sw	Parking brake lever pulled	ON
	Parking brake lever released	OFF
Rear Defogger Sw	Rear end door window defogger switch turned ON with engine running	ON
	Rear end door window defogger switch turned OFF with engine running	OFF
Driv Seatbelt Sw	Driver side seat belt fastened	Fasten
	Driver side seat belt unfastened	Unfasten
Rear end door opener	Rear end door open	ON
	Rear end door closed	OFF
“3” Position Sw	A/T select lever at 2nd or 3rd position with ignition switch turned ON	ON
	A/T select lever at other than 2nd or 3rd position with ignition switch turned ON	OFF
Charge Lamp	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
Oil pressure switch	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
A/C Switch	A/C and ignition switch turned ON	ON
	A/C switch turned OFF	OFF

Scan Tool Data Definitions

Vehicle Speed (km/h, mph): It is computed based on pulse signals from vehicle speed sensor on transmission.
Outside air Temp (°C, °F): It is detected by outside air temperature sensor.
Battery Voltage (V): This parameter indicates battery positive voltage inputted to BCM.
Coolant Temp (Engine coolant temperature) (°C, °F): It is detected by engine coolant temperature sensor.
Engine Speed (RPM): It is computed by reference pulse signals from CMP sensor.
Fuel Consumption (km/l): This parameter indicates the fuel consumption computed by ECM.
Key Reminder Sw (Key remainder switch) (Pulled / Key in): This parameter indicates the state of the key reminder switch.
Rear Wiper Sw (Rear wiper switch) (ON / INT / OFF): This parameter indicates the state of the rear wiper switch.
Door key Sw (Door key cylinder switch) (Lock / Neutral / Unlock): This parameter indicates the state of the door key cylinder switch.
Door lock Sw (Manual door lock switch) (Lock / Neutral / Unlock): This parameter indicates the state of the manual door lock switch.
Driv Door Sw (Driver side door switch) (Open / Close): This parameter indicates the state of the driver side door switch.
Pass Door Sw (Other than driver side door switch) (Open / Close): This parameter indicates the state of the door switches other than driver side door switch.
Brake Fluid Level (Low / Normal): Low: Brake fluid level is lower than specified level.
Normal: Brake fluid level is higher than MIN level.
Parking Brake Sw (Parking brake switch) (ON / OFF): ON: Parking brake lever is pulled up.
OFF: Parking lever is released
Rear Defogger Sw (Rear end door window defogger switch) (ON / OFF): This parameter indicates the state of the rear end door window defogger switch.
Driv Seatbelt Sw (Driver seat belt switch) (Fasten / Unfasten): This parameter indicates the state of the driver side seat belt buckle switch.
Rear end Door Opener (Rear end door opener switch) (ON / OFF): This parameter indicates the state of the rear end door opener switch.
"3" position Sw (ON/OFF): This parameter indicates the state of the "3" position switch included in A/T manual selector assembly.
Charge lamp (ON / OFF): This parameter indicates the state of the charge system monitor switch.
Oil pressure switch (ON / OFF): This parameter indicates the state of the oil pressure switch.
A/C Switch (ON / OFF): This parameter indicates the state of the air conditioning switch.

Diagnosis Using Output Test Function of SUZUKI Scan Tool

SUZUKI scan tool has the output test function which can force operation of following actuators and relays of the system controlled by BCM. When a malfunction is found in the system controlled by BCM, execute the output test which enables easy judgment whether the malfunction is on the input side or output side of BCM. For detailed information on operation of SUZUKI scan tool, refer to "SUZUKI Scan Tool Operator's Manual".

Item	Controlled Parts
Hazard warning light	Turn signal and hazard warning relay
Interior (Dome) light	Interior (Dome) light (when interior light switch is at DOOR position)
Door	Driver side door lock actuator
Rear end door open	Rear end door opener relay (when all doors are unlocked)
Warning buzzer	Warning buzzer (in BCM)
Rear wiper	Rear wiper relay
Alarm indicator	Alarm indicator light (in information display)
Rear defogger	Rear end door window defogger relay

DTC Table

S4RS0AA204004

DTC (displayed on SUZUKI scan tool)	DTC (indicated by alarm indicator lamp)	DTC (displayed on odometer in combination meter)	Detected item	Detecting condition
NO DTC	0000	0000	—	No DTC detected
☞ B1133	1133	b1133	Battery voltage too high	Battery voltage too high
☞ B1141	1141	b1141	Outside air temperature (ambient temperature) sensor circuit open	Sensor output voltage too high
☞ B1142	1142	b1142	Outside air temperature (ambient temperature) sensor circuit short to ground	Sensor output voltage too low
☞ B1143	1143	b1143	Outside air temperature (ambient temperature) sensor malfunction	Sensor output voltage out of specification
☞ B1150	1150	b1150	Air bag communication circuit malfunction	Air bag communication circuit open or short to ground
☞ B1157	1157	b1157	Air bag deployment signal input	Air bag deployment signal inputted
☞ B1170	1170	b1170	EEPROM access error	Memory error
☞ U1001	1001	U1001	High speed CAN communication bus	Transmitting error of BCM for specified time continuously
☞ U1073	1073	U1073	Control module communication bus off	Transmitting and receiving error of BCM for specified time continuously
☞ U1100	1100	U1100	Lost communication with ECM	Receiving error of BCM from ECM for specified time continuously
☞ U1101	1101	U1101	Lost communication with TCM	Receiving error of BCM from TCM for specified time continuously

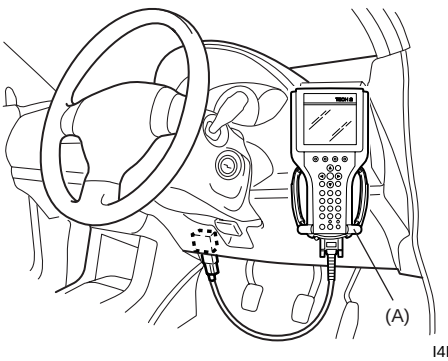
DTC Check

S4RS0AA204005

Using SUZUKI Scan Tool

1) Prepare SUZUKI scan tool.
2) With ignition switch turned OFF, connect it to data link connector (DLC) located on underside of instrument panel of driver's side.

Special tool
(A): SUZUKI scan tool



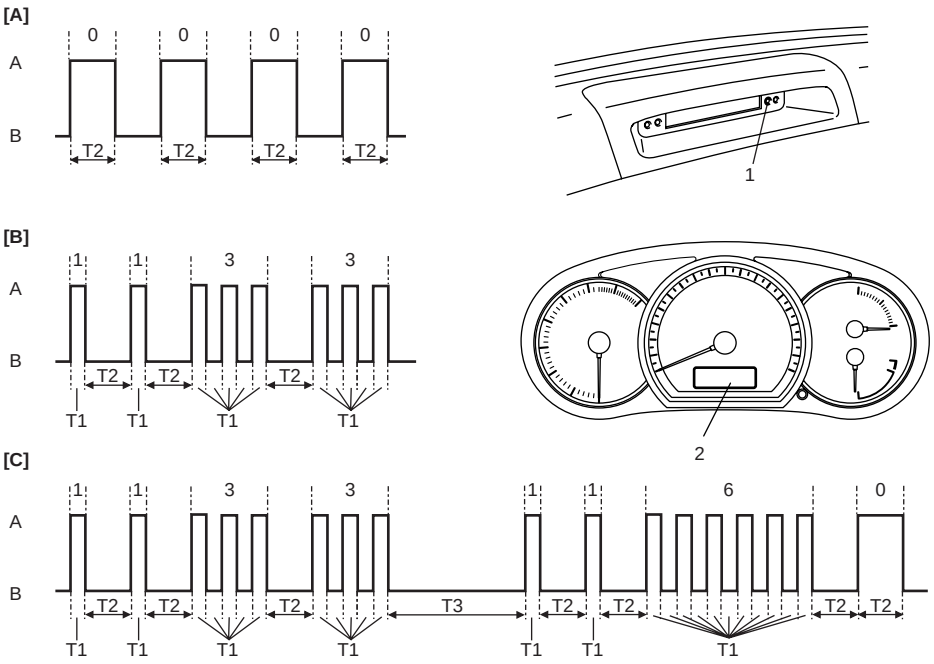
I4RS0AA20003-

3) Turn ignition switch ON.

4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down.
   Refer to SUZUKI scan tool operator's manual for further details.
   If communication between SUZUKI scan tool and BCM is not possible, check if SUZUKI scan tool is communicable by connecting it to BCM in another vehicle. If communication is possible in this case, SUZUKI scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from data link connector.

Without Using SUZUKI Scan Tool

1) Turn ignition switch to OFF position.
2) Perform following Steps a) to d) within 10 seconds after ignition switch is turned ON and engine stops.
   a) Turn headlight switch to "SMALL" position.
   b) Turn headlight switch to "OFF" position.
   c) Repeat Steps a) and b) 2 times.
   d) Press and release driver side door switch 3 times.
3) Check DTC displayed on odometer of combination meter or read flashing pattern of alarm indicator lamp which represents DTC as shown in the following example and write it down.
   When more than 2 DTCs are stored in memory, flashing for each DTC starts with the smallest DTC number in increasing order. Also, DTC is indicated repeatedly until the ignition switch is turned OFF.



I4RS0AA20007-

[A]: No DTC (No. 0000)	B: Indicator lamp turned OFF	1. Alarm indicator lamp
[B]: DTC B1133 (No. 1133)	T1: 0.3 seconds	2. Odometer
[C]: When 2 DTCs are detected	T2: 1.0 seconds	
A: Indicator lamp turned ON	T3: 3.0 seconds	

4) After completing the check, turn ignition switch to OFF position.

DTC Clearance

S4RS0AA204006

After repair or replace of malfunction part(s), clear all DTCs by performing the following procedure.

Using SUZUKI Scan Tool

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch ON and engine stops.
3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch off and disconnect scan tool from data link connector.

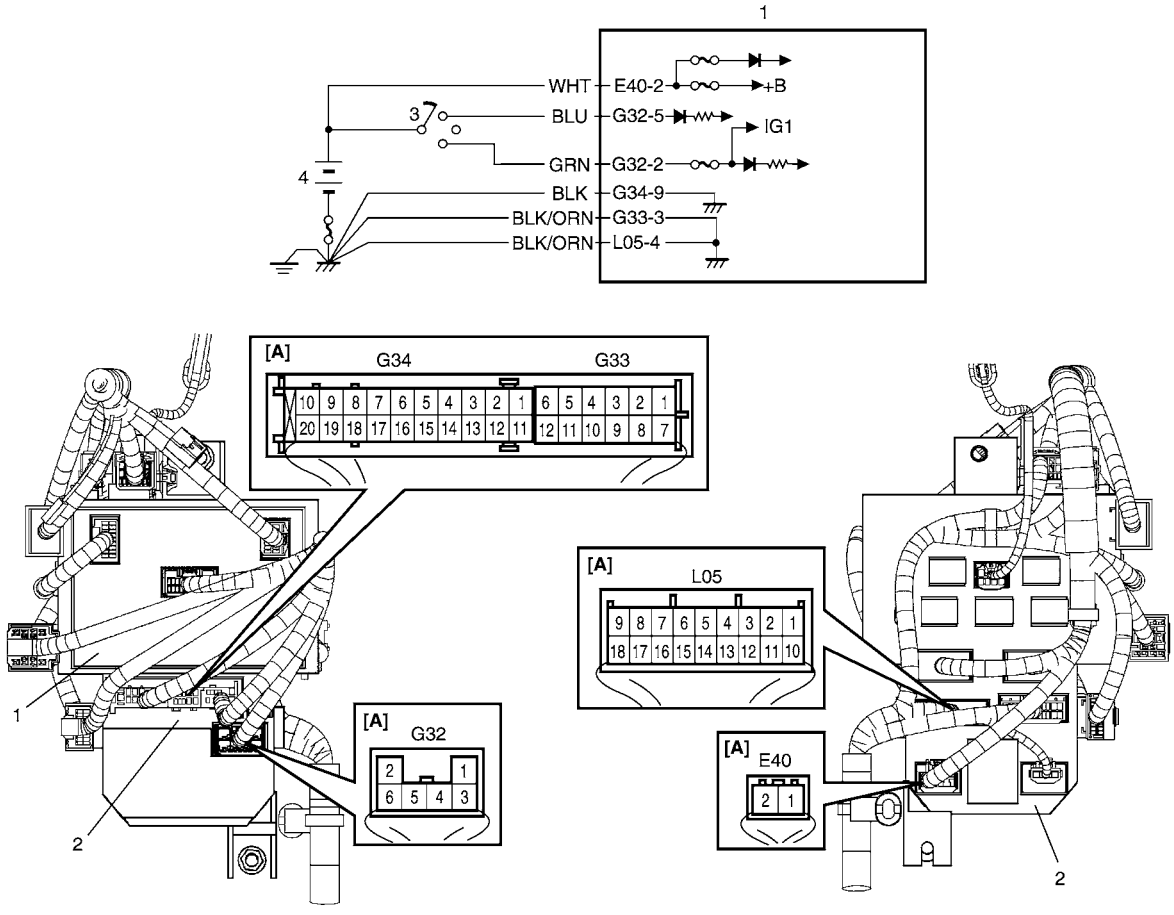
Without Using SUZUKI Scan Tool

1) Turn ignition switch to OFF position.
2) Perform following Steps a) to d) within 10 seconds after ignition switch is turned ON and engine stops.
   a) Turn headlight switch to "SMALL" position.
   b) Turn headlight switch to "OFF" position.
   c) Repeat Steps a) and b) 3 times.
   d) Press and release driver side door switch 4 times.
3) After completing above Steps, confirm that no malfunction DTC is detected.

BCM Power Circuit and Ground Circuit Check

S4RS0AA204007

Wiring Diagram



I4RS0AA20008-

[A]: Junction block assembly connector viewed from harness side	3. Ignition switch
1. BCM	4. Battery
2. Junction block assembly	

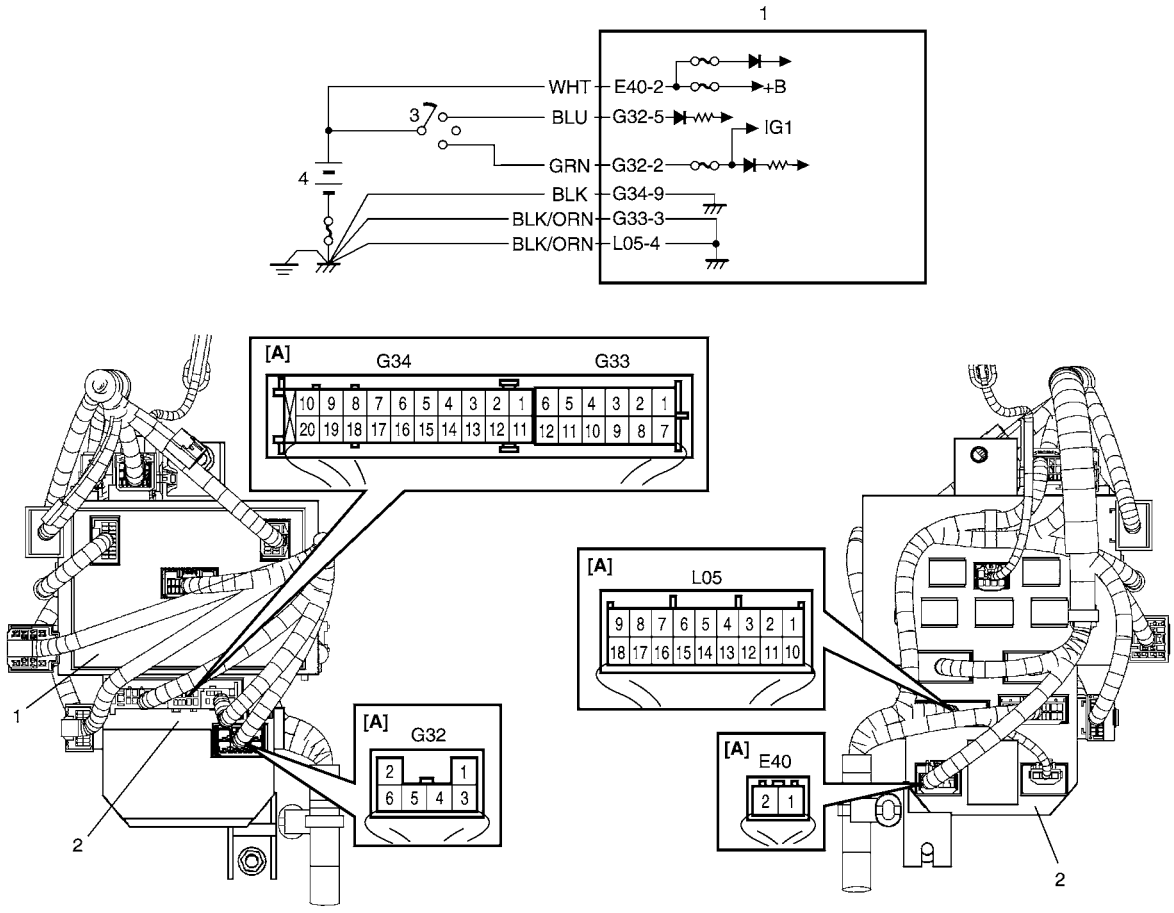
Troubleshooting

Step	Action	Yes	No
1	**Fuse check** 1) Turn ignition switch to OFF position. 2) Check circuit fuses for condition. *Are circuit fuses in good condition?*	Go to Step 2.	Replace fuse and check for short circuit to ground.
2	**Power supply circuit check** 1) Disconnect connectors from junction block assembly. 2) Check for proper connection to junction block assembly connector at terminal “E40-2”. 3) If OK, then measure voltage between “E40-2” terminal of junction block assembly connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 3.	Repair power supply circuit.
3	**Power supply circuit check** 1) Check for proper connection to junction block assembly connector at terminals “G32-2” and “G32-5”. 2) If OK, turn ignition switch ON. 3) Measure voltage between following terminals. • Between “G32-2” terminal of junction block assembly connector and vehicle body ground • Between “G32-5” terminal of junction block assembly connector and vehicle body ground *Is each voltage 10 – 14 V?*	Go to Step 4.	Repair power supply circuit.
4	**Ground circuit check** 1) Turn ignition switch to OFF position. 2) Check for proper connection to junction block assembly connector at terminals “G33-3”, “G34-9” and “L05-4”. 3) If OK, then measure resistance between following terminals. • Between “G33-3” terminal of junction block assembly connector and vehicle body ground • Between “G34-9” terminal of junction block assembly connector and vehicle body ground • Between “L05-4” terminal of junction block assembly connector and vehicle body ground *Is each resistance 2 Ω or less?*	BCM power supply circuit and ground circuit are in good condition.	Repair ground circuit.

DTC B1133 (DTC No.1133): Battery Voltage Too High

S4RS0AA204021

Wiring Diagram



I4RS0AA20008-

[A]: Junction block assembly connector viewed from harness side	3. Ignition switch
1. BCM	4. Battery
2. Junction block assembly	

DTC Detecting Condition and Possible cause

DTC detecting condition	Possible cause
Power voltage supplied from battery to BCM is higher than 16V.	• Charging system malfunction • BCM malfunction

Flow Test Description

Step 1: Check charging system

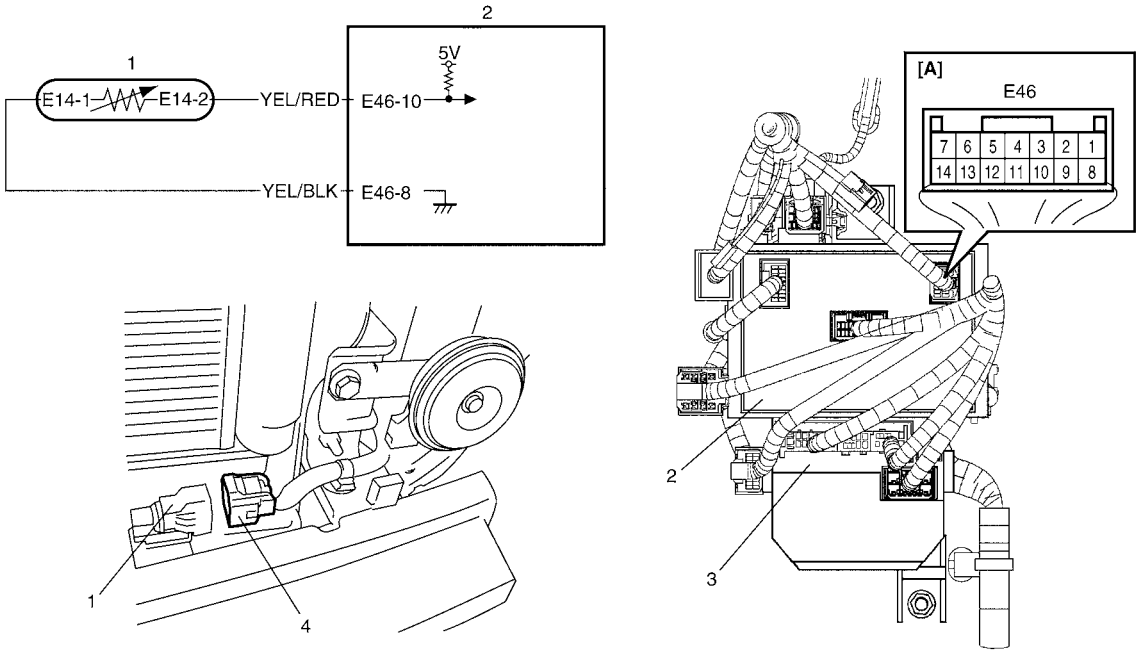
DTC troubleshooting

Step	Action	Yes	No
1	**Charging system operation check** 1) Check generator for operation referring to “Generator Test (Overcharged Battery Check): in Section 1J”. *Is it in good condition?*	Substitute a known good BCM (included in junction block assembly) and recheck.	Repair charging system.

DTC B1141 / DTC B1142 / DTC B1143 (No.1141 / No. 1142/ No. 1143) Outside Air Temperature (Ambient Temp.) Sensor Circuit Malfunction

S4RS0AA204022

Wiring Diagram



I4RS0AA20010-

[A]: BCM connector viewed from harness side	3. Junction block assembly
1. Outside air temperature sensor	4. Outside air temperature sensor connector
2. BCM	

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
DTC B1141 (DTC No. 1141): Input signal from outside air temperature sensor is higher than 4.88 V.	• Open in outside air temperature sensor circuit • Outside air temperature sensor malfunction • BCM malfunction
DTC B1142 (DTC No. 1142): Input signal from outside air temperature sensor is lower than 0.1 V.	• Short in outside air temperature sensor circuit • Outside air temperature sensor malfunction • BCM malfunction
DTC B1143 (DTC No. 1143): Input signal from outside air temperature sensor is 0.1 - 0.27 V or 4.6 - 4.88 V.	• High resistance in outside air temperature sensor circuit • Outside air temperature sensor malfunction • BCM malfunction

Flow Test Description

Step 1: Check whether malfunction is in outside air temperature sensor.
Step 2: Check outside air temperature sensor input circuit.
Step 3: Check outside air temperature sensor ground circuit (for DTC B1141 and B1143).

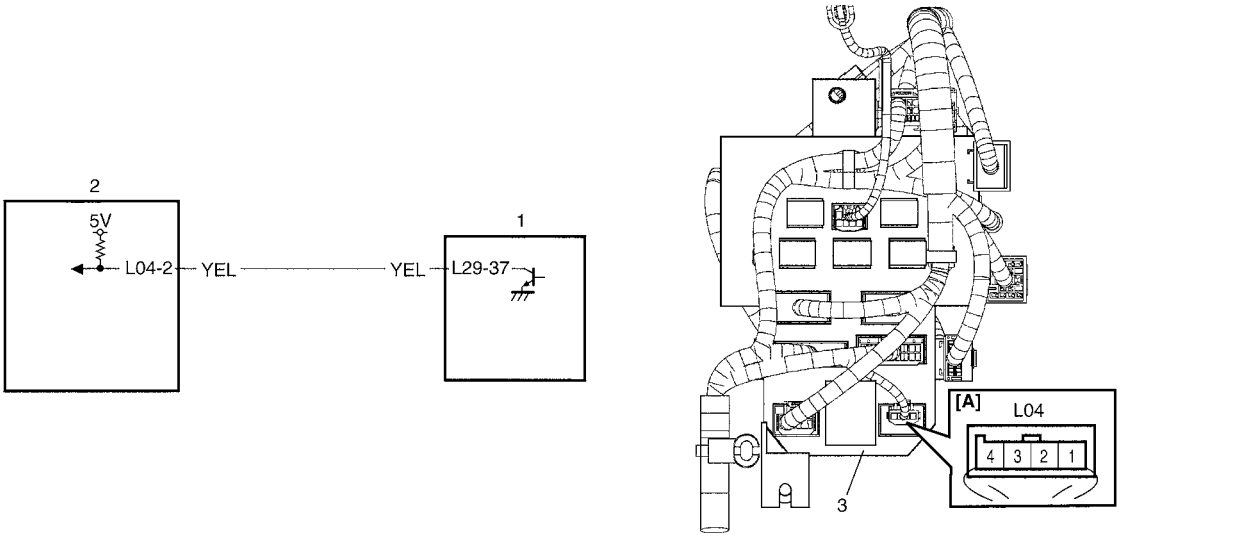
DTC troubleshooting

Step	Action	Yes	No
1	**Check outside air temperature sensor** 1) Turn ignition switch to OFF position. 2) Disconnect connector from outside air temperature sensor. 3) Check outside air temperature sensor for resistance referring to “Outside Air Temperature Sensor Inspection: in Section 9C”. *Is it in good condition?*	Go to Step 2.	Replace outside air temperature sensor.
2	**Check outside air temperature sensor circuit** 1) Turn ignition switch to ON position. 2) Measure voltage between “E14-2” terminal of outside air temperature sensor connector and vehicle body ground. *Is voltage 4 – 6 V?*	Go to Step 3.	Open or short in “YEL/RED” circuit. If OK, substitute a known-good BCM (included in junction block assembly) and recheck.
3	**Check outside air temperature sensor circuit** 1) Turn ignition switch to OFF position. 2) Check for proper connection to “E46-8” terminal of BCM connector. 3) If OK, measure resistance between “E14-1” terminal of outside air temperature sensor connector and vehicle body ground. *Is resistance 1 Ω or less?*	Substitute a known-good BCM (included in junction block assembly) and recheck.	Open or high resistance in “YEL/BLK” circuit.

DTC B1150 (No. 1150): Air Bag Communication Circuit Malfunction

S4RS0AA204014

Wiring Diagram



I4RS0AA20011-

[A]: Junction block assembly connector viewed from harness side	2. BCM
1. SDM	3. Junction block assembly

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
After ignition switch is turned on, abnormal signal is fed from SDM to BCM.	• Air bag communication circuit open or short • SDM malfunction • BCM malfunction

Flow Test Description

Step 1: Check air bag communication circuit.
Step 2: Check air bag communication circuit.
Step 3: Check air bag communication circuit.

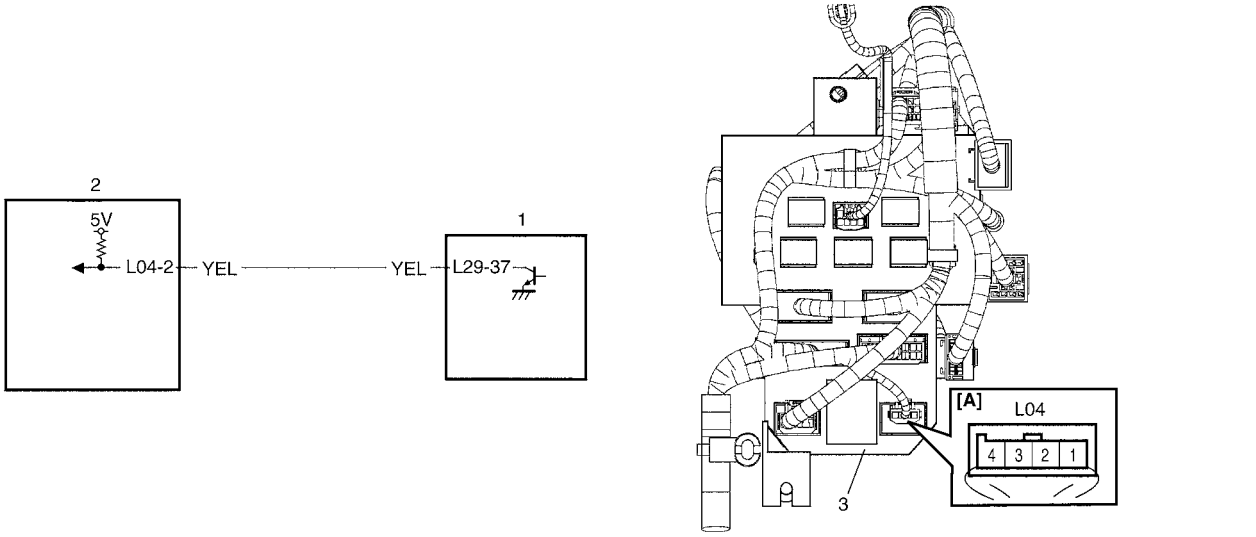
DTC Troubleshooting

Step	Action	Yes	No
1	**Check air bag communication circuit** 1) Turn ignition switch to OFF position. 2) Disconnect connector from SDM referring to “SDM Removal and Installation: in Section 8B”. 3) Disconnect connector from junction block assembly. 4) Turn ignition switch to ON position. 5) Measure voltage between “L29-37” terminal of SDM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 2.	Short to power supply in air bag communication circuit.
2	**Check air bag communication circuit** 1) Turn ignition switch to OFF position. 2) Connect connectors to junction block assembly. 3) Turn ignition switch to ON position. 4) Measure voltage between “L04-2” terminal of junction block assembly connector and vehicle body ground. *Is voltage 4 – 6 V?*	Go to Step 3.	Short to ground in air bag communication circuit. If OK, substitute a known-good BCM (included in junction block assembly) and recheck.
3	**Check air bag communication circuit** 1) Measure voltage between “L29-37” terminal of SDM connector and vehicle body ground. *Is voltage 4 – 6 V?*	Substitute a known-good SDM and recheck.	Open or high resistance in air bag communication circuit.

DTC B1157 (No.1157) Air Bag Deployment Signal Input

S4RS0AA204023

Wiring Diagram



I4RS0AA20012-

[A]: Junction block assembly connector viewed from harness side	2. BCM
1. SDM	3. Junction block assembly

DTC Detecting Condition and Possible cause

DTC detecting condition	Possible cause
Air bag deployment signal is fed from SDM to BCM.	• Air bag component parts • BCM malfunction

Flow Test Description

Step 1: Check DTC for SDM.

DTC troubleshooting

Step	Action	Yes	No
1	**Check DTC for SDM** 1) Check DTC stored in SDM referring to “DTC Check: in Section 8B”. *Is DTC B1021 detected?*	Go to “DTC B1021: Front Air Bag Module Deployed: in Section 8B”.	Substitute a known-good BCM (included in junction block assembly) and recheck.

DTC B1170 (No. 1170): EEPROM access error

S4RS0AA204012

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
Data write error or check sum error.	BCM malfunction

DTC Troubleshooting

NOTE:

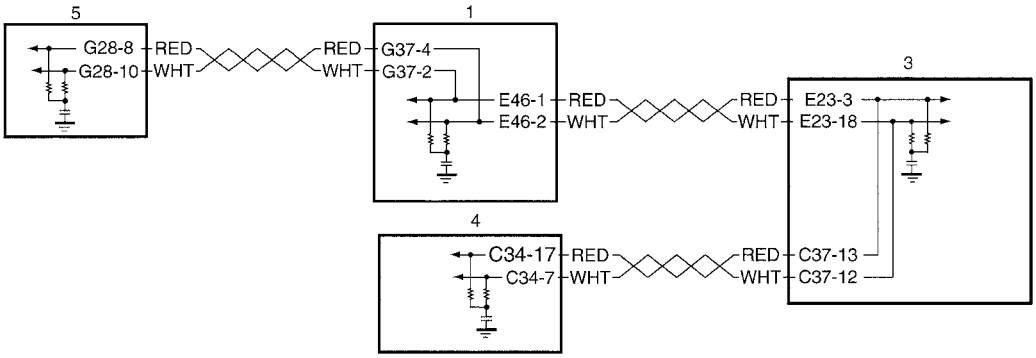
Before performing steps below, be sure to perform “Body Electrical Control System Check: ”.

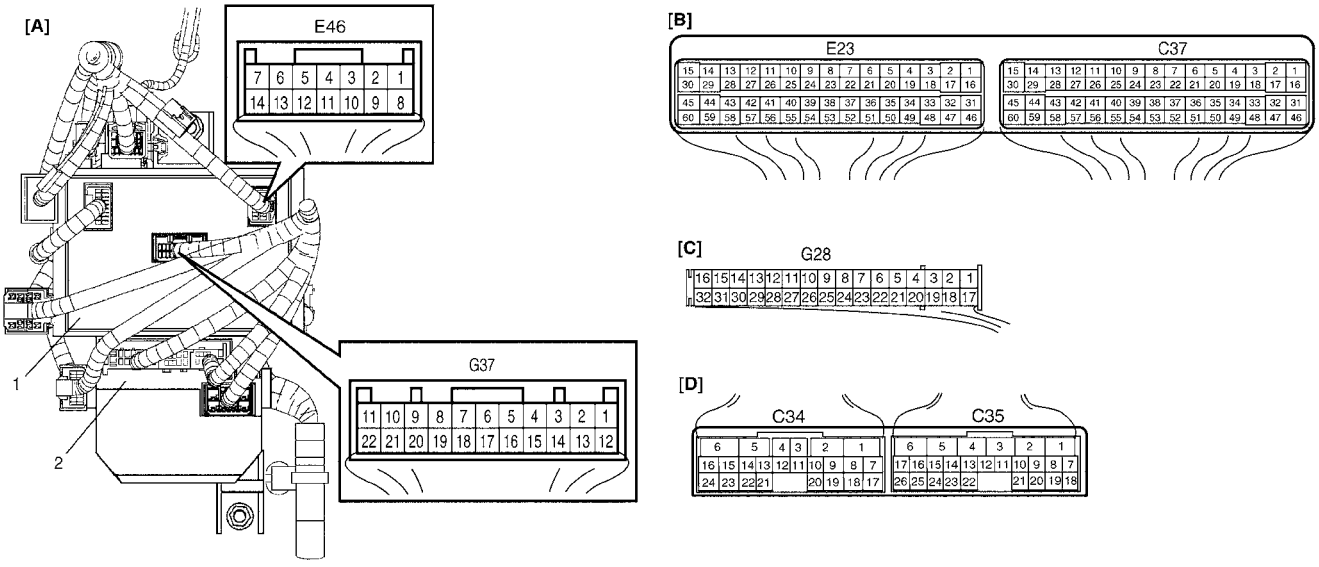
1) Ignition switch OFF.
2) Replace BCM.
3) Repeat BCM Check Flow Table.

DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)

S4RS0AA204024

Wiring Diagram





I4RS0AA20014-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (viewed from harness side)	3. ECM
[B]: ECM connector (viewed from harness side)	1. BCM	4. TCM (equipped with A/T)
[C]: Combination meter connector (viewed from terminal side)	2. Junction block assembly	5. Combination meter

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for BCM is detected for longer than specified time continuously.	• CAN communication circuit • Combination meter • BCM (included in junction block assembly) • TCM • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

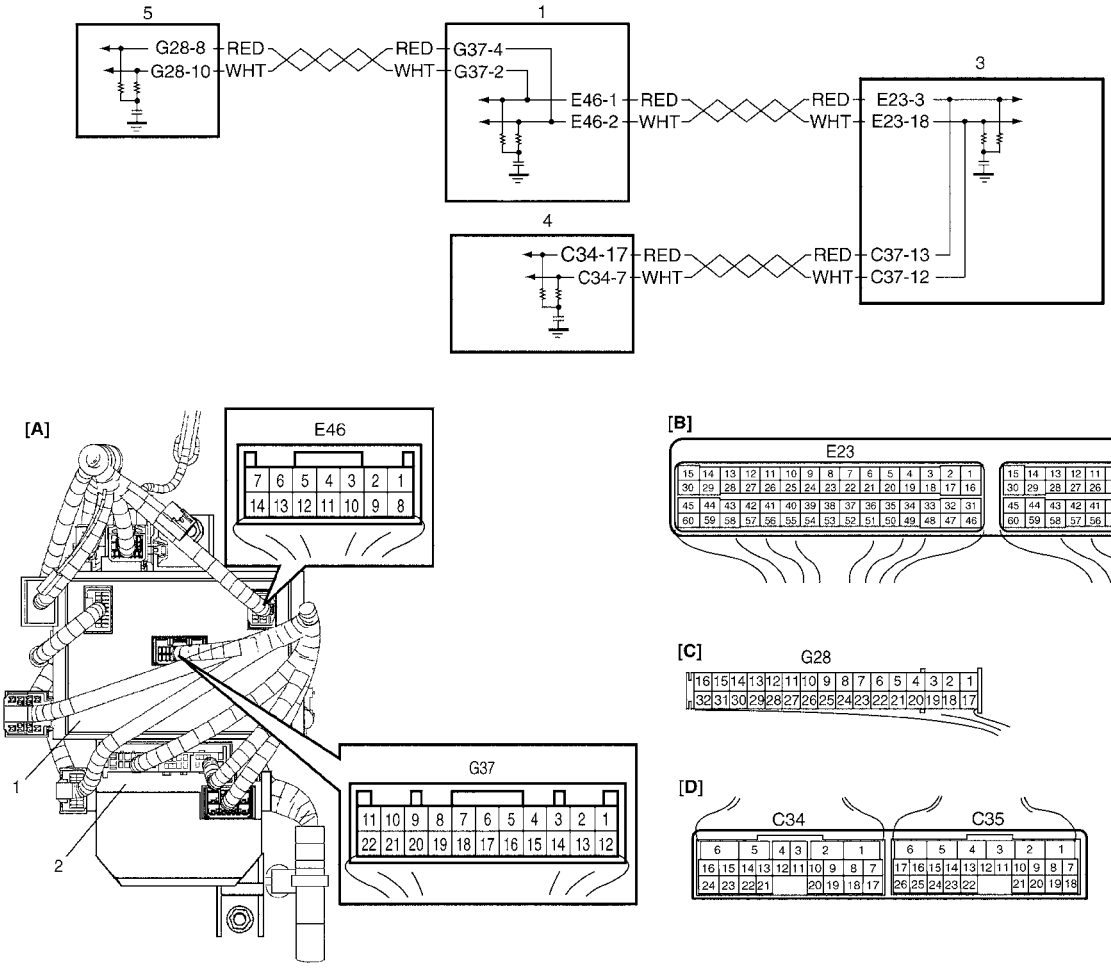
Troubleshooting

Step	Action	Yes	No
1	**Check DTC in BCM** *Is DTC U1001 (No. 1001) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: ".	Go to Step 2.
2	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U1001 (No. 1001) detected?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 4.	Repair circuit.
4	**Check DTC in ECM** 1) Connect connectors to all control modules. 2) Check ECM for DTC. *Is DTC P1676 detected?*	Go to "DTC P1676: CAN Communication (Reception Error for TCM): in Section 1A".	Go to Step 5.
5	**Check DTC in TCM** 1) Check TCM for DTC. *Is DTC P1777 detected?*	Go to "DTC P1777: TCM Lost Communication with ECM (Reception Error): in Section 5A".	Go to Step 6.
6	**Check combination meter for operation** 1) Start engine. 2) Check for operation of tachometer and A/T shift position indicator in combination meter. *Are they in good condition?*	Substitute a known-good BCM (included in junction block assembly) and recheck.	Substitute a known-good combination meter and recheck.

DTC U1073 (No. 1073): Control Module Communication Bus Off

S4RS0AA204025

Wiring Diagram



I4RS0AA20014-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. ECM
[B]: ECM connector (viewed from harness side)	1. BCM	4. TCM (equipped with A/T)
[C]: Combination meter connector (viewed from harness side)	2. Junction block assembly	5. Combination meter

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously. (1 driving detection logic)	• CAN circuit • Combination meter • BCM • TCM • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

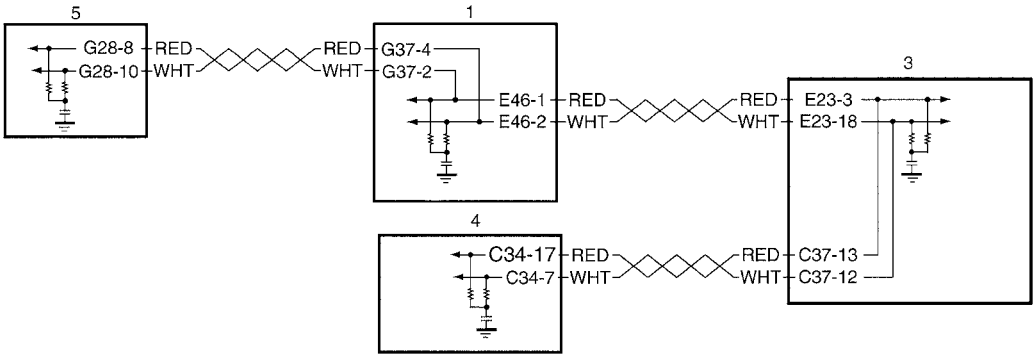
Troubleshooting

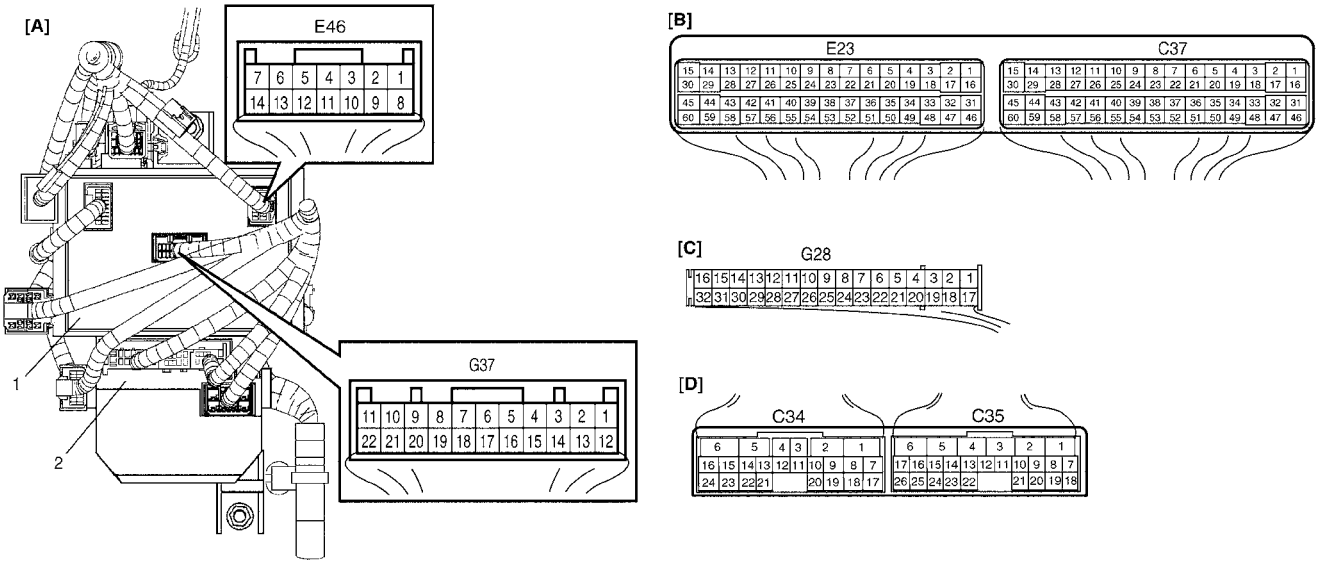
Step	Action	Yes	No
1	**Check each control unit connectors** 1) Check connection of connectors of all control modules (BCM, ECM, TCM (if equipped) and combination meter) communicating by means of CAN. 2) Recheck DTC. *Is DTC U1073 detected?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.
2	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 3.	Repair circuit.
3	**Check DTC in BCM** **NOTE:** **If vehicle equipped with M/T, go to Step 4.** 1) Turn ignition switch to OFF position. 2) Connect connectors to combination meter, BCM and ECM. 3) Recheck BCM for DTC. *Is DTC U1073 detected?*	Go to Step 4.	Check TCM power and ground circuit. If circuit is OK, substitute a known-good TCM and recheck.
4	**Check DTC in BCM** 1) Turn ignition switch to OFF position. 2) Connect connectors to combination meter and BCM. 3) Recheck BCM for DTC. *Is DTC U1073 detected?*	Go to Step 5.	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
5	**Check DTC in BCM** 1) Turn ignition switch to OFF position. 2) Disconnect connector from combination meter. 3) Recheck BCM for DTC. *Is DTC U1073 detected?*	Check BCM power and ground circuit. If circuit is OK, substitute a known-good BCM (included in junction block assembly) and recheck.	Check combination meter power and ground circuit. If circuit is OK, substitute a known-good combination meter and recheck.

DTC U1100 (No.1100): Lost communication with ECM

S4RS0AA204026

Wiring Diagram





I4RS0AA20014-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. ECM
[B]: ECM connector (viewed from harness side)	1. BCM	4. TCM (equipped with A/T)
[C]: Combination meter connector (viewed from harness side)	2. Junction block assembly	5. Combination meter

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from ECM for longer than specified time continuously.	• CAN communication circuit • BCM (included in junction block assembly) • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

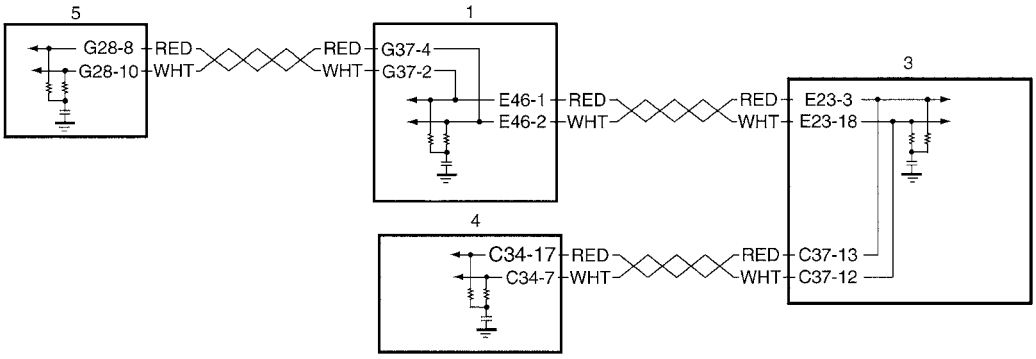
Troubleshooting

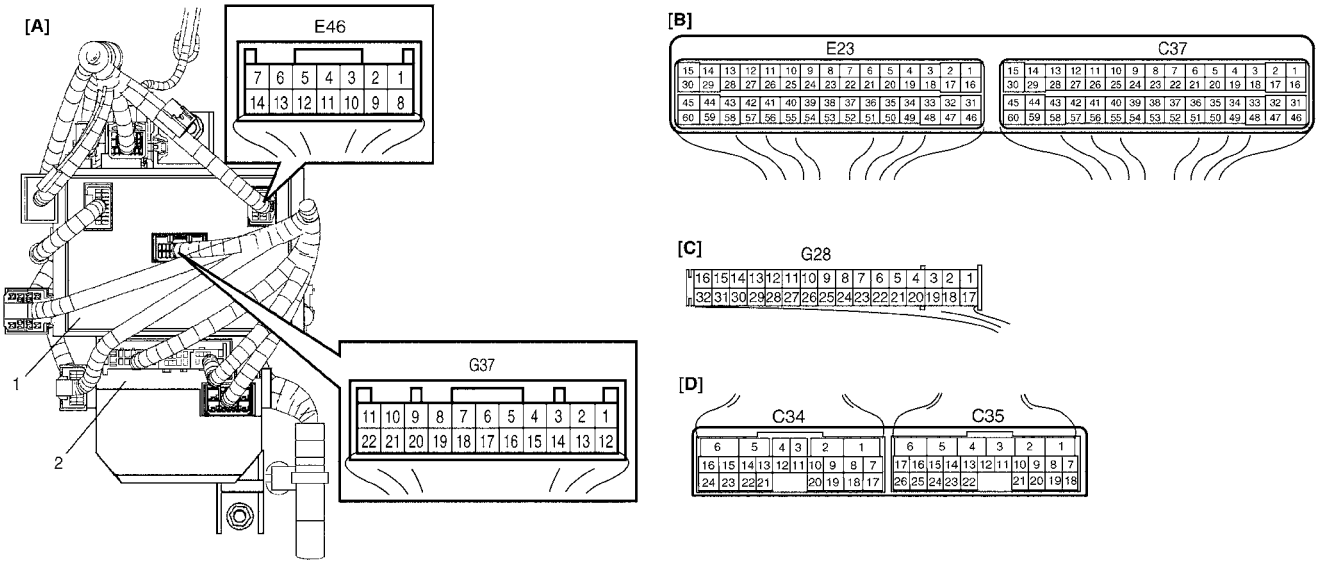
Step	Action	Yes	No
1	**Check DTC in BCM** *Is DTC U1100 (No. 1100) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: ".	Go to Step 2.
2	**Check DTC in ECM** 1) Check ECM for DTC. *Is DTC P1678 detected?*	Go to "DTC P1674: CAN Communication (Bus Off Error): in Section 1A".	Go to Step 3.
3	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U1100 (No. 1100) detected?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
4	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 5.	Repair circuit.
5	**Check DTC in TCM** 1) Connect connectors to all control modules. 2) Check TCM for DTC. *Is DTC P1777 detected?*	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly and recheck.

DTC U1101 (No.1101): Lost communication with TCM

S4RS0AA204027

Wiring Diagram





I4RS0AA20014-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. ECM
[B]: ECM connector (viewed from harness side)	1. BCM	4. TCM (equipped with A/T)
[C]: Combination meter connector (viewed from harness side)	2. Junction block assembly	5. Combination meter

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from TCM for longer than specified time continuously.	• CAN communication circuit • BCM (included in junction block assembly) • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

Troubleshooting

Step	Action	Yes	No
1	**Check DTC in BCM** *Is DTC U1101 (No. 1101) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: ".	Go to Step 2.
2	**Check DTC in TCM** 1) Check TCM for DTC. *Is DTC P1774 detected?*	Go to "DTC P1774: Control Module Communication Bus Off: in Section 5A".	Go to Step 3.
3	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U1101 (No. 1101) detected?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
4	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 5.	Repair circuit.
5	**Check DTC in ECM** 1) Connect connectors to all control modules. 2) Check ECM for DTC. *Is DTC P1676 detected?*	Check TCM power and ground circuit. If circuit is OK, substitute a known-good TCM and recheck.	Substitute a known-good BCM (included in junction block assembly and recheck.

Inspection of BCM and its Circuits

S4RS0AA204013

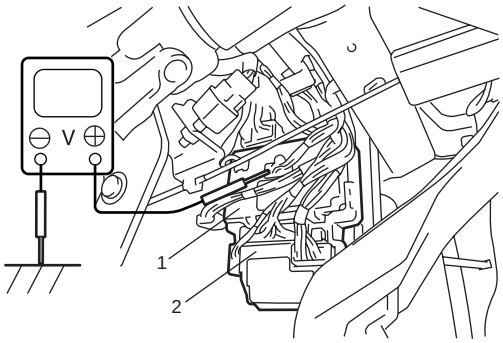
BCM and its circuits can be checked at BCM wiring couplers by measuring voltage and resistance.

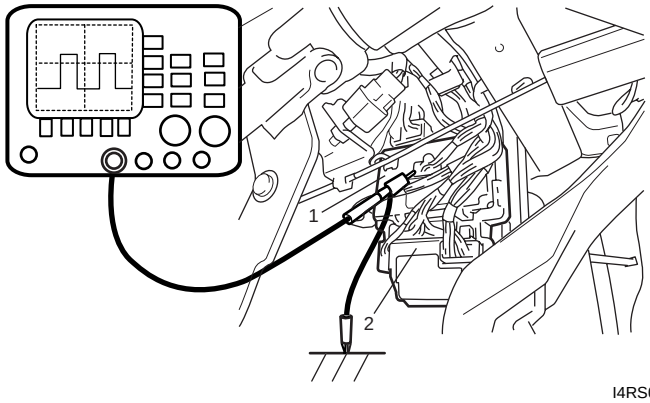
CAUTION:

BCM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to BCM with couplers disconnected from it.

Voltage Check

1) Disconnect negative cable (–) at battery.
2) Remove BCM (included in junction block assembly) referring to "BCM (Included in Junction Block Assembly) Removal and Installation: ".
3) Connect connectors to BCM (1) and junction block assembly (2).
4) Check voltage at each terminal number of couplers connected.
   For connector and terminal number, refer to "Connector Layout Diagram of BCM and Junction Block Assembly: ".





I4RS0AA20030-

NOTE:

- **As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Voltage with asterisk (*) can not be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.**

BCM connector "L01"

Terminal	Wire color	Circuit	Normal voltage	Condition
L01-1	GRN	Passenger side door lock actuator control	10 – 14 V	Unlock signal is output for doorlock actuators other than driver side door lock actuator.
			0 V	Unlock signal is not output for doorlock actuators other than driver side door lock actuator.
L01-2	—	—	—	—
L01-3	BLK/YEL	Rear end door switch	4 – 6 V	Rear end door is closed
			0 V	Rear end door is opened
L01-4	WHT	Rear end door opener switch	4 – 6 V	Rear end door switch is not pushed
			0 V	Rear end door switch is pushed
L01-5	GRY	Manual door lock switch (Unlock)	4 – 6 V	Manual door lock switch is at any position other than unlock position
			0 V	Manual door lock switch is at unlock position
L01-6	RED/BLK	Parking brake switch	*0 – 3 V ↑↓ 10 – 14 V ("Reference waveform No. 1: ")	Ignition switch is at ON position and parking brake lever is released
			0 V	Ignition switch is at ON position and parking brake lever is pulled up
L01-7	GRY/RED	Driver side door switch	10 – 14 V	Driver side door is closed
			0 V	Driver side door is opened
L01-8	LT GRN	"3" position switch	*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No. 2: ")	Ignition switch is at ON position and A/T select lever is at any position other than "2" or "3" position
			0 V	Ignition switch is at ON position and A/T select lever is at "2" or "3" position
L01-9	—	—	—	—
L01-10	GRN/RED	Driver side door lock actuator control	10 – 14 V	Unlock signal is output for driver side door lock actuator.
			0 V	Unlock signal is not output for driver side door lock actuator.

Terminal	Wire color	Circuit	Normal voltage	Condition
L01-11	BLU/YEL	Rear end door actuator motor	0 V	Rear end door actuator motor is not in operation
			10 – 14 V	Rear end door actuator motor is in operation
L01-12	GRY/WHT	Manual door lock switch (Lock)	4 – 6 V	Manual door lock switch is at any position other than lock position
			0 V	Manual door lock switch is at lock position
L01-13	—	—	—	—
L01-14	BRN/YEL	Driver seat belt switch	*0 – 3 V ↑↓ 10 – 14 V (“Reference waveform No. 3: ”)	Ignition switch is at ON position and driver side seat belt is fastened
			0 V	Ignition switch is at ON position and driver side seat belt is unfastened
L01-15	BLK/RED	Door switch (other than driver side door and rear end door)	10 – 14 V	Rear right and left side door and passenger side door are closed
			0 V	Any one of the door is opened (except driver side door and rear end door)
L01-16	LT GRN/ BLK	Driver side door key cylinder switch (Lock)	10 – 14 V	Driver side door key cylinder switch is at any position other than lock position
			0 V	Driver side door key cylinder switch is at lock position
L01-17	BRN	Driver side door key cylinder switch (Unlock)	10 – 14 V	Driver side door key cylinder switch is at any position other than unlock position
			0 V	Driver side door key cylinder switch is at unlock position
L01-18	—	—	—	—

BCM connector “E46”

Terminal	Wire color	Circuit	Normal voltage	Condition
E46-1	RED	CAN communication line (high) for ECM	*2.5 – 3.6 V (“Reference waveform No. 4: ”)	Ignition switch is at ON position
E46-2	WHT	CAN communication line (low) for ECM	*1.6 – 2.5 V (“Reference waveform No. 4: ”)	Ignition switch is at ON position
E46-3	—	—	—	—
E46-4	WHT/BLU	Generator “L” terminal	10 – 14 V	Engine is running
			0 V	Ignition switch is at ON position
E46-5	RED/BLK	Brake fluid level switch	*0 – 3 V ↑↓ 10 – 14 V (“Reference waveform No. 1: ”)	Ignition switch is at ON position, parking brake lever is released and brake fluid level is at specified level
			0 V	Ignition switch is at ON position, parking brake lever is released and brake fluid level is lower than MIN level
E46-6	—	—	—	—
E46-7	—	—	—	—
E46-8	YEL/BLK	Sensor ground for outside air temperature sensor	0 V	—
E46-9	PPL/WHT	Serial communication line of data link connector	10 – 14 V	Ignition switch is at ON position
E46-10	YEL/RED	Outside air temperature sensor	About 1.5 V	Ignition switch is at ON position and outside air temperature approx. 20 °C (68 °F)

Terminal	Wire color	Circuit	Normal voltage	Condition
E46-11	GRY	Oil pressure switch	*3 – 14 V (“Reference waveform No. 5: ”)	Engine is running and oil pressure is in normal condition
			0 V	Ignition switch is at ON position and engine is at stop
E46-12	—	—	—	—
E46-13	—	—	—	—
E46-14	—	—	—	—

BCM connector “G37”

Terminal	Wire color	Circuit	Normal voltage	Condition
G37-1	WHT/BLK	CAN communication line (low) for DLC	*1.6 – 2.5 V (“Reference waveform No. 6: ”)	Ignition switch is at ON position
G37-2	WHT	CAN communication line (low) for combination meter	*1.6 – 2.5 V (“Reference waveform No. 7: ”)	Ignition switch is at ON position
G37-3	RED/BLK	CAN communication line (high) for DLC	*2.5 – 3.6 V (“Reference waveform No. 6: ”)	Ignition switch is at ON position
G37-4	RED	CAN communication line (high) for combination meter	*2.5 – 3.6 V (“Reference waveform No. 7: ”)	Ignition switch is at ON position
G37-5	PPL/WHT	Serial communication line of data link connector for SDM	10 – 14 V	Ignition switch is at ON position
G37-6	—	—	—	—
G37-7	—	—	—	—
G37-8	GRY	Alarm indicator light	10 – 14 V	Alarm indicator light is not lit up
			0 V	Alarm indicator light is lit up
G37-9	—	—	—	—
G37-10	—	—	—	—
G37-11	YEL	Serial communication line for information display	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No. 8: ”)	Ignition switch is at ON position
G37-12	BRN/WHT	Ground for keyless receiver	0 V	—
G37-13	LT GRN	Power supply for keyless receiver	4 – 6 V	Ignition switch is at all positions
G37-14	PNK	Signal for keyless receiver	*0 – 1 V ↑↓ 4 – 6 V (“Reference waveform No. 9: ”)	When pushing lock or unlock button of keyless entry transmitter
G37-15	—	—	—	—
G37-16	BLU/YEL	Key reminder switch	10 – 14 V	Ignition key is inserted to ignition key cylinder
			0 V	Ignition key is pulled out from ignition key cylinder
G37-17	BRN	Rear end door window defogger switch	0 V	Ignition switch is at ON position and rear end door window defogger switch is at ON position
			4 – 6 V	Ignition switch is at ON position and rear end door window defogger switch is at any position other than ON position

Terminal	Wire color	Circuit	Normal voltage	Condition
G37-18	GRY/WHT	A/C switch	*3 – 14 V (“Reference waveform No. 10: ”)	Ignition switch is at ON position and A/C switch is at OFF position
			0 V	Ignition switch is at ON position, blower speed selector is at any position other than OFF position and A/C switch is at ON position
G37-19	—	—	—	—
G37-20	—	—	—	—
G37-21	BLU/BLK	Rear wiper INT switch	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No. 11: ”)	Ignition switch is at ON position and rear wiper switch is at any position other than INT position
			0 V	Ignition switch is at ON position and rear wiper switch is at INT position
G37-22	GRN	Rear wiper low switch	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No. 12: ”)	Ignition switch is at ON position and rear wiper switch is at any position other than LOW position
			0 V	Ignition switch is at ON position and rear wiper switch is at LOW position

Junction block connector “E40”

Terminal	Wire color	Circuit	Normal voltage	Condition
E40-2	WHT	Backup power source	10 – 14 V	Ignition switch is at all positions

Junction block connector “E41”

Terminal	Wire color	Circuit	Normal voltage	Condition
E41-3	GRN	Horn	10 – 14 V	Horn switch is at ON position
			0 V	Horn switch is at OFF position

Junction block connector “G32”

Terminal	Wire color	Circuit	Normal voltage	Condition
G32-2	GRN	Power source (IG)	10 – 14 V	Ignition switch is at ON position
			0 V	Ignition switch is at any position other than ON position
G32-5	BLU	Power source (ACC)	10 – 14 V	Ignition switch is at ACC or ON position
			0 V	Ignition switch is at any position other than ACC or ON position

Junction block connector “G33”

Terminal	Wire color	Circuit	Normal voltage	Condition
G33-3	BLK/ORN	Ground for body electrical controller	0 V	Ignition switch is at all positions
G33-7	BLK/RED	Rear end door window defogger switch indication	10 – 14 V	Engine is running and defogger switch indication is lit up
			0 V	Engine is running and defogger switch indication is not lit up

Junction block connector “G34”

Terminal	Wire color	Circuit	Normal voltage	Condition
G34-3	BLU	Horn switch	10 – 14 V	Horn switch is not pushed
			0 V	Horn switch is pushed
G34-7	RED/YEL	Lighting switch	10 – 14 V	Lighting switch is at any position other than OFF position
			0 V	Lighting switch is at OFF position
G34-9	BLK	Ground for body electrical controller	0 V	Ignition switch is at all positions

Terminal	Wire color	Circuit	Normal voltage	Condition
G34-11	WHT	Hazard switch	10 – 14 V	Hazard switch is at ON position or lock or unlock button of key less entry transmitter (answer back control) is pushed
			0 V	Hazard switch is at OFF position

Junction block connector “K01”

Terminal	Wire color	Circuit	Normal voltage	Condition
K01-5	WHT	Interior light	10 – 14 V	Interior light switch is at DOOR position and interior light is not lit up
			0 V	Interior light switch is at DOOR position and interior light is lit up

Junction block connector “L04”

Terminal	Wire color	Circuit	Normal voltage	Condition
L04-2	YEL	Air bag communication line	*0 – 1 V ↑↓ 4 – 6 V (“Reference waveform No. 13: ”)	Ignition switch is at ON position
L04-3	PPL/WHT	Serial communication line of data link connector for ECM	10 – 14 V	Ignition switch is at ON position

Junction block connector “L05”

Terminal	Wire color	Circuit	Normal voltage	Condition
L05-4	BLK/ORN	Ground for body electrical controller	0 V	Ignition switch is at all positions
L05-5	YEL	Power supply for rear wiper motor	10 – 14 V	Ignition switch is at ON position and rear wiper motor is not in operation
			0 V	Ignition switch is at ON position and rear wiper motor is in operation
L05-8	BLK/RED	Rear end door window defogger wire	10 – 14 V	Engine is running and rear end door window defogger is in operation
			0 V	Engine is running and rear end door window defogger is not in operation
L05-9	ORN	Rear wiper control	10 – 14 V	Ignition switch is at ON position and rear wiper is not in operation
			0 V	Ignition switch is at ON position and rear wiper is in operation

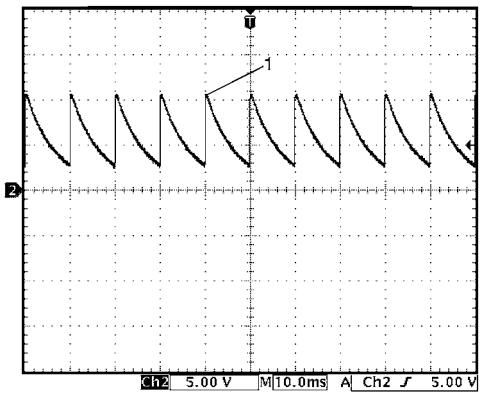
Junction block connector “L06”

Terminal	Wire color	Circuit	Normal voltage	Condition
L06-9	GRN	Rear right and left door lock actuator motor (Unlock)	10 – 14 V	Rear right and left door lock actuator motor is operated (Unlock)
			0 V	Rear right and left door lock actuator motor is not operated
L06-10	RED/BLU	Door lock actuator motor control (Lock)	10 – 14 V	Manual door lock switch is at LOCK position or driver side door key cylinder switch is at LOCK position
			0 V	Manual door lock switch is at any position other than LOCK position or driver side door key cylinder switch is at any position other than LOCK position

Reference waveform No. 1

Parking brake or brake fluid level switch signal (1)

Measurement terminal	Parking brake switch CH2: “L01-6” to “G33-3” Brake fluid level switch CH2: “E46-5” to “G33-3”
Oscilloscope setting	CH1: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Parking brake switch: • Ignition switch is at ON position, parking brake lever is released Brake fluid level switch • Ignition switch is at ON position, brake fluid lever is in normal

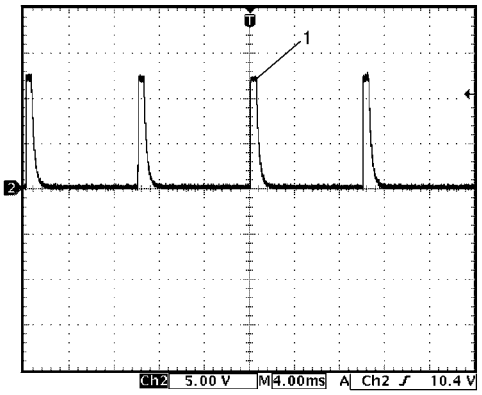


I4RS0AA20018-

Reference waveform No. 2

“3” position switch signal (1) for TCM

Measurement terminal	CH2: “L01-8” to “G33-3”
Oscilloscope setting	CH2: 5 V/DIV TIME: 400 ms/DIV
Measurement condition	Ignition switch is at ON position and A/T selector lever is at any position other than “2” or “3” position

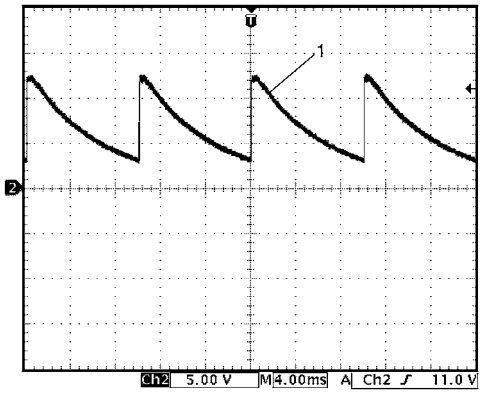


I4RS0AA20015-

Reference waveform No. 3

Driver seat belt switch signal (1)

Measurement terminal	CH2: “L01-14” to “G33-3”
Oscilloscope setting	CH2: 5 V/DIV TIME: 400 ms/DIV
Measurement condition	Ignition switch is at ON position and driver side seat belt is fastened

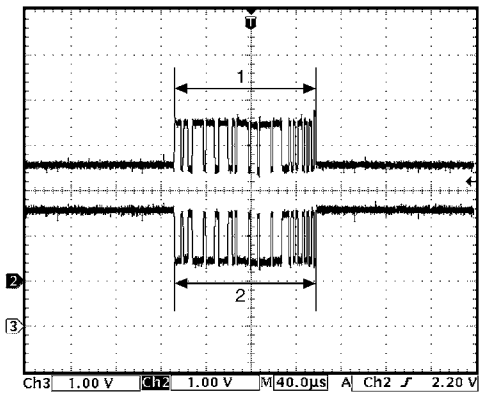


I4RS0AA20016-

Reference waveform No. 4

BCM – ECM CAN communication signal

Measurement terminal	CH2: “E46-1” to “G33-3” CH3: “E46-2” to “G33-3”
Oscilloscope setting	CH2: 1 V/DIV CH3: 1 V/DIV TIME: 40 μs/ DIV
Measurement condition	Ignition switch is at ON position



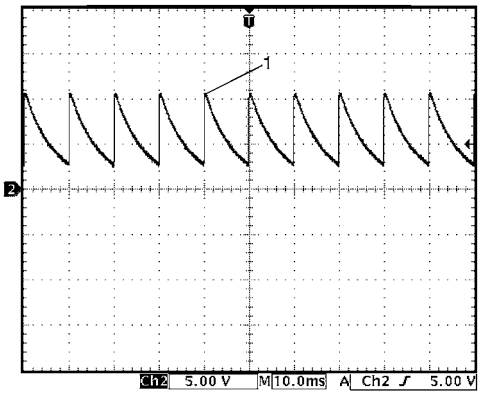
I4RS0AA20017-

1. CAN communication line signal (High)
2. CAN communication line signal (Low)

Reference waveform No. 5

Oil pressure switch signal (1)

Measurement terminal	CH2: “GE46-11” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Engine is running and oil pressure is in normal condition

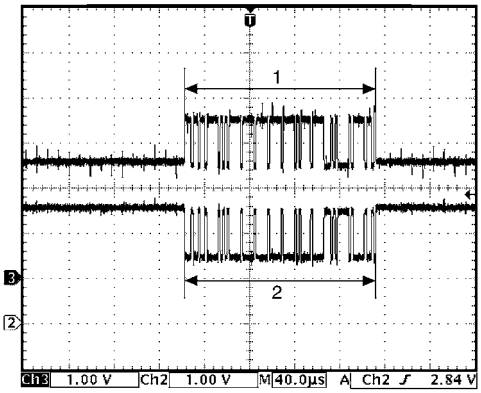


I4RS0AA20018-

Reference waveform No. 6

BCM – DLC CAN communication signal

Measurement terminal	CH2: “G37-1” to “G33-3” CH3: “G37-3” to “G33-3”
Oscilloscope setting	CH2: 1 V / DIV CH3: 1 V / DIV TIME: 40 μs / DIV
Measurement condition	Ignition switch is at ON position



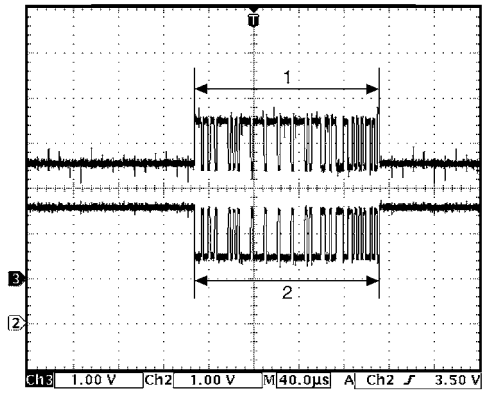
I4RS0AA20019-

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

Reference waveform No. 7

BCM – combination meter CAN communication signal

Measurement terminal	CH2: “G37-2” to “G33-3” CH3: “G37-4” to “G33-3”
Oscilloscope setting	CH2: 1 V / DIV CH3: 1 V / DIV TIME: 40 μs / DIV
Measurement condition	Ignition switch is at ON position



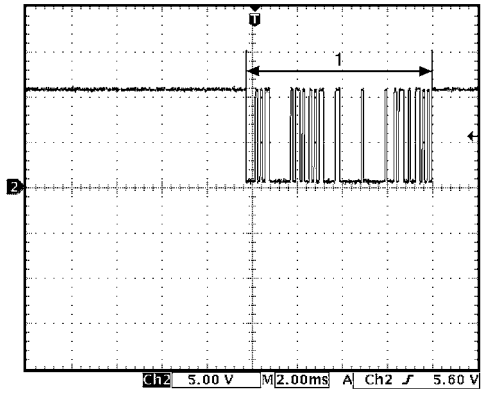
I4RS0AA20020-

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

Reference waveform No. 8

Information display serial communication signal (1)

Measurement terminal	CH2: “G37-11” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position

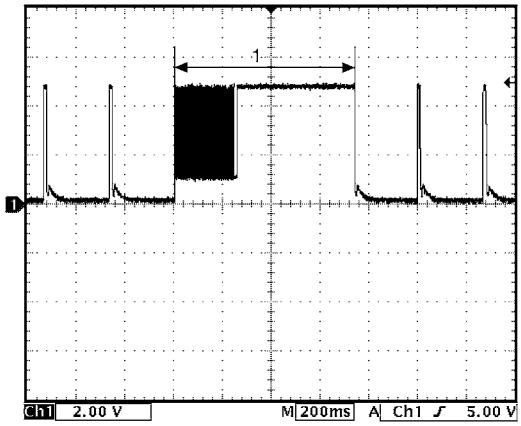


I4RS0AA20021-

Reference waveform No. 9

Keyless entry receiver signal (1)

Measurement terminal	CH2: “G37-14” to “G33-3”
Oscilloscope setting	CH2: 2 V / DIV TIME: 200 ms / DIV
Measurement condition	Lock or unlock button of key less entry transmitter is pushed

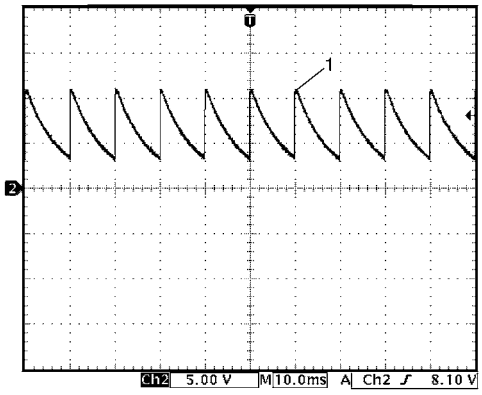


I4RS0AA20022-

Reference waveform No. 10

A/C switch signal (1)

Measurement terminal	CH2: “G37-18” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position and A/C switch is at ON position

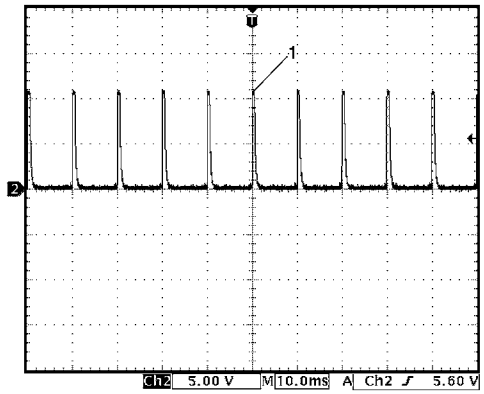


I4RS0AA20023-

Reference waveform No. 11

Rear wiper INT signal (1)

Measurement terminal	CH2: “G37-21” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position and rear wiper switch is at any position other than INT position

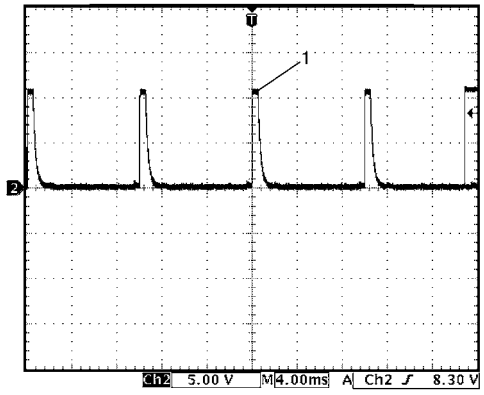


I4RS0AA20024-

Reference waveform No. 12

Rear wiper LOW signal (1)

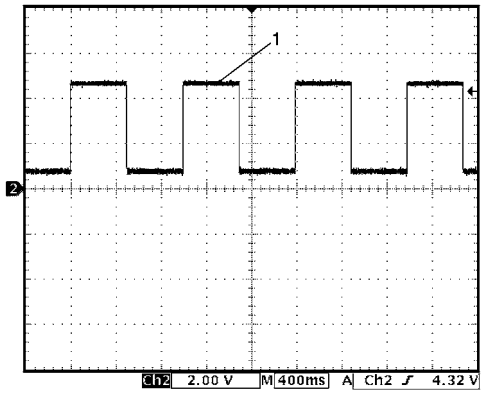
Measurement terminal	CH2: “G37-22” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position and rear wiper switch is at any position other than LOW position



I4RS0AA20025-

Reference waveform No. 13
SDM communication signal (1)

Measurement terminal	CH2: “G37-18” to “G33-3”
Oscilloscope setting	CH2: 2 V / DIV TIME: 400 ms / DIV
Measurement condition	Ignition switch is at ON position



I4RS0AA20026-

Repair Instructions

BCM (Included in Junction Block Assembly) Removal and Installation

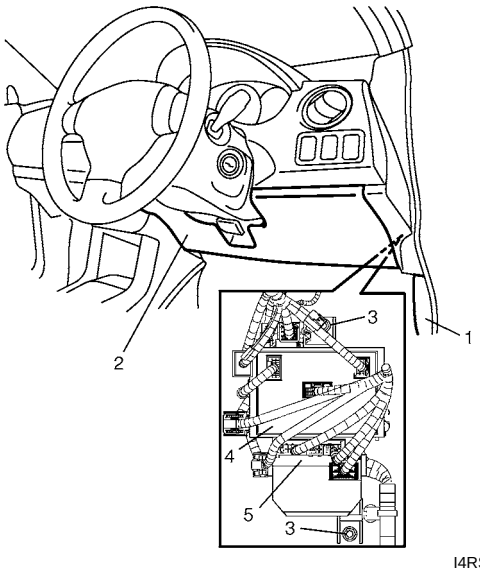
S4RS0AA206001

CAUTION:

Do not attempt removal of BCM from junction block assembly as it may cause contact failure.
If there is faulty condition in BCM, replace junction block assembly.

Removal

1) Disconnect negative cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove dash side trim (1) and steering column hole cover (2).
4) Remove junction block assembly mounting nuts (3).



I4RS0AA20027-

4. BCM
5. Junction block assembly

5) Disconnect connectors from BCM and junction block assembly.
6) Detach wiring harness clamp from junction block assembly.

Installation

Reverse removal procedure for installation, noting following points.

- Connect connectors securely.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.
- If BCM (included in junction block assembly) is replaced with a new one, program transmitter code(s) of keyless entry system, referring to “Programming Transmitter Code: in Section 9F”

Outside Air Temperature Sensor Removal and Installation

S4RS0AA206003

For removal and installation, refer to “Outside Air Temperature Sensor Removal and Installation: in Section 9C”.

Outside Air Temperature Sensor Inspection

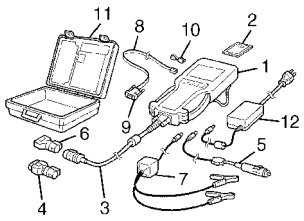
S4RS0AA206002

For inspection, refer to “Outside Air Temperature Sensor Inspection: in Section 9C”.

Special Tools and Equipment

Special Tool

S4RS0AA208001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞		

Immobilizer Control System

Precautions

Precautions in Diagnosing Troubles

S4RS0AA300001

- Before confirming the diagnostic trouble code (DTC), do not disconnect connector from ECM, battery cable from battery, ground wire harness, or main fuse. Such disconnection will erase DTC stored in ECM.
- DTC stored in ECM memory can be checked as well as cleared by using SUZUKI scan tool. Before using SUZUKI scan tool, read its operator's manual carefully to know how to use it and what functions are available.
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00" before inspection.
- Communication of ECM, BCM, and combination meter is established by CAN (Computer Area Network). Therefore, handle CAN communication lines with care referring to "Precaution for CAN Communication System: in Section 00".

Precaution in Replacing ECM

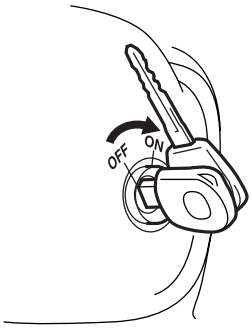
S4RS0AA300003

After ECM is replaced with new one, the transponder code in the transponder built in the ignition key has to be registered with ECM. Or, the engine cannot be started up. For the registration procedure, refer to "Procedure after ECM Replacement: ".

Precautions in Handling Immobilizer Control System

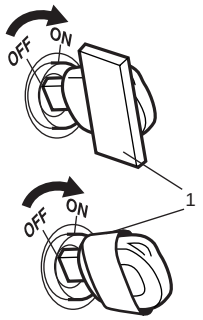
S4RS0AA300002

- Do not turn ON ignition switch with ignition key in contact with another one or quite close to another one. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



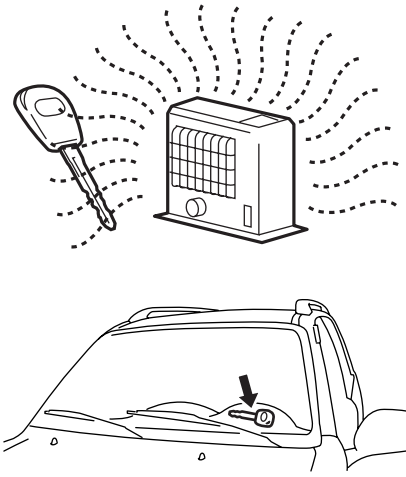
I3RH0AA30001-

- Do not turn ON ignition switch by using ignition key with any type of metal (1) wrapped its grip or in contact with it. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



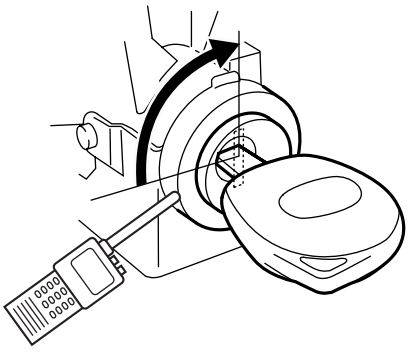
I3RH0AA30002-

- Do not leave ignition key in a place where temperature is high. High temperature may cause damage to the transponder built in the ignition key.



I3RH0AA30003-

- Do not turn ignition switch to ON position by bringing radio antenna close to coil antenna. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



I3RH0AA30004-

General Description

Immobilizer Control System Introduction

S4RS0AA301001

The immobilizer control system is an anti-theft device that immobilizes the vehicle. It stops the engine from working and prevents the vehicle from being stolen. It mainly consists of the following components.

- Engine Control Module (ECM)
- Immobilizer control module with the built-in coil antenna
- Ignition key with the built-in transponder

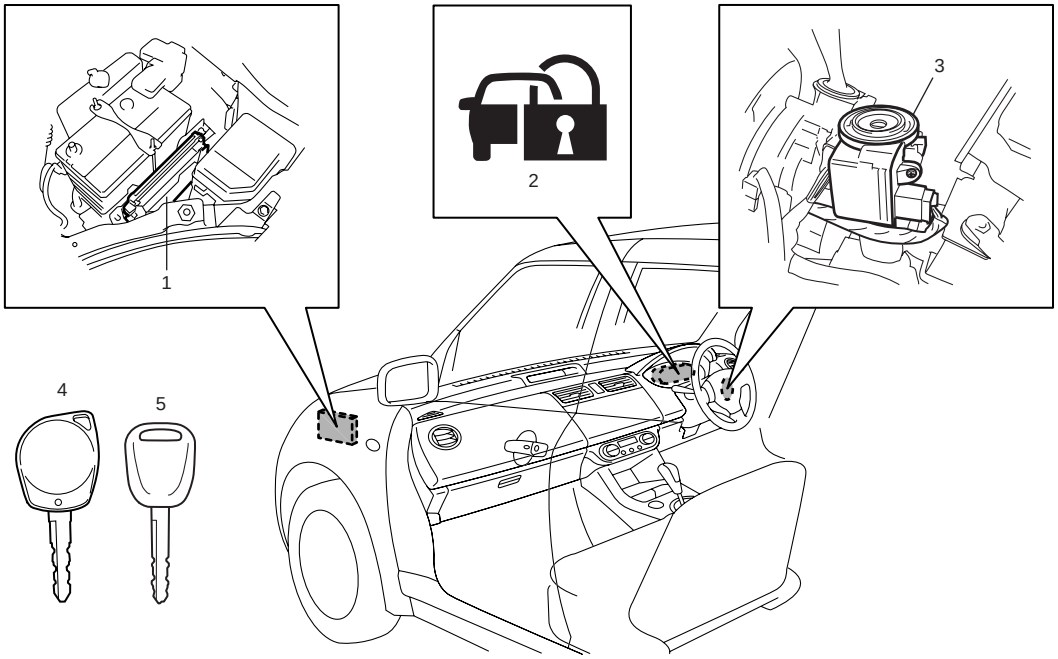
A code called the transponder code is memorized in the transponder. And, the code is registered with ECM. Basically, when the ignition switch is turned ON, ECM reads the code by the coil antenna. Then, if the code in transponder in the ignition key does not match with the one registered with ECM, ECM stops the operation of the fuel injection so as not to start up the engine and turns the immobilizer indicator lamp ON and OFF using CAN communication lines.

NOTE:

The authentication process mentioned above is only a part of the entire authentication process. For security reasons, the detailed explanation is left out.

Immobilizer Control System Components Location

S4RS0AA301004



I4RS0AA30001-

1. ECM	4. Ignition key with keyless entry system
2. Immobilizer indicator lamp	5. Ignition key without keyless entry system
3. Immobilizer control module	

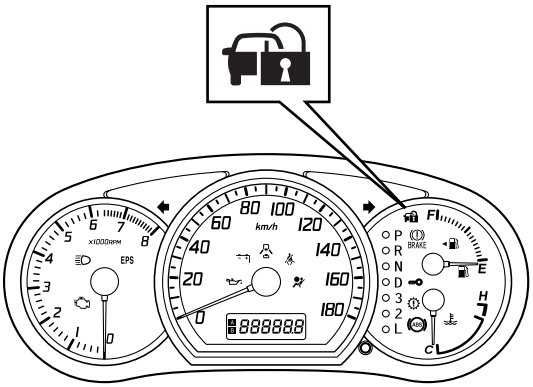
On-Board Diagnostic System Description (Self-diagnosis Function)

S4RS0AA301002

ECM diagnoses if there is any trouble with the immobilizer control system. The diagnostic information is stored as the diagnostic trouble code (DTC) in ECM. To read the diagnostic information, use SUZUKI scan tool referring to “Diagnostic Trouble Code (DTC) Check: ”. With the ignition switch turned ON (but the engine at stop) regardless of the condition of the engine and emission control system, ECM indicates whether there is any trouble with the immobilizer control system or not by either lighting ON or flashing ON and OFF the immobilizer indicator lamp.

Immobilizer indicator lamp lights ON:
No trouble exists in the immobilizer control system. (After starting up the engine, the lamp turns OFF.)

Immobilizer indicator lamp flashes ON and OFF:
There is some trouble with the immobilizer control system. Its diagnostic information is stored in ECM.



I4RS0AA30002-

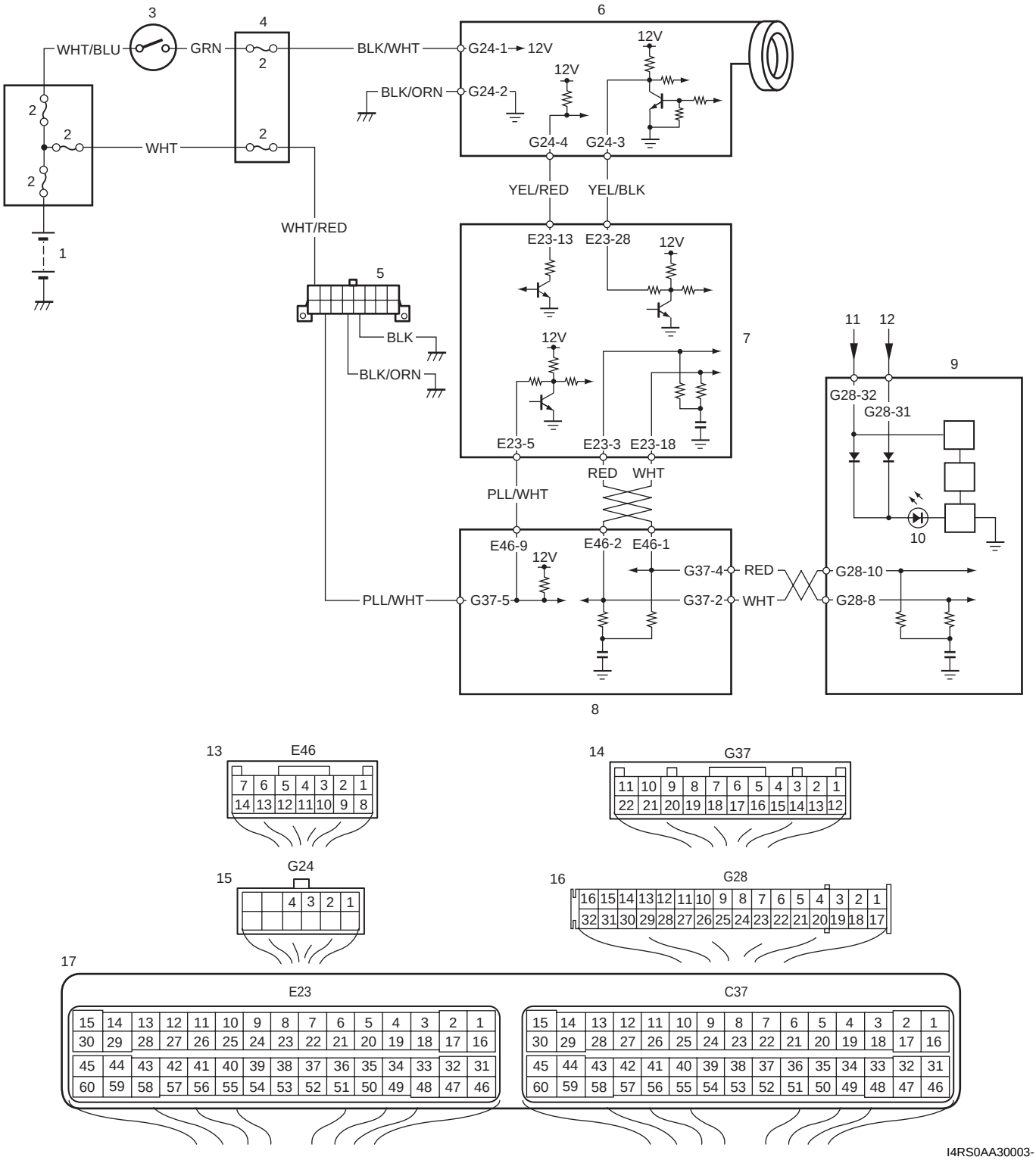
Schematic and Routing Diagram

Immobilizer Control System Wiring Circuit Diagram

S4RS0AA302001

NOTE:

For more details about power supply and ground circuits for ECM, BCM, and combination meter, refer to “System Circuit Diagram: in Section 9A”.



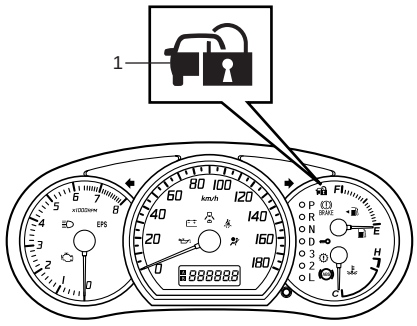
I4RS0AA30003-

1. Battery	7. ECM	13. BCM connector “E46” (harness side view)
2. Fuse	8. BCM	14. BCM connector “G37” (harness side view)
3. Ignition switch	9. Combination meter	15. Immobilizer control module connector “G24” (harness side view)
4. Junction block assembly	10. Immobilizer indicator lamp	16. Combination meter connector “G28” (harness side view)
5. Data link connector (DLC)	11. From “RADIO” fuse	17. ECM connectors “E23” and “C37” (harness side view)
6. Immobilizer control module	12. From “METER” fuse	

Diagnostic Information and Procedures

Immobilizer Control System Check

S4RS0AA304001

Step	Action	Yes	No
1	1) Start the engine. *Is it possible to start the engine?*	Immobilizer control system is in good condition.	Go to Step 2.
2	1) Check behavior of immobilizer indicator lamp (1) by turning the ignition switch to ON position.  I4RS0AA30004- *Does it flash ON and OFF continuously?*	Check what diagnostic trouble code (DTC) is detected by ECM referring to "Diagnostic Trouble Code (DTC) Check: ". Then, perform the troubleshooting referring to the corresponding flowchart in this section.	Perform "Engine and Emission Control System Check: in Section 1A".

Diagnostic Trouble Code (DTC) Check

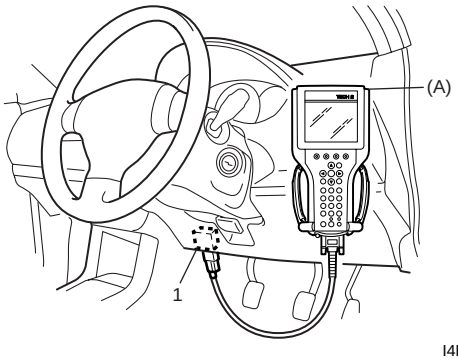
S4RS0AA304002

NOTE:

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

1) Turn the ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0AA30005-

3) Turn the ignition switch to ON position.
4) Check if any DTC is stored in ECM according to the instructions displayed on SUZUKI scan tool.
5) After completing the check, turn ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Diagnostic Trouble Code (DTC) Clearance

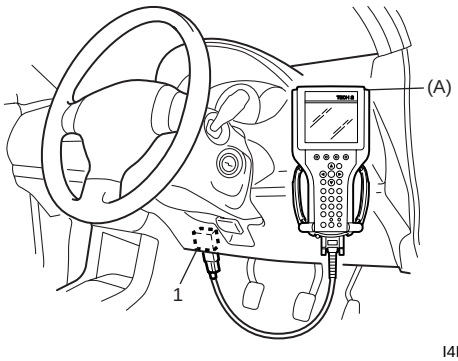
S4RS0AA304027

NOTE:

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

1) Turn the ignition switch to OFF position,
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0AA30005-

1) Turn the ignition switch to ON position.
2) Clear DTC(s) according to the instructions displayed on SUZUKI scan tool.
3) After completing the clearance, turn the ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Diagnostic Trouble Code (DTC) Table

S4RS0AA304003

ECM

DTC No.	Description	Detecting Condition
P1614	Transponder response error	Transponder code in the transponder built in the ignition key cannot be read through immobilizer control module.
P1621	Immobilizer communication line error	Communication error between immobilizer control module and ECM is detected by ECM.
P1622	EEPROM error	EEPROM in ECM is corrupted.
P1623	Unregistered transponder	Transponder code in the transponder built in the ignition key is invalid.
P1625	Immobilizer antenna error	Immobilizer control module is faulty.

NOTE:

If any DTC other than the above DTCs is detected, refer to "DTC Table: in Section 1A".

Scan Tool Data

S4RS0AA304016

The data listed below is the standard data obtained from the normal vehicle by using SUZUKI scan tool. Those are output from ECM. Use them as reference.

Scan Tool Data	Vehicle Condition	Normal Data
NUMBER OF LEARNT KEY	Ignition switch at ON position	2 PCS
INPUT YEAR	Ignition switch at ON position	2004
INPUT MONTH	Ignition switch at ON position	7

NOTE:

The normal data shown above is just an example. Keep in mind that the data varies for each vehicle.

Scan Tool Data Definitions

NUMBER OF LEARNT KEY

0 - 4 PCS: The number of the transponder code in the transponder built in the ignition key that is registered with ECM

NOTE:

A maximum of four transponder codes can be registered with ECM. Therefore, the maximal value should be 4.

INPUT YEAR

20:** The year in which the transponder code in the transponder built in the ignition key is registered with ECM

INPUT MONTH

1 – 12: The month in which the transponder code in the transponder built in the ignition key is registered with ECM

DTC P1614 Transponder Response Error

S4RS0AA304028

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error	• Communication among each component
• Use of the ignition key without the transponder	• Ignition key
• Corruption of the transponder in the ignition key	• Transponder
• Immobilizer control module faulty	• Immobilizer control module
• ECM faulty	• ECM

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) confirmation:** 1) Clear DTC(s) referring to “Diagnostic Trouble Code (DTC) Clearance: ”. 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to “Diagnostic Trouble Code (DTC) Check: ”. *Is DTC P1614 still detected?*	Go to Step 2.	The troubleshooting is completed.
2	**Diagnostic Trouble Code (DTC) check:** 1) Check if any DTC other than P1614 is detected referring to “Diagnostic Trouble Code (DTC) Check: ”. *Is any DTC other than P1614 is detected?*	Perform troubleshooting referring to the corresponding flowchart in this section, and then go to Step 3.	Go to Step 3.
3	**Registration of the new ignition key with ECM and Diagnostic Trouble Code (DTC) check:** 1) The transponder in the ignition key is corrupted or the ignition key without the transponder is used. Therefore, prepare the new ignition key. 2) Register the transponder code in the transponder in the new ignition key with ECM referring to “Registration of the Ignition Key: ”. 3) Make sure that DTC P1614 is not detected referring to “Diagnostic Trouble Code (DTC) Check: ”. *Is DTC P1614 still detected?*	Go to Step 4.	The troubleshooting is completed.
4	**Check for fault of immobilizer control module:** 1) Check immobilizer control module referring to “Inspection of Immobilizer Control Module and Its Circuit: ”. *Is immobilizer control module normal?*	Replace ECM with new one referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”, and then perform “Procedure after ECM Replacement: ”.	Replace immobilizer control module with new one referring to “Immobilizer Control Module Removal and Installation: ”.

DTC P1621 Immobilizer Communication Line Error

S4RS0AA304029

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error • Related fuse(s) blown • Poor connection at immobilizer control module connector • "BLK/WHT" wire open • "BLK/ORN" wire open • "YEL/BLK" wire open, short to ground circuit, short to power circuit, or shorted to "YEL/RED" wire • "YEL/RED" wire open, short to ground circuit, short to power circuit, or shorted to "YEL/BLK" wire • Immobilizer control module faulty • ECM faulty	• Related fuse(s) • Connection at immobilizer control module • "BLK/WHT" wire • "BLK/ORN" wire • "YEL/BLK" wire • "YEL/RED" wire • Immobilizer control module • ECM

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) confirmation:** 1) Clear DTC(s) referring to "Diagnostic Trouble Code (DTC) Clearance: ". 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1621 still detected?*	Go to Step 2.	The troubleshooting is completed.
2	**Fuse check:** 1) Check if any related fuse is blown. *Is any fuse blown?*	Replace blown fuse(s) with new one (s).	Go to Step 3.
3	**Check for poor connection at immobilizer control module:** 1) Disconnect immobilizer control module connector "G24" referring to "Immobilizer Control Module Removal and Installation: ". 2) Check if wire connections are normal at immobilizer assembly connector "G24". *Is each wire connection normal?*	Go to Step 4.	Repair poor connection(s).
4	**Check for poor connection at ECM:** 1) Disconnect ECM connector "E23" referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C". 2) Check if wire connections at "E23-13" and "E23-28" wire terminals are normal. *Is each wire connection normal?*	Go to Step 5.	Repair poor connection(s).
5	**Check for open in "BLK/WHT" wire:** 1) Connect immobilizer control module connector "G24" referring to "Immobilizer Control Module Removal and Installation: ". 2) With the ignition switch at ON position, check voltage between "G24-1" wire terminal at immobilizer control module and body ground. *Is voltage about 12 V?*	Go to Step 6.	Repair open in "BLK/WHT" wire.

Step	Action	Yes	No
6	**Check for open in "BLK/ORN" wire:** 1) With the ignition switch at ON position, check voltage between "G24-2" wire terminal at immobilizer control module and body ground. *Is voltage 0?*	Go to Step 7.	Repair open in "BLK/ ORN" wire.
7	**Check for open in "YEL/BLK" wire:** 1) Disconnect immobilizer control module connector "G24" referring to "Immobilizer Control Module Removal and Installation: ". 2) Disconnect ECM connector "E23" referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C". 3) Check resistance between "G24-3" wire terminal at immobilizer control module connector and "E23-28" wire terminal at ECM connector. *Is resistance infinite?*	Repair open in "YEL/ BLK" wire.	Go to Step 8.
8	**Check for short to ground circuit in "YEL/BLK" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, check resistance between "G24-3" wire terminal at immobilizer control module connector and body ground. *Is resistance infinite?*	Go to Step 9.	Repair short to ground circuit in "YEL/BLK" wire.
9	**Check for short to power circuit in "YEL/BLK" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, turn the ignition switch to ON position. 2) Check voltage between "G24-3" wire terminal at immobilizer control module connector and body ground. *Is voltage 0 V?*	Go to Step 10.	Repair short to power circuit in "YEL/BLK" wire.
10	**Check for open in "YEL/RED" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, check resistance between "G24-4" wire terminal at immobilizer control module connector and "E23-13" wire terminal at ECM connector. *Is resistance infinite?*	Repair open in "YEL/ RED" wire.	Go to Step 11.
11	**Check for short to ground circuit in "YEL/RED" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, check resistance between "G24-4" wire terminal at immobilizer control module connector and body ground. *Is resistance infinite?*	Go to Step 12.	Repair short to ground circuit in "YEL/RED" wire.
12	**Check for short to power circuit in "YEL/RED" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, turn the ignition switch to ON position. 2) Check voltage between "G24-4" wire terminal at immobilizer control module connector and body ground. *Is voltage 0 V?*	Go to Step 13.	Repair short to power circuit in "YEL/RED" wire.

Step	Action	Yes	No
13	**Check for short of "YEL/BLK" and "YEL/RED" wires:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, check resistance between "G24-3" wire terminal and "G24-4" wire terminal at immobilizer control module connector. *Is resistance infinite?*	Go to Step 14.	Repair short of "YEL/BLK" and "YEL/RED" wires.
14	**Check for fault of immobilizer control module:** 1) Check immobilizer control module referring to "Inspection of Immobilizer Control Module and Its Circuit: ". *Is immobilizer control module normal?*	Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C", and then perform "Procedure after ECM Replacement: ".	Replace immobilizer control module with new one referring to "Immobilizer Control Module Removal and Installation: ".

DTC P1622 EEPROM Error

S4RS0AA304030

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error • Internal failure (EEPROM corruption) of ECM	ECM

Troubleshooting

1) Clear DTC(s) referring to "Diagnostic Trouble Code (DTC) Clearance: ".
2) Turn the ignition switch to OFF position.
3) Check if DTC P1622 is still detected referring to "Diagnostic Trouble Code (DTC) Check: ". If still detected, go to the next step. If not, the troubleshooting is completed.
4) Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C".
5) Perform "Procedure after ECM Replacement: ".

DTC P1623 Unregistered Transponder

S4RS0AA304031

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error • Use of the unregistered ignition key • Immobilizer control module faulty • ECM faulty	• Transponder in the ignition key • Immobilizer control module • ECM

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) confirmation:** 1) Clear DTC(s) referring to "Diagnostic Trouble Code (DTC) Clearance: ". 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1623 still detected?*	Go to Step 2.	The troubleshooting is completed.
2	**Diagnostic Trouble Code (DTC) check:** 1) Check if any DTC other than P1623 is detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is any DTC other than P1623 is detected?*	Perform troubleshooting referring to the corresponding flowchart in this section, and then go to Step 3.	Go to Step 3.

Step	Action	Yes	No
3	**Registration of the unregistered ignition key with ECM and Diagnostic Trouble Code (DTC) check:** 1) Register the transponder code in the transponder in the unregistered ignition key with ECM referring to "Registration of the Ignition Key: ". 2) Make sure that DTC P1623 is not detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1623 still detected?*	Go to Step 4.	The troubleshooting is completed.
4	**Check for fault of immobilizer control module:** 1) Check immobilizer control module referring to "Inspection of Immobilizer Control Module and Its Circuit: ". *Is immobilizer control module normal?*	Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C", and then perform "Procedure after ECM Replacement: ".	Replace immobilizer control module with new one referring to "Immobilizer Control Module Removal and Installation: ".

DTC P1625 Immobilizer Antenna Error

S4RS0AA304032

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error	• Immobilizer control module
• Immobilizer control module faulty	• ECM
• ECM faulty	

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) confirmation:** 1) Clear DTC(s) referring to "Diagnostic Trouble Code (DTC) Clearance: ". 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1625 still detected?*	Go to Step 2.	The troubleshooting is completed.
2	**Immobilizer control module replacement and Diagnostic Trouble Code (DTC) check:** 1) Replace immobilizer control module referring to "Immobilizer Control Module Removal and Installation: ". 2) Check if DTC P1625 is still detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1625 still detected?*	Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C", and then perform "Procedure after ECM Replacement: ".	The troubleshooting is completed.

Inspection of Immobilizer Control Module and Its Circuit

S4RS0AA304015

Immobilizer control module and its circuit can be checked at immobilizer control module wiring connector by measuring voltage.

CAUTION:

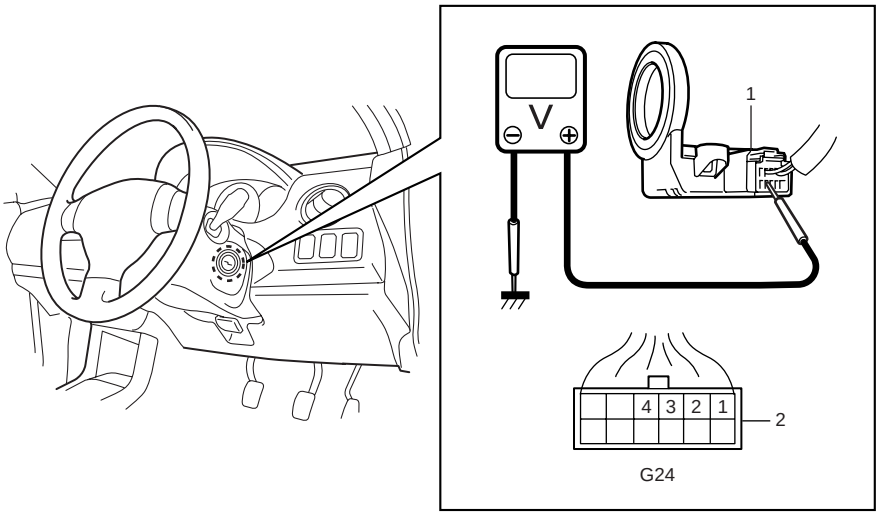
Immobilizer control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to immobilizer control module with connector disconnected from it.

Voltage Check

1) Remove immobilizer control module (1) from steering lock assembly referring to “Immobilizer Control Module Removal and Installation: ”.
2) Connect immobilizer control module wiring connector (2) to immobilizer control module.
3) Check voltage at each terminal.

NOTE:

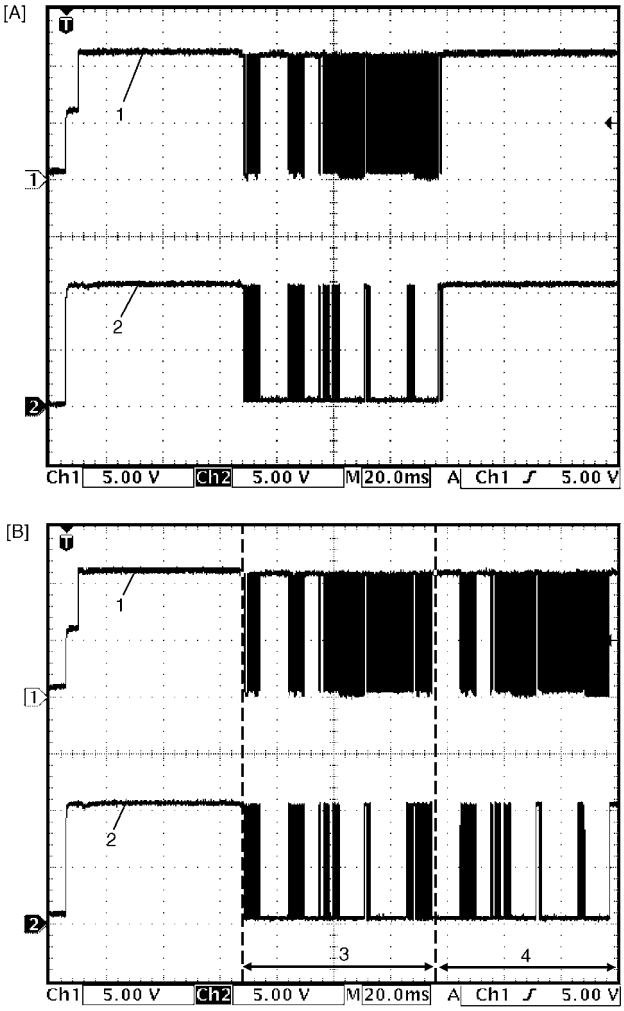
As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when the ignition switch is turned to ON position.



I4RS0AA30006-

Connector	Terminal		Circuit	Normal Voltage	Condition
G24	1	BLK/ WHT	Power supply	About 12.0 V	Ignition switch at ON position
				0.0 V	Ignition switch at OFF position
	2	BLK/ ORG	Ground	0.0 V	Ignition switch at ON position
				0.0 V	Ignition switch at OFF position
	3	YEL/ BLK	Serial communication line	See the reference waveform.	—
				0.0 V	Ignition switch at OFF position
	4	YEL/ RED	Clock line	See the reference waveform.	—
				0.0 V	Ignition switch at OFF position

Reference waveform



I4RS0AA30007-

[A]:	The transponder code read successfully at the first try.
[B]:	The transponder code read successfully at the second try.
1.	Serial communication line
2.	Clock line
3.	First try
4.	Second try

NOTE:

When ECM cannot read the transponder code at the first try, ECM tries to read the transponder code repeatedly up to 8 times. The second waveform is the example showing that ECM read the transponder code successfully at the second try.

Measurement terminals	CH1: G24-3 to G24-2 CH2: G24-4 to G24-2
Oscilloscope settings	CH1: 5 V/DIV CH2: 5 V/DIV TIME: 20 ms
Measurement condition	Right after the ignition switch is turned ON, the waveform can be read.

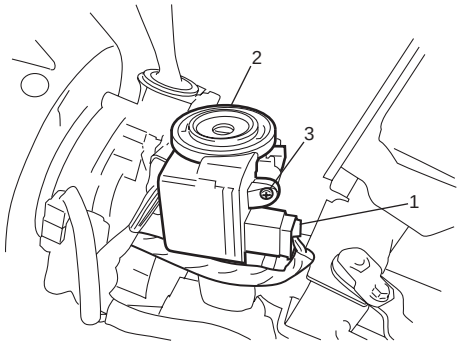
Repair Instructions

Immobilizer Control Module Removal and Installation

S4RS0AA306005

Removal

1) Disconnect negative (-) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
4) Remove steering wheel referring to “Steering Wheel Removal and Installation: in Section 6B”.
5) Remove steering column lower and upper covers.
6) Disconnect connector (1) from immobilizer control module (2).
7) Remove a screw (3) from immobilizer control module.



I4RS0AA30008-

8) Remove immobilizer control module from steering lock assembly.

Installation

Reverse the removal procedure.

Registration of the Ignition Key

S4RS0AA306002

To finish the registration of the ignition key, the transponder code memorized in the transponder built in the ignition key has to be registered with ECM. To register the transponder code with ECM, perform “Register Ig Key” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator’s Manual”.

NOTE:

- **A maximum of four transponder codes can be registered with ECM.**
- **At an early part of the registration process, all transponder codes of the ignition keys in use already registered with ECM are cleared. Therefore, before starting the registration, prepare all ignition keys in use in addition to the new ignition key(s) to be registered with ECM.**

Procedure after ECM Replacement

S4RS0AA306004

After ECM is replaced with new one, the transponder code in the transponder built in the ignition key has to be registered with ECM. To register transponder code in the ignition key with ECM, perform “Replace New ECM” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator’s Manual”.

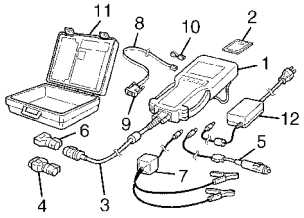
NOTE:

A maximum of four transponder codes can be registered with ECM.

Special Tools and Equipment

Special Tool

S4RS0AA308001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞		

Prepared by

SUZUKI MOTOR CORPORATION

1st Ed. Dec., 2004

IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words **WARNING, CAUTION** and **NOTE** have special meanings. Pay special attention to the messages highlighted by these signal words.

WARNING:

Indicates a potential hazard that could result in death or injury.

CAUTION:

Indicates a potential hazard that could result in vehicle damage.

NOTE:

Indicates special information to make maintenance easier or instructions clearer.

WARNING:

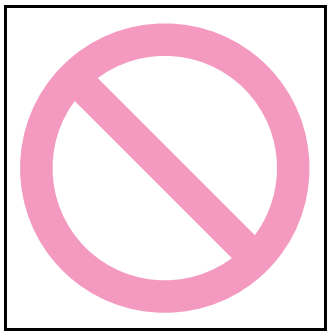
This service manual is intended for authorized Suzuki dealers and qualified service technicians only. Inexperienced technicians or technicians without the proper tools and equipment may not be able to properly perform the services described in this manual.
Improper repair may result in injury to the technician and may render the vehicle unsafe for the driver and passengers.

WARNING:

For vehicles equipped with a Supplemental Restraint or Air Bag System:

- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components and Wiring Location View" under "General Description" in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and "Service Precautions" under "On-Vehicle Service" in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **If the air bag system and another vehicle system both need repair, Suzuki recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.**
- **Do not modify the steering wheel, instrument panel or any other air bag system component on or around air bag system components or wiring. Modifications can adversely affect air bag system performance and lead to injury.**
- **If the vehicle will be exposed to temperatures over 93°C (200°F), for example, during a paint baking process, remove the air bag system components, that is air bag or inflator modules, SDM and/or seat belt with pretensioner, beforehand to avoid component damage or unintended activation.**

The circle with a slash in this manual means "Don't do this" or "Don't let this happen".



FOREWORD

This manual (Volumes 1 and 2) contains procedures for diagnosis, maintenance, adjustments, minor service operations, replacement of components (Service) and for disassembly and assembly of major components (Unit Repair-Overhaul).

VOLUME 1 contains General information, Engine, Suspension, Drive/Axle and Brakes sections (Sections 0 – 4).
VOLUME 2 contains Transmmision/Transaxle, Steering, HVAC, Restraint, Body/Cab/Accessories and Control Systems sections (Sections 5 – 10).

Applicable model:
SWIFT (RS415) vehicles on and after following vehicle identification numbers (VINs).

JSAEZC21S00100001

The contents are classified into sections each of which is given a section number as indicated in the Table of Contents on following page. And on the first page of each individual section is an index of that section.
This manual should be kept in a handy place for ready reference of the service work.
Strict observance of the so specified items will enable one to obtain the full performance of the vehicle.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others.
Therefore, note that illustrations may differ from the vehicle being actually serviced.
The right is reserved to make changes at any time without notice.

SUZUKI MOTOR CORPORATION

© COPYRIGHT SUZUKI MOTOR CORPORATION 2004

TABLE OF CONTENTS

Volume 1

Precautions 00-i
Precautions 00-1

General Information 0-i
General Information 0A-1
Maintenance and Lubrication 0B-1

Engine 1-i
Precautions 1-1
Engine General Information and Diagnosis 1A-1
Aux. Emission Control Devices 1B-1
Engine Electrical Devices 1C-1
Engine Mechanical 1D-1
Engine Lubrication System 1E-1
Engine Cooling System 1F-1
Fuel System 1G-1
Ignition System 1H-1
Starting System 1I-1
Charging System 1J-1
Exhaust System 1K-1

Suspension 2-i
Precautions 2-1
Suspension General Diagnosis 2A-1
Front Suspension 2B-1
Rear Suspension 2C-1
Wheels and Tires 2D-1

Driveline / Axle 3-i
Drive Shaft / Axle 3A-1

Brakes 4-i
Precautions 4-1
Brake Control System and Diagnosis 4A-1
Front Brakes 4B-1
Rear Brakes 4C-1
Parking Brake 4D-1
ABS 4E-1

Volume 2

Precautions 00-i
Precautions 00-1

Transmission / Transaxle 5-i
Precautions 5-1
Automatic Transmission 5A-1
Manual Transmission 5B-1
Clutch 5C-1

Steering 6-i
Precautions 6-1
Steering General Diagnosis 6A-1
Steering Wheel and Column 6B-1
Power Assisted Steering System 6C-1

HVAC 7-i
Precautions 7-1
Heater and Ventilation 7A-1
Air Conditioning System 7B-1

Restraint 8-i
Precautions 8-1
Seat Belts 8A-1
Air Bag System 8B-1

Body, Cab and Accessories 9-i
Precautions 9-1
Wiring Systems 9A-1
Lighting Systems 9B-1
Instrumentation / Driver Info. / Horn 9C-1
Wipers / Washers 9D-1
Glass / Windows / Mirrors 9E-1
Security and Locks 9F-1
Seats 9G-1
Interior Trim 9H-1
Hood / Fenders / Doors 9J-1
Body Structure 9K-1
Paint / Coatings 9L-1
Exterior Trim 9M-1

Control systems 10-i
Precautions 10-1
Body Electrical Control System 10B-1
Immobilizer Control System 10C-1

Section 00

Precautions

CONTENTS

Precautions 00-1
Precautions 00-1
Precautions for Vehicles Equipped with a Supplemental Restraint (Air Bag) System 00-1
General Precautions 00-3
Precautions for Catalytic Converter 00-6
Precautions for Installing Mobile Communication Equipment 00-6
Precaution for CAN Communication System 00-7
Precautions for Electrical Circuit Service 00-7
Air Bag Warning 00-9
Air Bag System Service Warning 00-9
Fastener Caution 00-9
Suspension Caution 00-9
Wheels and Tires Caution 00-9
Brake Caution 00-10
Repair Instructions 00-10
Electrical Circuit Inspection Procedure 00-10
Intermittent and Poor Connection Inspection 00-12

Precautions

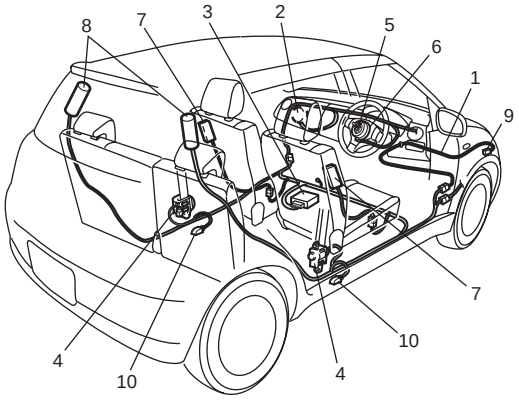
Precautions

Precautions for Vehicles Equipped with a Supplemental Restraint (Air Bag) System

S4RS0A0000001

WARNING:

- **The configuration of air bag system parts are as shown in the figure. When it is necessary to service (remove, reinstall and inspect) these parts, be sure to follow procedures described in Air Bag System section. Failure to follow proper procedures could result in possible air bag system activation, personal injury, damage to parts or air bag system being unable to activate when necessary.**
- **If the air bag system and another vehicle system both need repair, SUZUKI recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.**
- **Do not modify the steering wheel, dashboard, or any other air bag system components. Modifications can adversely affect air bag system performance and lead to injury.**
- **If the vehicle will be exposed to temperatures over 93 °C (200 °F) (for example, during a paint baking process), remove the air bag system components beforehand to avoid component damage or unintended air bag system activation.**



I4RS0A000001-

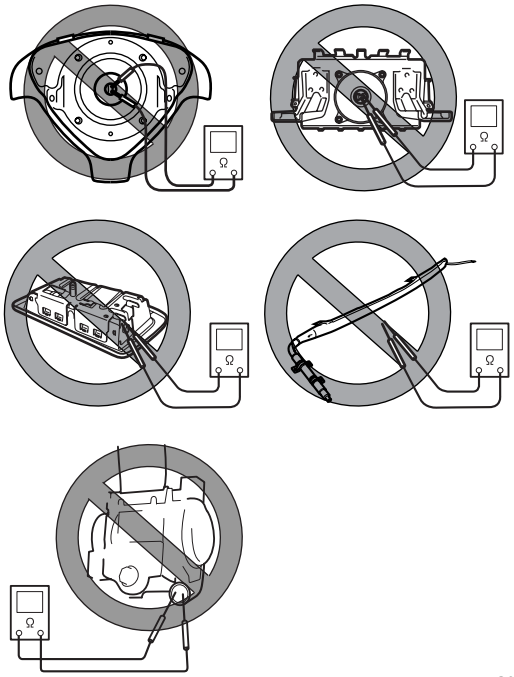
1. Air bag wire harness (in floor, main and instrument panel harness)	6. Driver air bag (inflator) module
2. Passenger air bag (inflator) module	7. Side air bag (inflator) module (if equipped)
3. SDM	8. Curtain air bag (inflator) module (if equipped)
4. Seat belt pretensioner	9. Forward sensor
5. Contact coil	10. Side sensor (if equipped)

Diagnosis

- When troubleshooting air bag system, be sure to follow “Diagnosis” in Air Bag System section. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacement.
- Never use electrical test equipment other than that specified.

WARNING:

Never attempt to measure the resistance of the air bag (inflator) modules (driver, passenger, side and curtain) and seat belt pretensioners (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag or activate the pretensioner.



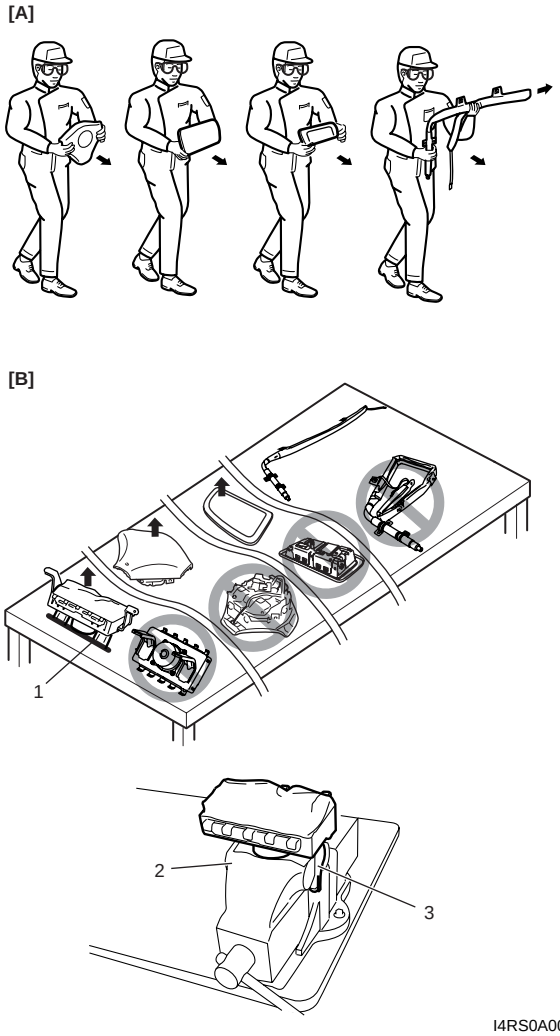
I4RS0A000002-

Servicing and Handling

WARNING:

Many of service procedures require disconnection of "A/BAG" fuse and all air bag (inflator) module(s) from initiator circuit to avoid an accidental deployment.
Driver, Passenger, Side and Curtain Air Bag (Inflator) Modules

- **For handling and storage of a live air bag (inflator) module, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. Never carry the air bag (inflator) module by the wires or connector on the underside of the module. When placing a live air bag (inflator) module on a bench or other surface, always face the bag up, away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit (1) or use the workbench vise (2) to hold it securely at its lower mounting bracket (3). It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment. Otherwise, personal injury may result.**
- **Never dispose of live (undeployed) air bag (inflator) modules (driver, passenger, side and curtain). If disposal is necessary, be sure to deploy them according to deployment procedures described in "Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal: in Section 8B" before disposal.**
- **The air bag (inflator) module immediately after deployment is very hot. Wait for at least half an hour to cool it off before proceeding the work.**
- **After an air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and by-products of the chemical reaction. As with many service procedures, gloves and safety glasses should be worn.**



I4RS0A000003-

[A]:	Always carry air bag (inflator) module with trim cover (air bag opening) away from body.
[B]:	Always place air bag (inflator) module on workbench with trim cover (air bag opening) up, away from loose objects.

WARNING:

SDM

- **For handling and storage of a SDM, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM). Never strike or jar the SDM.**
- **Never power up the air bag system when the SDM is not rigidly attached to the vehicle. All SDM and mounting bracket fasteners must be carefully torqued and the arrow must be pointing toward the front of the vehicle to ensure proper operation of the air bag system.**
  The SDM could be activated when powered while not rigidly attached to the vehicle which could cause deployment and result in personal injury.

WARNING:

Driver and Passenger Seat Belt Pretensioners

- **For handling and storage of a live seat belt pretensioner, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Never carry seat belt pretensioner by wire or connector of pretensioner. When placing a live seat belt pretensioner on the workbench or some place like that, never put something on seat belt pretensioner. Otherwise, personal injury may result.**
- **Never dispose of live (inactivated) seat belt pretensioners (drive and passenger). If disposal is necessary, be sure to activate them according to activation procedures described in "Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal: in Section 8B" before disposal.**
- **The seat belt pretensioner immediately after activation is very hot. Wait for at least half an hour to cool it off before proceeding the work.**
- **With many service procedures, gloves and safety glasses should be worn to prevent any possible irritation of the skin or eyes.**

- Even when the accident was light enough not to cause air bags to activate, be sure to inspect system parts and other related parts according to instructions under "Repair and Inspection Required after Accident: in Section 8B".
- When servicing parts other than air bag system, if shocks may be applied to air bag system component parts, remove those parts beforehand.
- When handling the air bag (inflator) modules (driver, passenger, side and curtain), seat belt pretensioners (driver and passenger), forward sensor, side sensors or SDM, be careful not to drop it or apply an impact to it. If an excessive impact was applied, never attempt disassembly or repair but replace it with a new one.
- When grease, cleaning agent, oil, water, etc. has got onto air bag (inflator) modules (driver, passenger, side and curtain) or seat belt pretensioners (drive and passenger), wipe off immediately with a dry cloth.
- Air bag wire harness is included in floor and instrument panel wire harnesses. Air bag wire harness branched off from floor and instrument panel wire harnesses can be identified easily as it is covered with a yellow protection tube and it has yellow connectors. Be very careful when handling it.
- When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.
- Do not apply power to the air bag system unless all components are connected or a diagnostic flow requests it, as this will set a DTC.
- Never use air bag system component parts from another vehicle.
- When using electric welding, be sure to disconnect all air bag (inflator) module connectors and pretensioner connectors from air bag wire harness respectively.
- Never expose air bag system component parts directly to hot air (drying or baking the vehicle after painting) or flames.
- WARNING / CAUTION labels are attached on each part of air bag system components. Be sure to follow the instructions.
- After vehicle is completely repaired, perform "Air Bag Diagnostic System Check: in Section 8B".

General Precautions

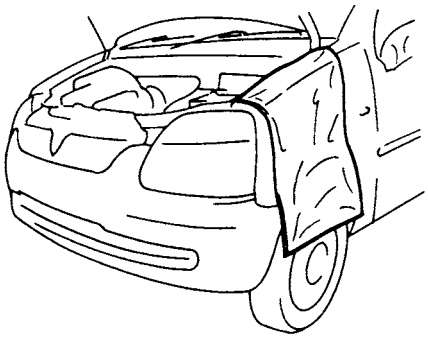
S4RS0A0000002

The WARNING and CAUTION describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures, and they will not necessarily be repeated with each procedure to which they apply.

WARNING:

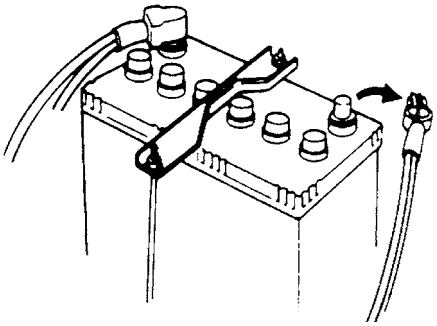
- **Whenever raising a vehicle for service, be sure to follow the instructions under "Vehicle Lifting Points: in Section 0A".**
- **When it is necessary to do service work with the engine running, make sure that the parking brake is set fully and the transmission is in Neutral (for manual transmission vehicles) or Park (for automatic transmission vehicles), Keep hands, hair, clothing, tools, etc. away from the fan and belts when the engine is running.**
- **When it is necessary to run the engine indoors, make sure that the exhaust gas is forced outdoors.**
- **Do not perform service work in areas where combustible materials can come in contact with a hot exhaust system. When working with toxic or flammable materials (such as gasoline and refrigerant), make sure that the area you work in is well-ventilated.**
- **To avoid getting burned, keep away from hot metal parts such as the radiator, exhaust manifold, tail pipe, muffler, etc.**
- **New and used engine oil can be hazardous. Children and pets may be harmed by swallowing new or used oil. Keep new and used oil and used engine oil filters away from children and pets. Continuous contact with used engine oil has been found to cause [skin] cancer in laboratory animals. Brief contact with used oil may irritate skin. To minimize your exposure to used engine oil, wear a long-sleeve shirt and moisture-proof gloves (such as dish washing gloves) when changing engine oil. If engine oil contacts your skin, wash thoroughly with soap and water. Launder any clothing or rags if wet with oil, recycle or properly dispose of used oil and filters.**
- **Be sure to observe following instructions when handling service materials such as fuel, oil, fluid, coolant, grease, sealant, thread lock cement, etc. Otherwise, your health may be ruined.**
  - **– Whenever handling any of these service materials, wear safety glasses to protect your eyes. If it gets into your eye, it may cause inflammation.**
  - **– Whenever handling any of these service materials, wear moisture-proof gloves to protect your skin. If it adheres to your skin, it may cause inflammation.**
  - **– Do not swallow any of these service materials. It would cause diarrhea or nausea.**
  - **– Keep all these materials out of children's reach.**
- **Make sure the bonnet is fully closed and latched before driving. If it is not, it can fly up unexpectedly during driving, obstructing your view and resulting in an accident.**

- Before starting any service work, cover fenders, seats and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g., buttons) may cause damage to the vehicle's finish.



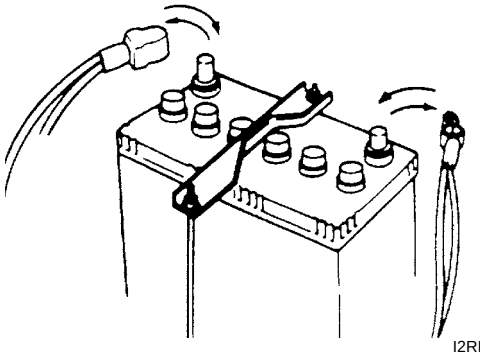
I2RH01010025-

- When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.
- When disconnecting the negative cable from the battery, record displayed contents of the clock and/or audio system before disconnecting and reset it as before after connecting.



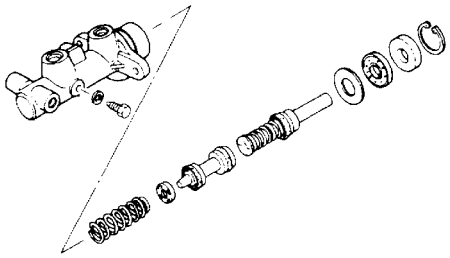
I2RH01010026-

- When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover.



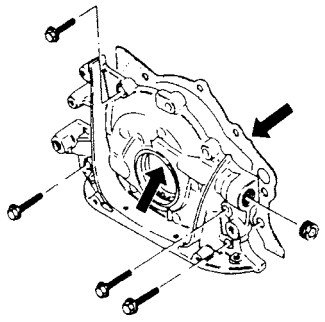
I2RH01010027-

- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.



I2RH01010028-

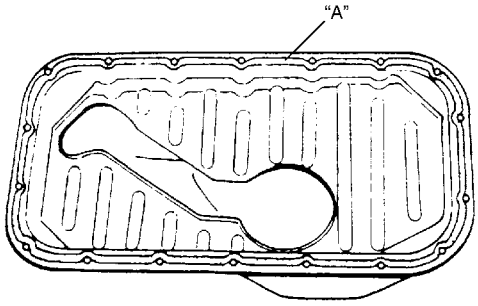
- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.



I2RH01010029-

- Make sure that all parts used in reassembly are perfectly clean.
  When use of a certain type of lubricant, bond or sealant is specified, be sure to use the specified type.

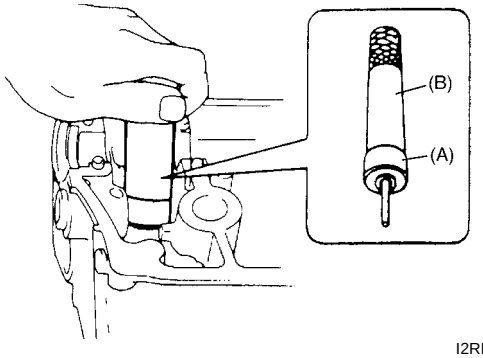
  "A": Water tight sealant 99000–31250



I2RH01010030-

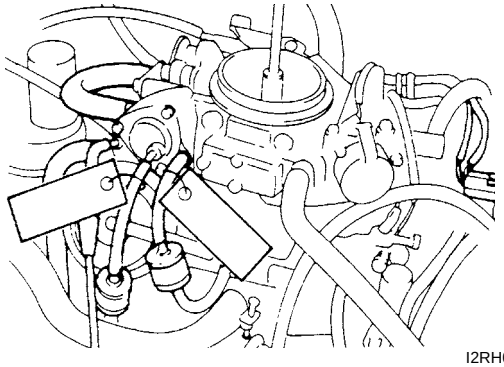
- Be sure to use special tools when instructed.

  Special tool
  (A): 09917-98221
  (B): 09916-58210



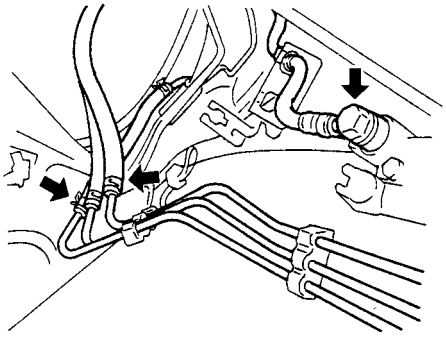
I2RH01010031-

- When disconnecting vacuum hoses, attach a tag describing the correct installation positions so that the hoses can be reinstalled correctly.



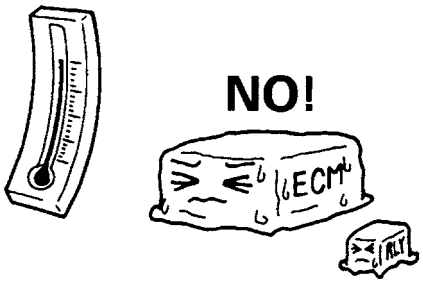
I2RH01010032-

- After servicing fuel, oil, coolant, vacuum, exhaust or brake systems, check all lines related to the system for leaks.



I2RH01010033-

- For vehicles equipped with fuel injection systems, never disconnect the fuel line between the fuel pump and injector without first releasing the fuel pressure, or fuel can be sprayed out under pressure.
- When performing a work that produces a heat exceeding 80 °C (176 °F) in the vicinity of the electrical parts, remove the heat sensitive electrical part(s) beforehand.

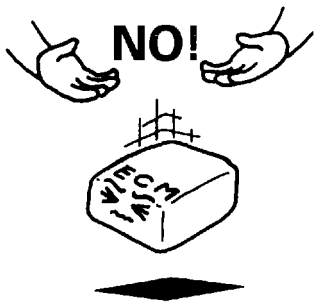


I2RH01010034-

- Use care not to expose connectors and electrical parts to water which will be a cause of a trouble.

I2RH01010035-

- Always be careful not to handle electrical parts (computer, relay, etc.) in a rough manner or drop them.



I2RH01010036-

Precautions for Catalytic Converter

S4RS0A0000003

For vehicles equipped with a catalytic converter, use only unleaded gasoline and be careful not to let a large amount of unburned gasoline enter the converter or it can be damaged.

- Conduct a spark jump test only when necessary, make it as short as possible, and do not open the throttle.
- Conduct engine compression checks within the shortest possible time.
- Avoid situations which can result in engine misfire (e.g. starting the engine when the fuel tank is nearly empty.)

Precautions for Installing Mobile Communication Equipment

S4RS0A0000004

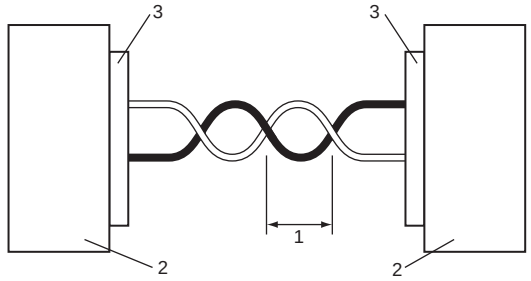
When installing mobile communication equipment such as CB (Citizens-Band)-radio or cellular-telephone, be sure to observe the following precautions.
Failure to follow cautions may adversely affect electronic control system.

- Keep the antenna as far away as possible from the vehicle's electronic control unit.
- Keep the antenna feeder more than 20 cm (7.9 in.) away from electronic control unit and its wire harnesses.
- Do not run the antenna feeder parallel with other wire harnesses.
- Confirm that the antenna and feeder are correctly adjusted.

Precaution for CAN Communication System

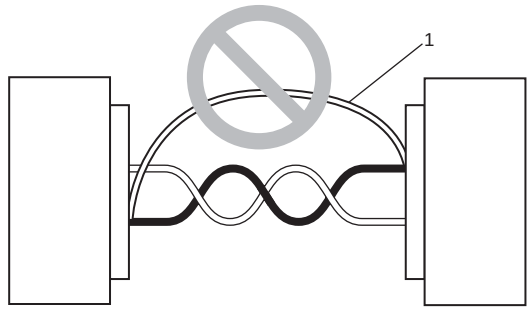
S4RS0A0000014

- The loose (1) in the wire harnesses twist of the CAN lines except around the connector (3) should be within 100 mm (3.9 in.). Refer to the wiring diagram for the CAN lines discrimination. Excessively-loosed lines may be influenced by the electric noise.



I4JA01000002-

- Do not connect terminals of the CAN line using a bypass wire (1). Otherwise, the CAN line may be influenced by the electric noise.

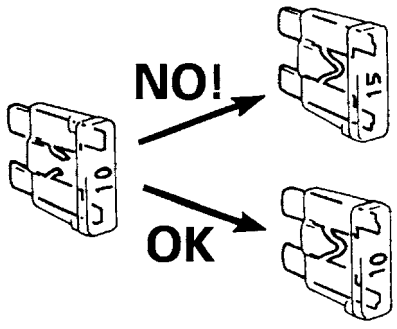


I4JA01000003-

Precautions for Electrical Circuit Service

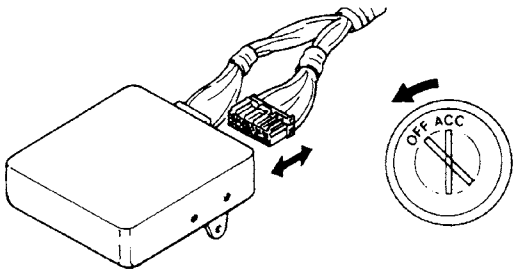
S4RS0A0000007

- When replacing a fuse, make sure to use a fuse of the specified capacity. Use of a fuse with a larger capacity will cause a damage to the electrical parts and a fire.



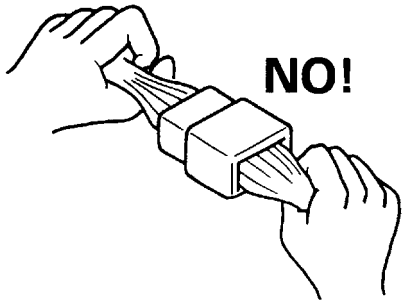
I2RH01010038-

- When disconnecting and connecting coupler, make sure to turn ignition switch OFF, or electronic parts may get damaged.



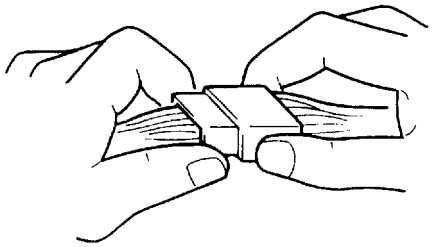
I2RH01010039-

- When disconnecting connectors, never pull the wiring harness. Unlock the connector lock first and then pull them apart by holding connectors themselves.



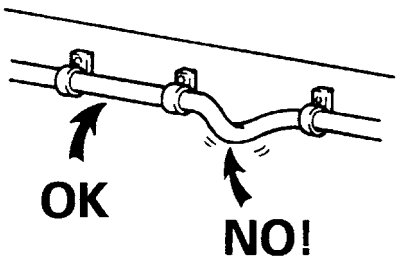
I2RH01010040-

- When connecting connectors, also hold connectors and put them together until they lock securely (a click is heard).



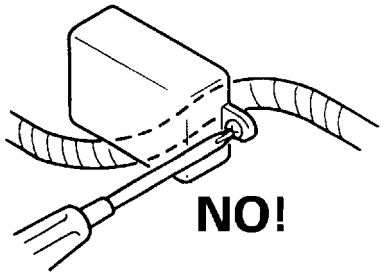
I2RH01010041-

- When installing the wiring harness, fix it with clamps so that no slack is left.



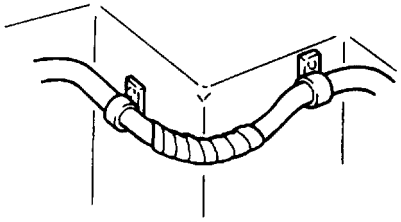
I2RH01010042-

- When installing vehicle parts, be careful so that the wiring harness is not interfered with or caught by any other part.



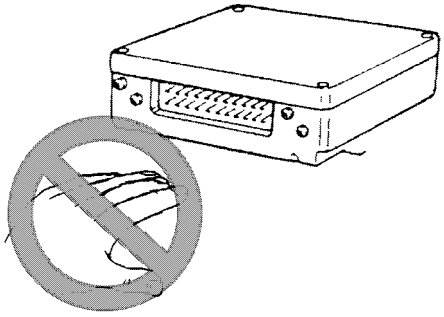
I2RH01010043-

- To avoid damage to the harness, protect its part which may contact against a part forming a sharp angle by winding tape or the like around it.



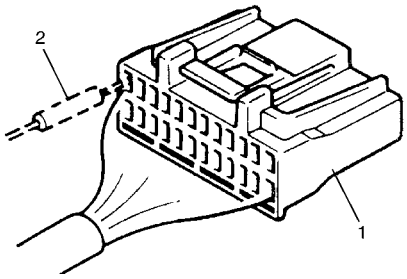
I2RH01010044-

- Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit like as ECM, PCM, P/S controller, etc.). The static electricity from your body can damage these parts.



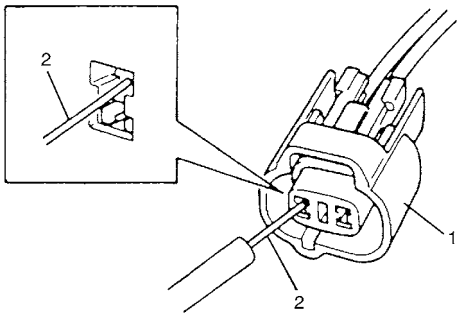
I3RM0A000004-

- Never connect any tester (voltmeter, ohmmeter, or whatever) to electronic control unit when its coupler is disconnected. Attempt to do it may cause damage to it.
- Never connect an ohmmeter to electronic control unit with its coupler connected to it. Attempt to do it may cause damage to electronic control unit and sensors.
- Be sure to use a specified voltmeter / ohmmeter. Otherwise, accurate measurements may not be obtained or personal injury may result. If not specified, use a voltmeter with high impedance (M Ω/V minimum) or a digital type voltmeter.
- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe (2) from the wire harness side (backside) of the connector (1).



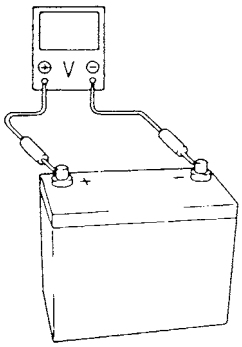
I2RH01010046-

- When connecting meter probe (2) from terminal side of coupler (1) because it can't be connected from harness side, use extra care not to bend male terminal of coupler of force its female terminal open for connection.
  In case of such coupler as shown connect probe as shown to avoid opening female terminal.
  Never connect probe where male terminal is supposed to fit.



I2RH01010047-

- When checking connection of terminals, check its male half for bend and female half for excessive opening and both for locking (looseness), corrosion, dust, etc.
- Before measuring voltage at each terminal, check to make sure that battery voltage is 11 V or higher. Such terminal voltage check at low battery voltage will lead to erroneous diagnosis.



I2RH01010048-

Air Bag Warning

S4RS0A0000008

WARNING:

For vehicles equipped with Supplemental Restraint (Air Bag) System:

- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components, Wiring and Connectors Location: in Section 8B" in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and "Precautions on Service and Diagnosis of Air Bag System: in Section 8B" before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the LOCK position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

Air Bag System Service Warning

S4RS0A0000009

WARNING:

- **Service on or around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Please observe all WARNINGS in Air Bag System and "Precautions on Service and Diagnosis of Air Bag System: in Section 8B" before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintended activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **The procedures in the air bag system section must be followed in the order listed to disable the air bag system temporarily and prevent false DTCs from setting. Failure to follow procedures could result in possible activation of the air bag system, personal injury or otherwise unneeded air bag system repairs.**

Fastener Caution

S4RS0A0000010

CAUTION:

When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread-locking compound, will be called out. The correct torque value must be used when installing fasteners that require it. If the conditions are not followed, parts or system damage could result.

Suspension Caution

S4RS0A0000011

CAUTION:

- **All suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.**
- **Never attempt to heat, quench or straighten any suspension part. Replace it with a new part or damage to the part may result.**

Wheels and Tires Caution

S4RS0A0000012

CAUTION:

All wheel fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts.
There is to be no welding as it may result in extensive damage and weakening of the metal.

Brake Caution

S4RS0A0000013

CAUTION:

All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.

Repair Instructions

Electrical Circuit Inspection Procedure

S4RS0A0006001

While there are various electrical circuit inspection methods, described here is a general method to check its open and short circuit by using an ohmmeter and a voltmeter.

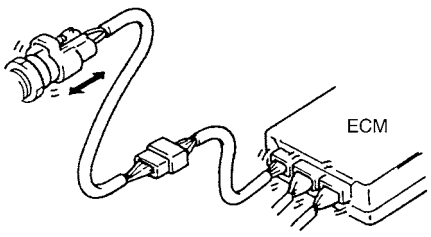
Open Circuit Check

Possible causes for the open circuit are as follows. As the cause is in the connector or terminal in many cases, they need to be checked particularly carefully.

- Loose connection of connector
- Poor contact of terminal (due to dirt, corrosion or rust on it, poor contact tension, entry of foreign object etc.)
- Wire harness being open

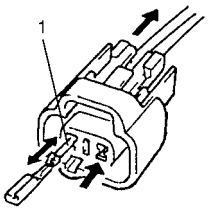
When checking system circuits including an electronic control unit such as ECM, TCM, ABS control module, etc., it is important to perform careful check, starting with items which are easier to check.

1) Disconnect negative (–) cable from battery
2) Check each connector at both ends of the circuit being checked for loose connection. Also check lock condition of connector if equipped with connector lock.



I2RH01010049-

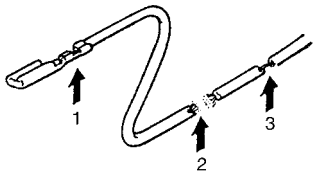
3) Using a test male terminal, check both terminals of the circuit being checked for contact tension of its female terminal. Check each terminal visually for poor contact (possibly caused by dirt, corrosion, rust entry of foreign object, etc.). At the same time, check to make sure that each terminal is locked in the connector fully.



I2RH01010050-

1. Check contact tension by inserting and removing just for once.

4) Using continuity check or voltage check the following procedure, check the wire harness for open circuit and poor connection with its terminals. Locate abnormality, if any.

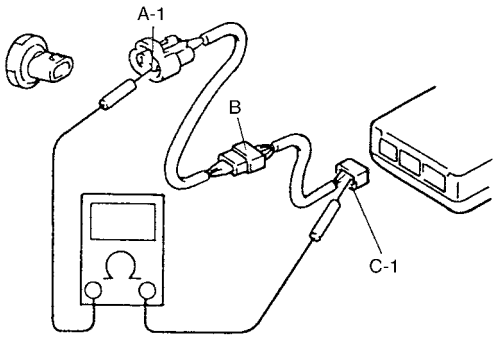


I2RH01010051-

1. Looseness of crimping
2. Open
3. Thin wire (single strand of wire)

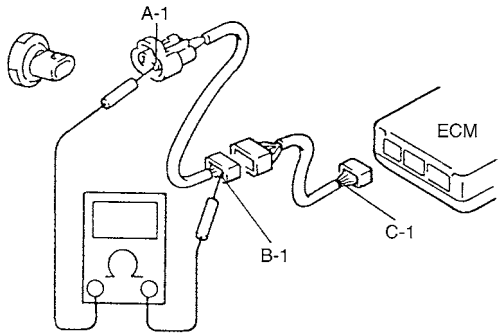
Continuity Check

1) Measure resistance between connector terminals at both ends of the circuit being checked (between “A-1” and “C-1” in the figure). If no continuity is indicated (infinity or over limit), that means that the circuit is open between terminals “A-1” and “C-1”.



I2RH01010052-

2) Disconnect the connector included in the circuit (connector-B in the figure) and measure resistance between terminals “A-1” and “B-1”.
If no continuity is indicated, that means that the circuit is open between terminals “A-1” and “B-1”. If continuity is indicated, there is an open circuit between terminals “B-1” and “C-1” or an abnormality in connector-B.



I2RH01010053-

Voltage Check

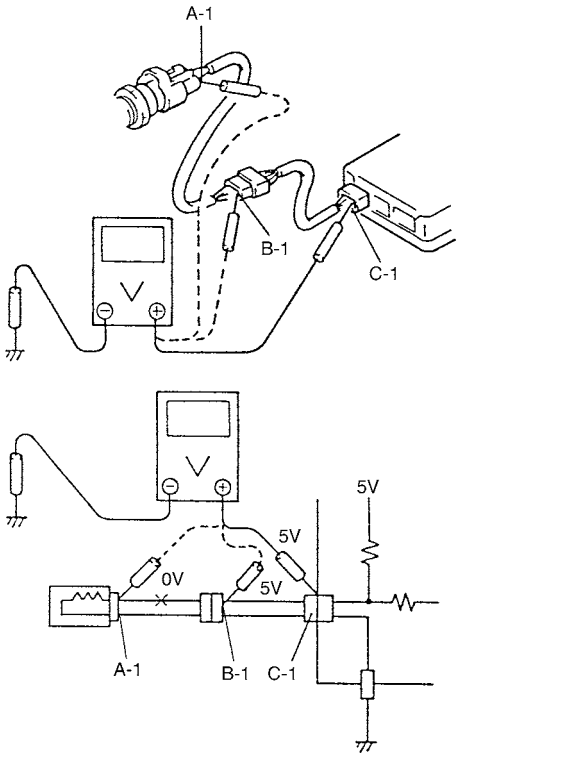
If voltage is supplied to the circuit being checked, voltage check can be used as circuit check.

1) With all connectors connected and voltage applied to the circuit being checked, measure voltage between each terminal and body ground.
   a) If measurements were taken as shown in the figure and results were as listed in the following, it means that the circuit is open between terminals “B-1” and “A-1”.

      Voltage between
      “C-1” and body ground: Approx. 5 V
      “B-1” and body ground: Approx. 5 V
      “A-1” and body ground: 0 V

   b) Also, if measured values were as listed in the following, it means that there is a resistance (abnormality) of such level that corresponds to the voltage drop in the circuit between terminals “A-1” and “B-1”.

      Voltage between
      “C-1” and body ground: Approx. 5 V
      “B-1” and body ground: Approx. 5 V
      “A-1” and body ground: Approx. 3 V



I5RH01000005-

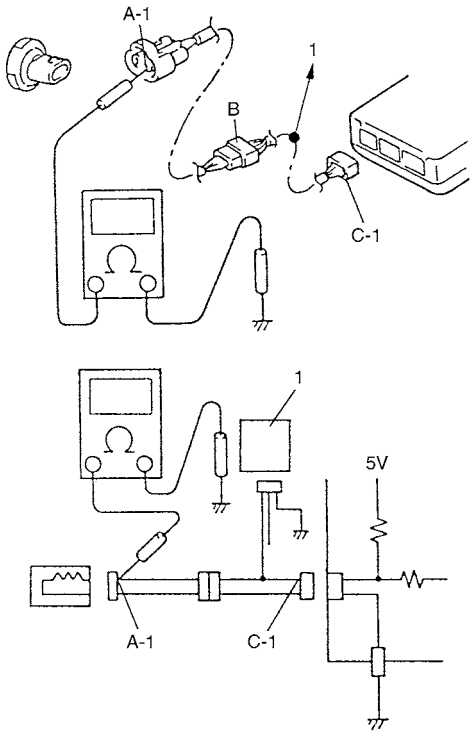
Short Circuit Check (Wire Harness to Ground)

1) Disconnect negative (–) cable at battery.
2) Disconnect connectors at both ends of the circuit to be checked.

   NOTE:

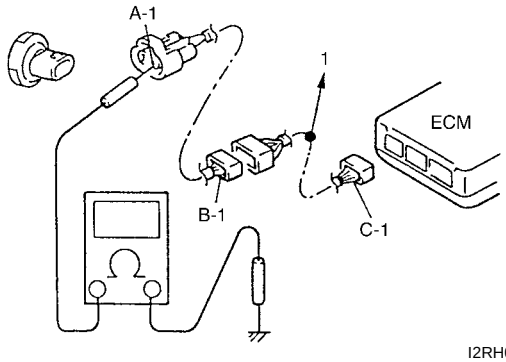
   If the circuit to be checked is connected to other parts (1), disconnect all connectors of those parts.
   Otherwise, diagnosis will be misled.

3) Measure resistance between terminal at one end of circuit (“A-1” terminal in the figure) and body ground. If continuity is indicated, it means that there is a short to ground between terminals “A-1” and “C-1” of the circuit.



I5RH01000006-

4) Disconnect the connector included in circuit (connector-B) and measure resistance between “A-1” and body ground. If continuity is indicated, it means that the circuit is shorted to the ground between terminals “A-1” and “B-1”.



I2RH01010056-

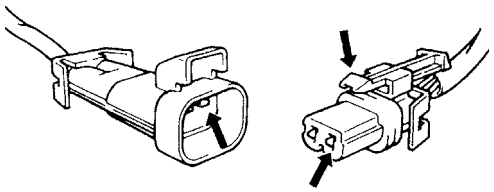
1.	To other parts

Intermittent and Poor Connection Inspection

S4RS0A0006002

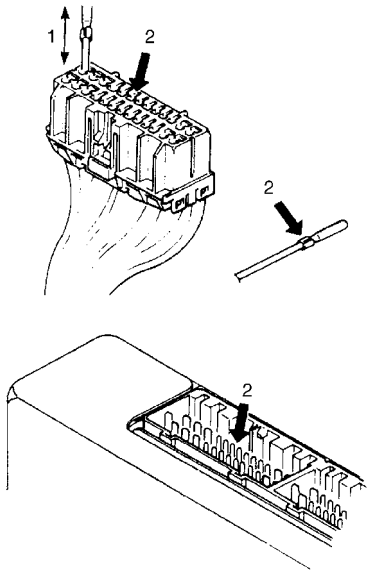
Most intermittent are caused by faulty electrical connections or wiring, although a sticking relay or solenoid can occasionally be at fault. When checking it for proper connection, perform careful check of suspect circuits for:

- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact. However, cleaning the terminal with a sand paper or the like is prohibited.
- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.



I2RH01010057-

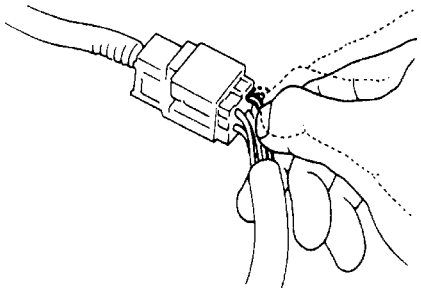
- Improperly formed or damaged terminals.
  Check each connector terminal in problem circuits carefully to ensure good contact tension by using the corresponding mating terminal.
  If contact tension is not enough, reform it to increase contact tension or replace.



I5RH01000007-

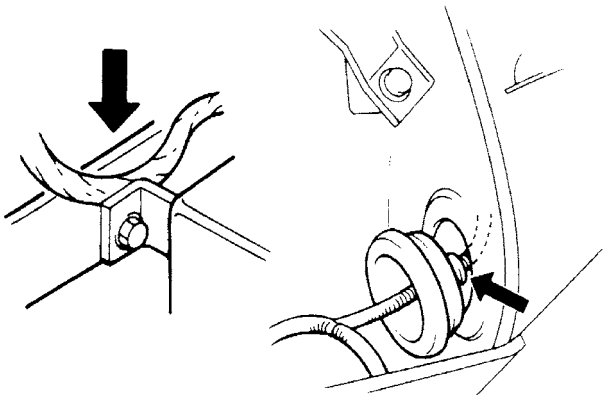
1.	Check contact tension by inserting and removing just once.
2.	Check each terminal for bend and proper alignment.

- Poor terminal-to-wire connection.
  Check each wire harness in problem circuits for poor connection by shaking it by hand lightly. If any abnormal condition is found, repair or replace.



I2RH01010059-

- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are intact, resistance could be far too high.
  If any abnormality is found, repair or replace.



I2RH01010060-

Section 0

General Information

0

CONTENTS

General Information 0A-1
General Description 0A-1
Abbreviations 0A-1
Symbols 0A-2
Wire Color Symbols 0A-2
Fasteners Information 0A-3
Vehicle Lifting Points 0A-4
Engine Supporting Points 0A-6
Vehicle Identification Number 0A-7
Engine Identification Number 0A-7
Transmission Identification Number 0A-7
Component Location 0A-7
Warning, Caution and Information Labels Location 0A-7

Maintenance and Lubrication 0B-1
Precautions 0B-1
Precautions for Maintenance and Lubrication 0B-1
Scheduled Maintenance 0B-1
Maintenance Schedule under Normal Driving Conditions 0B-1
Maintenance Recommended under Severe Driving Conditions 0B-2
Repair Instructions 0B-3
Accessory Drive Belt Inspection 0B-3
Accessory Drive Belt Replacement 0B-4
Valve Lash (Clearance) Inspection 0B-4
Engine Oil and Filter Change 0B-4
Engine Coolant Change 0B-5
Exhaust System Inspection 0B-6
Spark Plugs Replacement 0B-6
Air Cleaner Filter Inspection 0B-6
Air Cleaner Filter Replacement 0B-6
Fuel Lines and Connections Inspection 0B-6
Fuel Filter Replacement 0B-7
Fuel Tank Inspection 0B-7
PCV Valve Inspection 0B-7
Fuel Evaporative Emission Control System Inspection 0B-7
Brake Discs and Pads (Front) Inspection 0B-7
Brake Drums and Shoes (Rear) Inspection 0B-7
Brake Hoses and Pipes Inspection 0B-8
Brake Fluid Replacement 0B-8
Brake Lever and Cable Inspection 0B-8
Clutch fluid Inspection 0B-8
Tires Inspection 0B-9
Wheel Discs Inspection 0B-9
Wheel Bearing Inspection 0B-9
Suspension System Inspection 0B-9
Steering System Inspection 0B-9
Drive Shaft (Axle) Boots Inspection 0B-10
Manual Transaxle Oil Inspection 0B-10
Manual Transaxle Oil Replacement 0B-10
Automatic Transaxle Fluid Level Inspection 0B-11
Automatic Transaxle Fluid Replacement 0B-11
Automatic Transaxle Fluid Cooler Hose Inspection 0B-11
All Latches, Hinges and Locks Inspection 0B-11
Air Conditioning Filter (If Equipped) Inspection 0B-12
Air Conditioning Filter (If Equipped) Replacement 0B-12
Final Inspection for Maintenance Service 0B-12
Specifications 0B-13
Tightening Torque Specifications 0B-13
Special Tools and Equipment 0B-13
Recommended Fluids and Lubricants 0B-13
Special Tool 0B-13

General Information

General Description

Abbreviations

S4RS0A0101001

A:
ABS: Anti-lock Brake System
ATDC: After Top Dead Center
API: American Petroleum Institute
ATF: Automatic Transmission Fluid, Automatic Transaxle Fluid
ALR: Automatic Locking Retractor
AC: Alternating Current
A/T: Automatic Transmission, Automatic Transaxle
A/C: Air Conditioning
ABDC: After Bottom Dead Center
A/F: Air Fuel Mixture Ratio
A-ELR: Automatic-Emergency Locking Retractor
B:
B+: Battery Positive Voltage
BTDC: Before Top Dead Center
BBDC: Before Bottom Dead Center
BCM: Body Electrical Control Module
C:
CAN: Controller Area Network
CKT: Circuit
CKP Sensor: Crankshaft Position Sensor
CMP Sensor: Camshaft Position Sensor
CO: Carbon Monoxide
CPP Switch: Clutch Pedal Position Switch (Clutch Switch, Clutch Start Switch)
CPU: Central Processing Unit
CRS: Child Restraint System
D:
DC: Direct Current
DLC: Data Link Connector (Assembly Line Diag. Link, ALDL, Serial Data Link, SDL)
DOHC: Double Over Head Camshaft
DOJ: Double Offset Joint
DRL: Daytime Running Light
DTC: Diagnostic Trouble Code (Diagnostic Code)
E:
EBCM: Electronic Brake Control Module, ABS Control Module
EBD: Electronic Brake Force Distribution
ECM: Engine Control Module
ECT Sensor: Engine Coolant Temperature Sensor (Water Temp. Sensor, WTS)
EGR: Exhaust Gas Recirculation
EGRT Sensor: EGR Temperature Sensor (Recirculated Exhaust Gas Temp. Sensor, REGTS)
EFE Heater: Early Fuel Evaporation Heater (Positive Temperature Coefficient, PTC Heater)
EPS: Electronic Power Steering
EVAP: Evaporative Emission
EVAP Canister: Evaporative Emission Canister (Charcoal Canister)
F:
4WD: 4 Wheel Drive
G:
GEN: Generator
GND: Ground
H:
HC: Hydrocarbons
HO2S: Heated Oxygen Sensor
HAVC: Heating, Ventilating and Air Conditioning
I:
IAC Valve: Idle Air Control Valve (Idle Speed Control Solenoid Valve, ISC Solenoid Valve)
IAT Sensor: Intake Air Temperature Sensor (Air temperature Sensor, ATS)
ICM: Immobilizer Control Module
IG: Ignition
ISC Actuator: Idle Speed Control Actuator
L:
LH: Left Hand
LSPV: Load Sensing Proportioning Valve
M:
MAF Sensor: Mass Air Flow Sensor (Air Flow Sensor, AFS, Air Flow Meter, AFM)
MAP Sensor: Manifold Absolute Pressure Sensor (Pressure Sensor, PS)
Max: Maximum
MFI: Multiport Fuel Injection (Multipoint Fuel Injection)
Min: Minimum
MIL: Malfunction Indicator Lamp (“SERVICE ENGINE SOON” Light)
M/T: Manual Transmission, Manual Transaxle
N:
NOx: Nitrogen Oxides
O:
OBD: On-Board Diagnostic System (Self-Diagnosis Function)
O/D: Overdrive
OHC: Over Head Camshaft
O2S: Oxygen Sensor
P:
PNP: Park / Neutral Position
P/S: Power Steering
PSP Switch: Power Steering Pressure Switch (P/S Pressure Switch)
PCM: Powertrain Control Module
PCV: Positive Crankcase Ventilation
R:
RH: Right Hand
S:
SAE: Society of Automotive Engineers
SDM: Sensing and Diagnostic Module (Air Bag Controller, Air bag Control Module)
SFI: Sequential Multiport Fuel Injection
SOHC: Single Over Head Camshaft
T:
TBI: Throttle Body Fuel Injection (Single-Point Fuel Injection, SPI)

TCC: Torque Converter Clutch
TCM: Transmission Control Module (A/T Controller, A/T Control Module)
TP Sensor: Throttle Position Sensor
TVV: Thermal Vacuum Valve (Thermal Vacuum Switching Valve, TVSV, Bimetal Vacuum Switching Valve, BVSV)
TWC: Three Way Catalytic Converter (Three Way Catalyst)
2WD: 2 Wheel Drive
V:
VIN: Vehicle Identification Number
VSS: Vehicle Speed Sensor
VVT: Variable Valve Timing
W:
WU-OC: Warm Up Oxidation Catalytic Converter
WU-TWC: Warm Up Three Way Catalytic Converter

Symbols

S4RS0A0101002

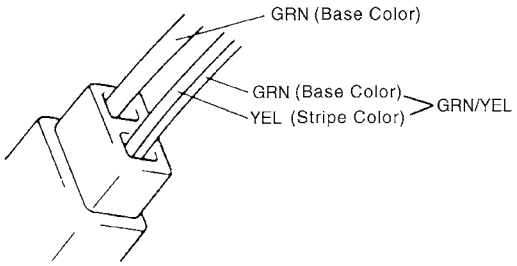
Symbol	Definition	Symbol	Definition
	Tightening torque	1216B	Apply SUZUKI BOND NO. 1216B 99000-31230
OIL	Apply oil (engine, transmission, transfer, differential)	Si	Apply SILICONE SEALANT 99000-31120
FLD	Apply fluid (brake, power steering or automatic transmission fluid)	366E	Apply SEALING COMPOUND 366E 99000-31090
A	Apply SUZUKI SUPER GREASE A 99000-25010		
C	Apply SUZUKI SUPER GREASE C 99000-25030	1322	Apply THREAD LOCK 1322 99000-32110
E	Apply SUZUKI SUPER GREASE E 99000-25050	1333B	Apply THREAD LOCK 1333B 99000-32020
H	Apply SUZUKI SUPER GREASE H 99000-25120	1342	Apply THREAD LOCK 1342 99000-32050
I	Apply SUZUKI SUPER GREASE I 99000-25210		
1215	Apply SUZUKI BOND NO. 1215 99000-31110		Do not reuse
1207F	Apply SUZUKI BOND NO. 1207F 99000-31250		Note on reassembly
1217G	Apply SUZUKI BOND NO. 1217G 99000-31260		

Wire Color Symbols

S4RS0A0101003

Symbol		Wire Color	Symbol		Wire Color
B	BLK	Black	O, Or	ORN	Orange
Bl	BLU	Blue	R	RED	Red
Br	BRN	Brown	W	WHT	White
G	GRN	Green	Y	YEL	Yellow
Gr	GRY	Gray	P	PNK	Pink
Lbl	LT BLU	Light blue	V	PPL	Violet
Lg	LT GRN	Light green			

There are two kinds of colored wire used in this vehicle. One is single-colored wire and the other is dual-colored (striped) wire.
The single-colored wire uses only one color symbol (i.e. “GRN”).
The dual-colored wire uses two color symbols (i.e. “GRN/YEL”). The first symbol represents the base color of the wire (“GRN” in the figure) and the second symbol represents the color of the stripe (“YEL” in the figure).



I2RH01010010-

Fasteners Information

S4RS0A0101004

Metric Fasteners

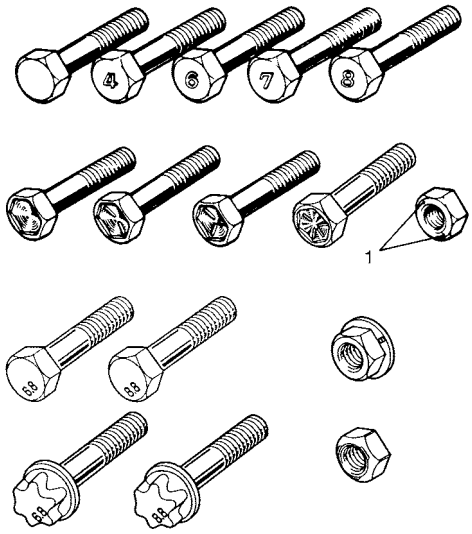
Most of the fasteners used for this vehicle are metric. When replacing any fasteners, it is most important that replacement fasteners be the correct diameter, thread pitch and strength.

Fastener Strength Identification

Most commonly used metric fastener strength property classes are 4T, 6.8, 7T, 8.8 and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch, 6 or 8 mark strength identification on the nut face. Figure shows the different strength markings.

When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct diameter and thread pitch. Correct replacement bolts and nuts are available through the parts division.

Metric bolts: Identification class numbers or marks correspond to bolt strength (increasing numbers represent increasing strength).



I5RH01010001-

1. Nut strength identification

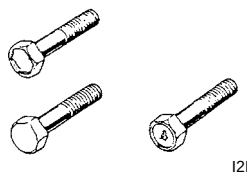
Standard Tightening Torque

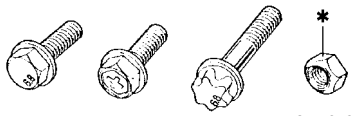
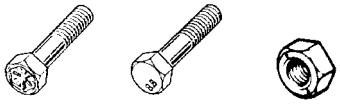
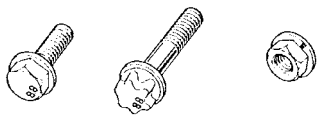
Each fastener should be tightened to the torque specified in each section. If no description or specification is provided, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, however, use the torque specified for the original fastener.

NOTE:

- **For the flanged bolt, flanged nut and self-lock nut of 4T and 7T strength, add 10% to the tightening torque given in the following chart.**
- **The following chart is applicable only where the fastened parts are made of steel light alloy.**

Tightening torque chart

Strength	Unit	Thread diameter (Nominal diameter) (mm)								
		4	5	6	8	10	12	14	16	18
A equivalent of 4T strength fastener	N·m	1.5	3.0	5.5	13	29	45	65	105	160
	kg-m	0.15	0.30	0.55	1.3	2.9	4.5	6.5	10.5	16
	lb-ft	1.0	2.5	4.0	9.5	21.0	32.5	47.0	76.0	116.0
 I2RH01010012-01										

Strength	Unit	Thread diameter (Nominal diameter) (mm)								
		4	5	6	8	10	12	14	16	18
A equivalent of 6.8 strength fastener without flange	N·m	2.4	4.7	8.4	20	42	80	125	193	280
	kg-m	0.24	0.47	0.84	2.0	4.2	8.0	12.5	19.3	28
	lb-ft	2.0	3.5	6.0	14.5	30.5	58.0	90.5	139.5	202.5
I2RH01010013-01										
A equivalent of 6.8 strength fastener with flange *: Self-lock nut	N·m	2.4	4.9	8.8	21	44	84	133	203	298
	kg-m	0.24	0.49	0.88	2.1	4.4	8.4	13.3	20.3	29.8
	lb-ft	2.0	3.5	6.5	15.5	32.0	61.0	96.5	147.0	215.5
 I2RH01010014-01										
A equivalent of 7T strength fastener	N·m	2.3	4.5	10	23	50	85	135	210	240
	kg-m	0.23	0.45	1.0	2.3	5.0	8.5	13.5	21	24
	lb-ft	2.0	3.5	7.5	17.0	36.5	61.5	98.0	152.0	174.0
I2RH01010015-01										
A equivalent of 8.8 strength fastener without flange	N·m	3.1	6.3	11	27	56	105	168	258	373
	kg-m	0.31	0.63	1.1	2.7	5.6	10.5	16.8	25.8	37.3
	lb-ft	2.5	4.5	8.0	19.5	40.5	76.0	121.5	187.0	270.0
 I2RH01010016-01										
A equivalent of 8.8 strength fastener with flange	N·m	3.2	6.5	12	29	59	113	175	270	395
	kg-m	0.32	0.65	1.2	2.9	5.9	11.3	17.5	27	39.5
	lb-ft	2.5	5.0	9.0	21.0	43.0	82.0	126.5	195.5	286.0
 I2RH01010017-01										

***:Self-lock nut**

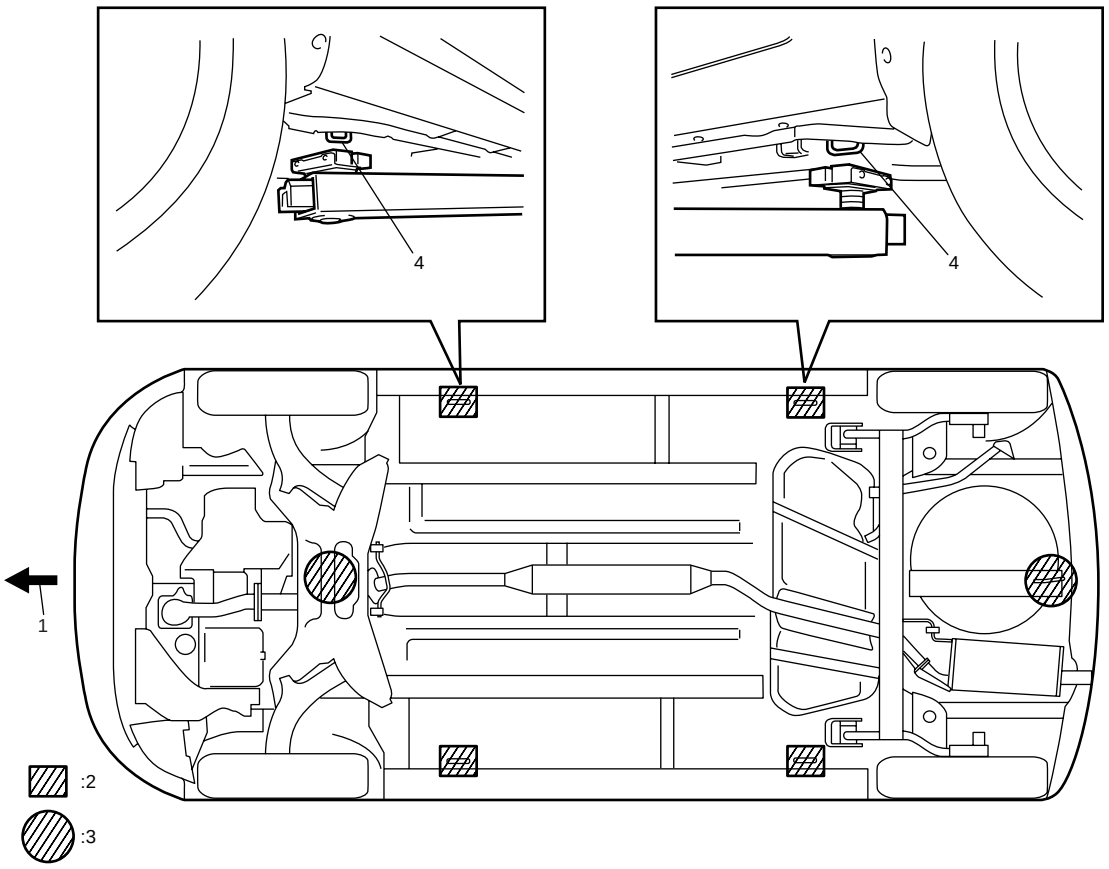
Vehicle Lifting Points

S4RS0A0101005

WARNING:

- **Before applying hoist to underbody, always take vehicle balance throughout service into consideration. Vehicle balance on hoist may change depending on what part to be removed.**
- **Before lifting up the vehicle, check to be sure that end of hoist arm is not in contact with brake pipe, fuel pipe, bracket or any other part.**
- **When using frame contact hoist, apply hoist as shown (right and left at the same position). Lift up the vehicle till 4 tires are a little off the ground and make sure that the vehicle will not fall off by trying to move vehicle body in both ways. Work can be started only after this confirmation.**
- **Make absolutely sure to lock hoist after vehicle is hoisted up.**

When Using Frame Contact Hoist



I4RS0A010001-

1. Vehicle front	3. Floor jack position
2. Support position for frame contact hoist and safety stand	4. Body mounting stay

When Using Floor Jack

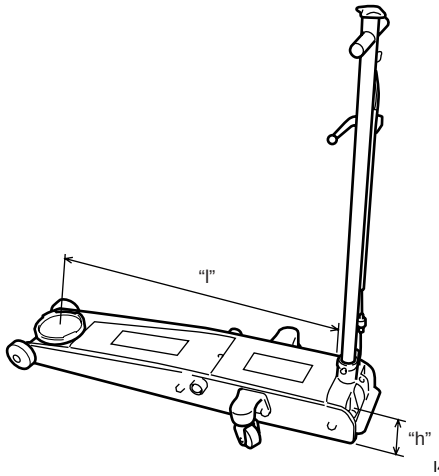
WARNING:

If the vehicle to be jacked up only at the front or rear end, be sure to block the wheels on ground in order to ensure safety.
After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on jack alone.

CAUTION:

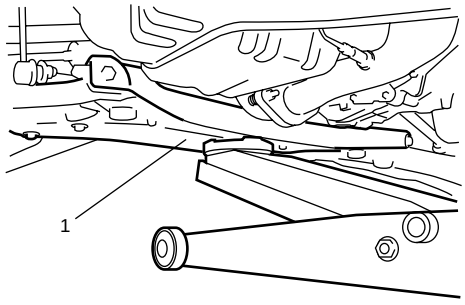
- **Never apply jack against rear suspension parts (i.e., stabilizer, etc.) or vehicle floor, or it may get deformed.**
- **When jacking up the front end, be sure to use an air type floor jack with the following specified height or a manual type floor jack of the following size. Otherwise, the jack may cause the bumper or vehicle body panel a damage.**

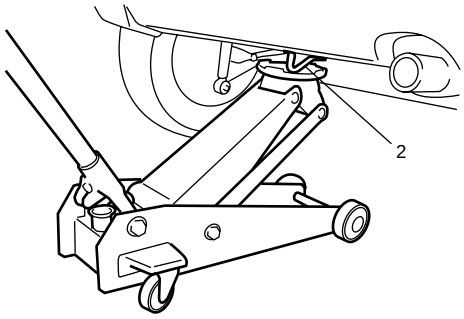
Jack size
Height "h": under 145 mm (under 5.71 in.)
Length "l": above 900 mm (above 35.4 in.)



I4RS0A010002-

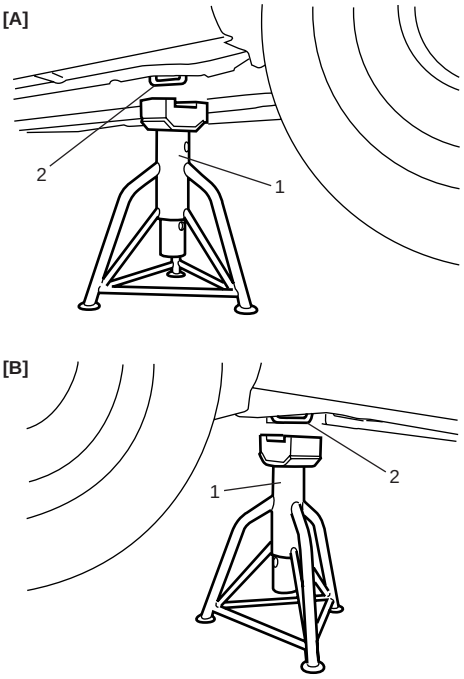
In raising front or rear vehicle end off the floor by jacking, be sure to put the jack against front suspension frame (1) or rear jacking bracket (2).





I4RS0A010003-

To perform service with either front or rear vehicle end jacked up, be sure to place safety stands (1) under body mounting stay (2) so that vehicle body is securely supported. And then check to ensure that body mounting stay (2) does not slide on safety stands (1) and the vehicle is held stable for safety's sake.



I4RS0A010004-

[A]:	Front
[B]:	Rear

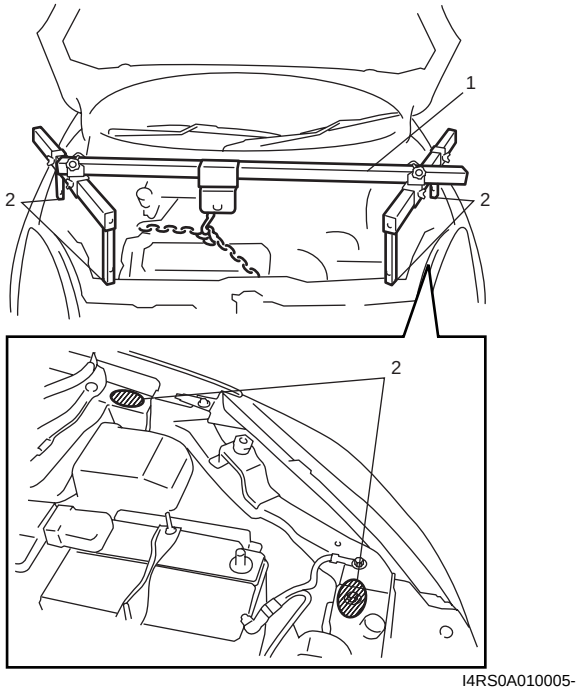
Engine Supporting Points

S4RS0A0101008

WARNING:

When using engine supporting device (1), be sure to observe the followings. Otherwise, not only deformation of vehicle body but also personal injury may result.

- **Apply supporting device at the specified positions (2) indicated in figure**
- **Install supporting device taking a well-balanced posture.**
- **Do not contact supporting device with other parts than engine room body panel and engine hooks.**

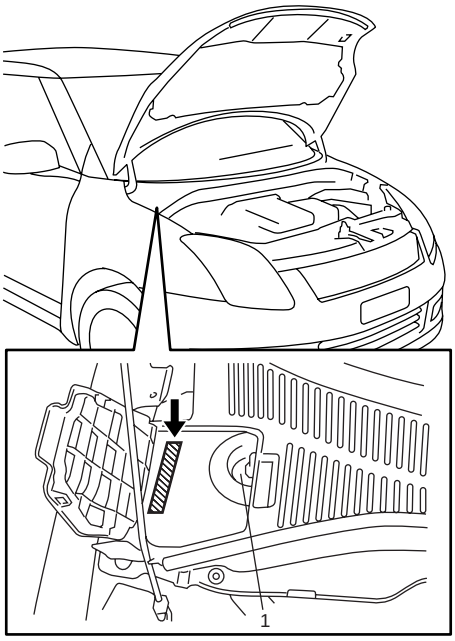


I4RS0A010005-

Vehicle Identification Number

S4RS0A0101006

The number is punched close by the right side strut support (1) in engine room.

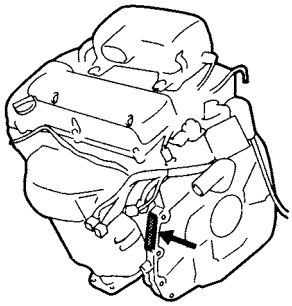


I4RS0A010006-

Engine Identification Number

S4RS0A0101007

The number is punched on cylinder block.

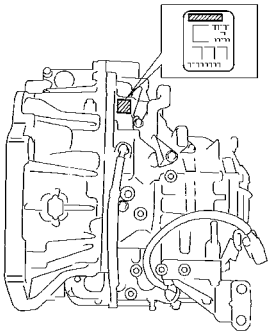


I3RM0A010005-

Transmission Identification Number

S4RS0A0101009

The automatic transmission identification number is located on transmission case.



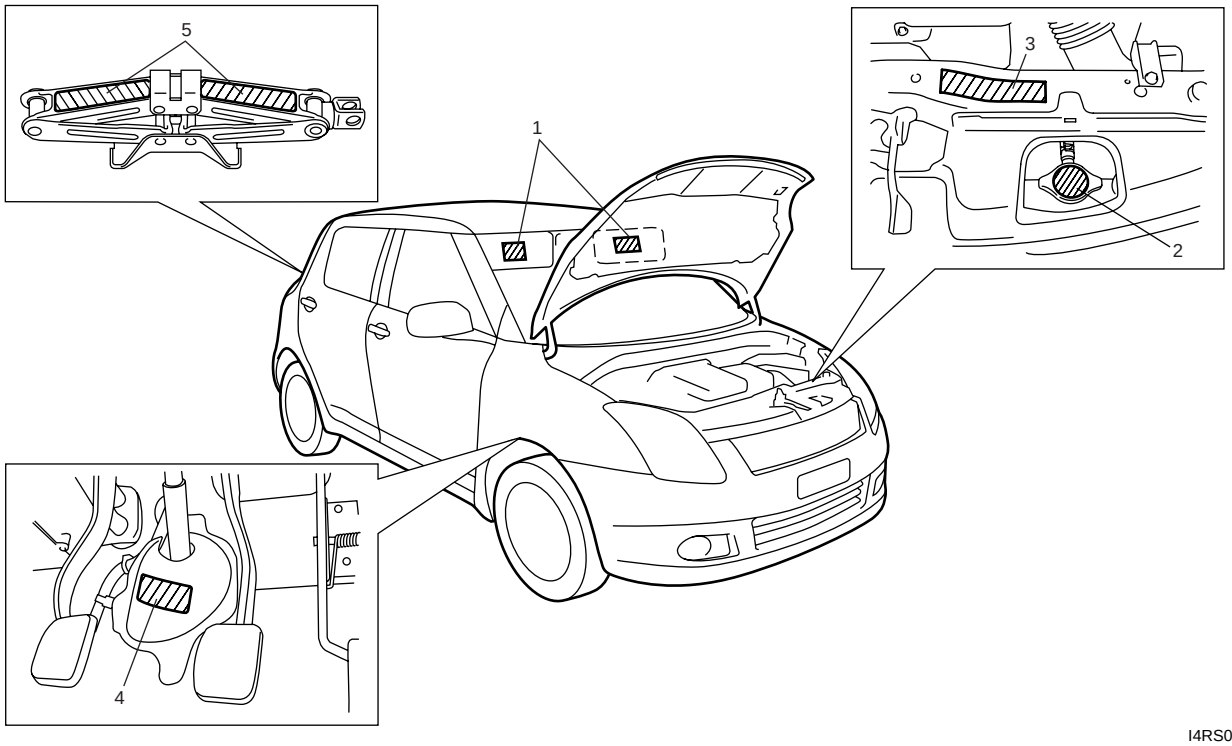
I4RS0A010008-

Component Location

Warning, Caution and Information Labels Location

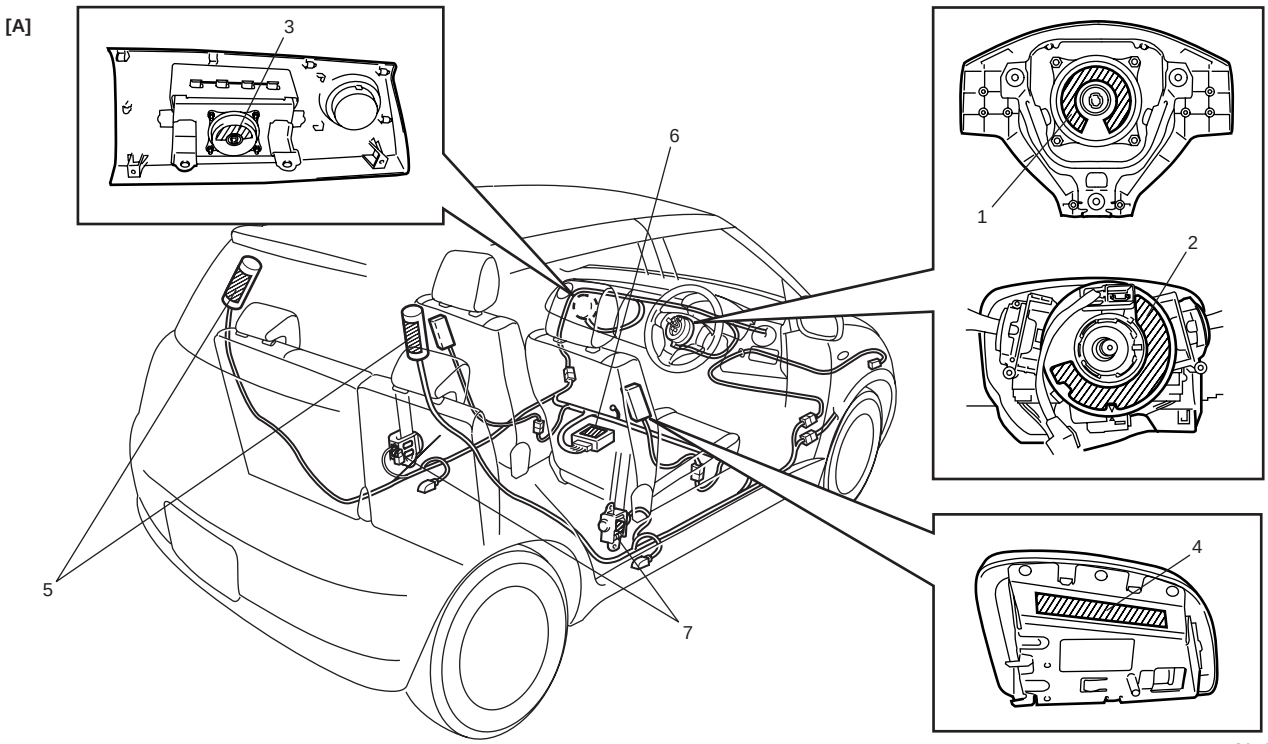
S4RS0A0103001

The figure shows main labels among others that are attached to vehicle component parts.
When servicing and handling parts, refer to WARNING / CAUTION instructions printed on labels.
If any WARNING / CAUTION label is found stained or damaged, clean or replace it as necessary.



I4RS0A010007-

1. Air bag label on sun visor (if equipped)	4. Steering shaft joint cover label (if equipped)
2. Radiator cap label	5. Jack label
3. Engine cooling fan label	



I4RS0A010009-

1. Air bag label on driver air bag (inflator) module	5. Air bag label on curtain air bag (inflator) module
2. Air bag label on combination switch and contact coil assembly	6. Air bag label on SDM
3. Air bag label on passenger air bag (inflator) module	7. Pretensioner label on seat belt retractor
4. Air bag label on side air bag (inflator) module	[A]: These labels are attached on vehicle equipped with air bag system only.

Maintenance and Lubrication

Precautions

Precautions for Maintenance and Lubrication

S4RS0A0200001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Scheduled Maintenance

Maintenance Schedule under Normal Driving Conditions

S4RS0A0205001

NOTE:

- **This interval should be judged by odometer reading or months, whichever comes first.**
- **This table includes service as scheduled up to 90,000 km (54,000 miles) mileage. Beyond 90,000 km (54,000 miles), carry out the same services at the same intervals respectively.**

Interval				Km (x 1,000)	15	30	45	60	75	90
				Miles (x 1,000)	9	18	27	36	45	54
				Months	12	24	36	48	60	72
Engine										
Accessory drive belt (I: ☞, R: ☞)					—	—	I	—	—	R
Valve lash (clearance) (I: ☞)					—	I	—	I	—	I
Engine oil and oil filter (R: ☞)					R	R	R	R	R	R
Engine coolant (R: ☞)					—	—	R	—	—	R
Exhaust system (I: ☞)					—	I	—	I	—	I
Ignition system										
Spark plugs (R: ☞)	When unleaded fuel is used	Vehicle without HO2S	Nickel plug		—	R	—	R	—	R
			Iridium plug		—	—	—	R	—	—
		Vehicle with HO2S	Nickel plug		—	—	R	—	—	R
			Iridium plug (Highly recommended)		Replace every 105,000 km (63,000 miles) or 84 months					
	When leaded fuel is used, refer to “Maintenance Recommended under Severe Driving Conditions: ”.									
Fuel system										
Air cleaner filter (R: ☞, I: ☞)			Paved-road		I	I	R	I	I	R
			Dusty conditions		Refer to “Maintenance Recommended under Severe Driving Conditions: ”.					
Fuel lines and connections (I: ☞)					—	I	—	I	—	I
Fuel filter (R: ☞)					Replace every 105,000 km (63,000 miles)					
Fuel tank (I: ☞)					—	—	I	—	—	I
Emission control system										
PCV valve (I: ☞)		Vehicle without HO2S			—	—	I	—	—	I
		Vehicle with HO2S			—	—	—	—	—	I
Fuel evaporative emission control system (I: ☞)					—	—	—	—	—	I
Brake										
Brake discs and pads (thickness, wear, damage) (I: ☞)					I	I	I	I	I	I
Brake drums and shoes (wear, damage) (I: ☞)					—	I	—	I	—	I
Brake hoses and pipes (leakage, damage, clamp) (I: ☞)					—	I	—	I	—	I
Brake fluid (R: ☞)					—	R	—	R	—	R
Brake lever and cable (damage, stroke, operation) (I: ☞)					Inspect at first 15,000 km (9,000 miles only)					
Chassis and body										
Clutch (fluid level, leakage) (I: ☞)					—	I	—	I	—	I
Tires (wear, damage, rotation) / wheels (damage) (I: ☞ / ☞)					I	I	I	I	I	I
Suspension system (tightness, damage, rattle, breakage) (I: ☞)					—	I	—	I	—	I

Interval	Km (x 1,000)	15	30	45	60	75	90
	Miles (x 1,000)	9	18	27	36	45	54
	Months	12	24	36	48	60	72
Steering system (tightness, damage, breakage, rattle) (I: ☞)		—	I	—	I	—	I
Drive shaft (axle) boots (I: ☞)		—	—	I	—	—	I
Manual transaxle oil (leakage, level) (I: ☞ 1st 15,000 km only) (R: ☞)		I	—	R	—	—	R
Automatic transaxle fluid	Fluid level (I: ☞)	—	I	—	I	—	I
	Fluid change (R: ☞)	Replace every 165,000 km (99,000 miles)					
	Fluid hose (I: ☞)	—	—	—	I	—	—
All latches, hinges and locks (I: ☞)		—	I	—	I	—	I
Air conditioning filter (if equipped) (I: ☞) (R: ☞)		—	I	R	—	I	R

NOTE:

- **"R": Replace or change**
- **"I": Inspect and correct, replace or lubricate if necessary**
- **For spark plugs, replace every 50,000 km if the local law requires.**
- **Nickel spark plug: BKR6E-11 (NGK) or K20PR-U11 (DENSO)**
- **Iridium spark plug: IFR6J11 (NGK)**

Maintenance Recommended under Severe Driving Conditions

S4RS0A0205002

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, IT IS RECOMMENDED that applicable maintenance operation be performed at the particular interval as shown in the following table.

Severe condition code:

A: Repeated short trips
B: Driving on rough and/or muddy roads
C: Driving on dusty roads
D: Driving in extremely cold weather and/or salted roads
E: Repeated short trips in extremely cold weather
F: Leaded fuel use
G: – – – – –
H: Towing a trailer (if admitted)

Severe condition code	Maintenance		Maintenance operation	Maintenance interval
– B C D – – – –	Accessory drive belt		☞ I	Every 15,000 km (9,000 miles) or 12 months
			☞ R	Every 45,000 km (27,000 miles) or 36 months
A – C D E F – H	Engine oil and oil filter		☞ R	Every 7,500 km (4,500 miles) or 6 months
– – C – – – – –	Air cleaner filter *1		☞ I	Every 2,500 km (1,500 miles)
			☞ R	Every 30,000 km (18,000 miles) or 24 months
A B C – E F – H	Spark plugs	Nickel spark plug	☞ R	Every 10,000 km (6,000 miles) or 8 months
		Iridium spark plug		Every 30,000 km (18,000 miles) or 24 months
– B C D – – – H	Wheel bearings		☞ I	Every 15,000 km (9,000 miles) or 12 months
– B – D E – – H	Drive shafts		☞ I	Every 15,000 km (9,000 miles) or 12 months

Severe condition code	Maintenance	Maintenance operation	Maintenance interval
– B – – E – – H	Manual transaxle oil	☞ R	First time only: 15,000 km (9,000 miles) or 12 months
			Second time and after: Every 30,000 km (18,000 miles) or 24 months reckoning from 0 km (0 mile) or 0 month
– B – – E – – H	Automatic transaxle fluid	☞ R	Every 30,000 km (18,000 miles) or 24 months
– – C D – – – –	Air conditioning filter *2	☞ I	Every 15,000 km (9,000 miles) or 12 months
		☞ R	Every 45,000 km (27,000 miles) or 36 months

NOTE:

- **"I": Inspect and correct or replace if necessary**
- **"R": Replace or change**
- ***1: Inspect more frequently if the vehicle is used under dusty conditions.**
- ***2: Clean or replace more frequently if the air from the air conditioning decreases.**

Repair Instructions

Accessory Drive Belt Inspection

S4RS0A0206001

WARNING:

All inspection and replacement are to be performed with ENGINE NOT RUNNING.

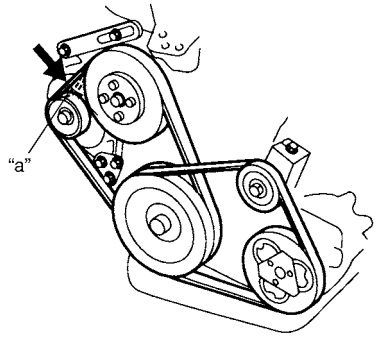
Water Pump and Generator Drive Belt

1) Disconnect negative (–) cable at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace.
   Check belt for tension.

   Water pump and generator belt tension
   "a": 4.5 – 5.5 mm (0.18 – 0.22 in.) deflection under 100 N (10 kg, 22 lb) pressure

   NOTE:

   When replacing belt with a new one, adjust belt tension to 3 – 4 mm (0.12 – 0.16 in.)



I3RM0A020001-

3) If belt is too tight or too loose, adjust it to specification by adjusting alternator position.
4) Tighten alternator adjusting bolts and pivot bolt.
5) Connect negative (–) cable to battery.

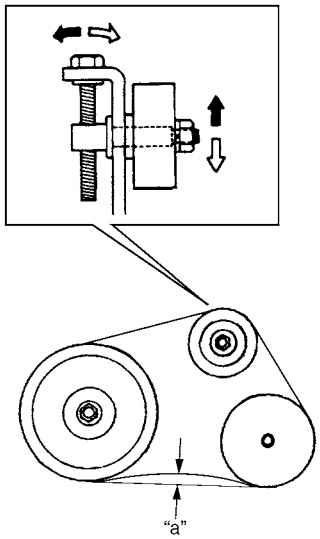
A/C Compressor Drive Belt (If Equipped)

1) Disconnect negative (–) cable at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace.
   Check belt for tension.
   If belt tension is out of specification, adjust it referring to "Compressor Drive Belt Inspection and Adjustment: in Section 7B".

   A/C compressor drive belt tension
   "a": 7 – 8 mm (0.28 – 0.31 in.) deflection under 100 N (10 kg, 22 lb) pressure

NOTE:

When replacing belt with a new one, adjust belt tension to 6 – 7 mm (0.24 – 0.28 in.).



I4RS0A020001-

3) Connect negative (–) cable to battery

Accessory Drive Belt Replacement

S4RS0A0206002

Water Pump and Generator Drive Belt

Replace belt with new one referring to "Water Pump / Generator Drive Belt Removal and Installation: in Section 1F".

A/C Compressor Drive Belt (If Equipped)

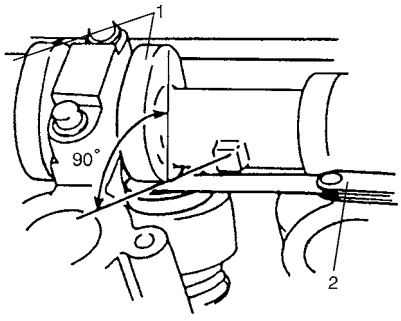
Replace belt with new one referring to "Compressor Drive Belt Removal and Installation: in Section 7B".

Valve Lash (Clearance) Inspection

S4RS0A0206003

Inspect intake and exhaust valve lash and adjust as necessary.

Refer to "Valve Lash (Clearance) Inspection: in Section 1D" for valve lash inspection and adjustment procedure.



I2RH0B020003-

1. Camshaft	2. Thickness gauge

Engine Oil and Filter Change

S4RS0A0206004

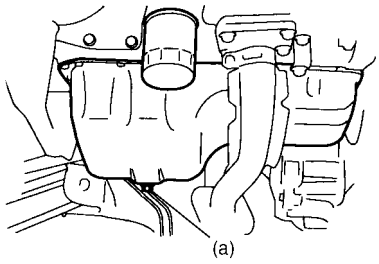
WARNING:

- **New and used engine oil can be hazardous.**
  Be sure to read "WARNING" in "General Precautions: in Section 00" and observe what is written there.
- **Step 1) – 7) outlined below must be performed with ENGINE NOT RUNNING.**
  For Step 8), be sure to have adequate ventilation while engine is running.

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.

1) Drain engine oil by removing drain plug.
2) After draining oil, wipe drain plug clean. Reinstall drain plug.

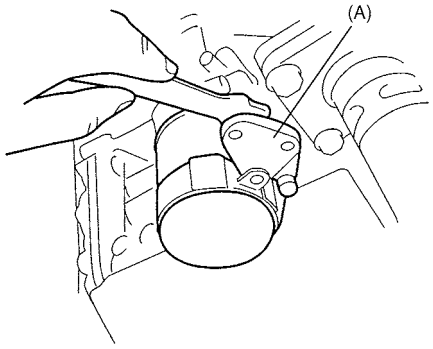
Tightening torque
Engine oil drain plug (a): 35 N·m (3.5 kg-m, 25.5 lb-ft)



I2RH0B020004-

3) Loosen oil filter by using oil filter wrench (special tool).

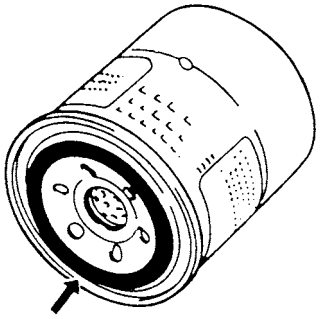
Special tool
(A): 09915–47331



I2RH0B020005-

NOTE:

Before fitting new oil filter, be sure to oil its O-ring. Use engine oil for this purpose.



IYSQ01020009-

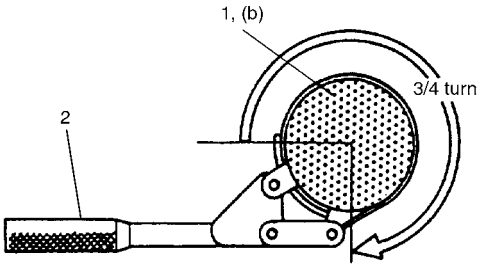
4) Screw new filter on oil filter stand by hand until the filter O-ring contacts mounting surface.

CAUTION:

To tighten oil filter properly, it is important to accurately identify the position at which filter O-ring first contacts mounting surface.

5) Tighten the filter (1) 3/4 turn from the point of contact with the mounting surface using an oil filter wrench (2).

Tightening torque
Oil filter (b): 14 N·m (1.4 kg-m, 10.5 lb-ft) (for reference)



IYSQ01020010-

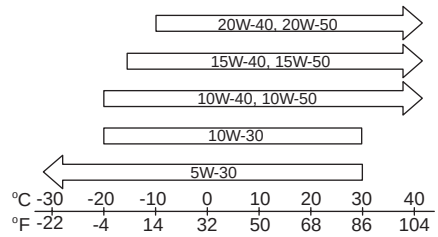
6) Replenish oil until oil level is brought to FULL level mark on dipstick (oil pan and oil filter capacity). The filler inlet is at the top of the cylinder head cover. It is recommended to use engine oil of SG, SH, SJ or SL grade. Select the appropriate oil viscosity according to the proper engine oil viscosity chart [A].

NOTE:

Engine oil capacity is specified as the following.
However, note that the amount of oil required when actually changing oil may somewhat differ from the data depending on various conditions (temperature, viscosity, etc.).

Engine oil specification
Oil pan capacity: About 3.7 liters (7.8 / 6.5 US / lmp pt.)
Oil filter capacity: About 0.2 liter (0.4 / 0.3 US / lmp pt.)
Others: About 0.3 liter (0.6 / 0.5 US / lmp pt.)
Total: About 4.2 liters (8.9 / 7.4 US / lmp pt.)

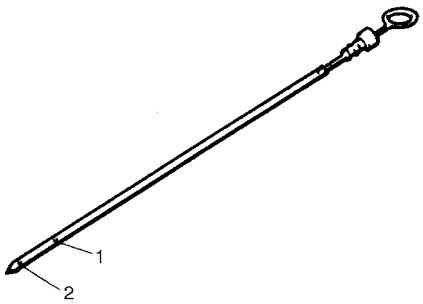
[A]



I4RS0A020002-

7) Check oil filter and drain plug for oil leakage.

8) Start engine and run it for 3 minutes. Stop it and wait another 5 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark (1) on dipstick.



IYSQ01020012-

2. Low level mark (hole)

Engine Coolant Change

S4RS0A0206005

WARNING:

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

CAUTION:

When changing engine coolant, use mixture of 50% specified water and 50% ANTIFREEZE / ANTICORROSION COOLANT for the purpose of corrosion protection and lubrication.

Change engine coolant with new one referring to “Cooling System Flush and Refill: in Section 1F”.

Exhaust System Inspection

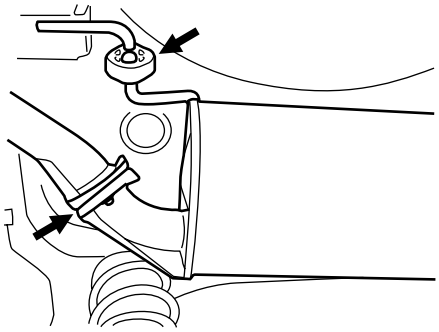
S4RS0A0206006

WARNING:

To avoid danger of being burned, do not touch exhaust system when it is still hot. Any service on exhaust system should be performed when it is cool.

When carrying out periodic maintenance, or the vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connections, dents and damages.
  If bolts or nuts are loose, tighten them to specification.
- Check nearby body areas for damaged, missing or mispositioned parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into the vehicle.
- Make sure that exhaust system components have enough clearance from the underbody to avoid overheating and possible damage to floor carpet.



I4RS0A020003-

- Any defects should be fixed at once.

Spark Plugs Replacement

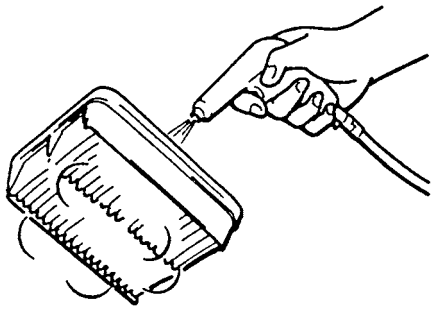
S4RS0A0206007

Replace spark plugs with new ones referring to “Spark Plug Removal and Installation: in Section 1H”.

Air Cleaner Filter Inspection

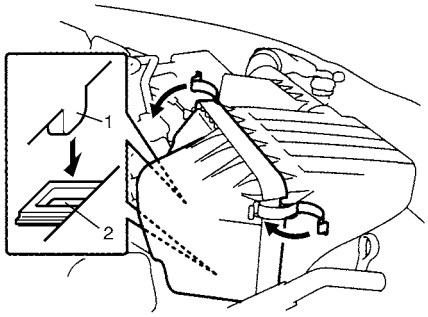
S4RS0A0206008

1) Remove air cleaner case clamps.
2) Take air cleaner filter out of case.
3) Check that filter is not excessively dirty, damaged or oily, clean filter with compressed air from air outlet side of filter.



I2RH01140007-

4) Install air cleaner filter and then case cap by inserting cap tab (1) into case groove (2). Clamp cap securely.



I4RS0A020004-

Air Cleaner Filter Replacement

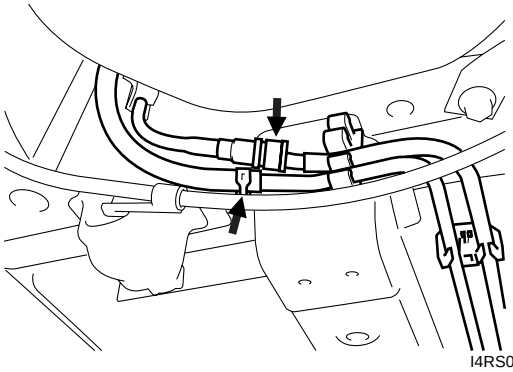
S4RS0A0206009

Replace air cleaner filter with new one according to Steps 1), 2) and 4) of “Air Cleaner Filter Inspection: ”.

Fuel Lines and Connections Inspection

S4RS0A0206010

Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking and damage. Make sure all clamps are secure.
Repair leaky joints, if any.
Replace hoses that are suspected of being cracked.



I4RS0A020005-

Fuel Filter Replacement

S4RS0A0206042

WARNING:

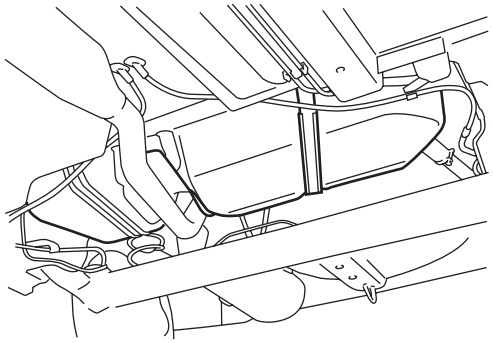
This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).

Fuel filter is installed in fuel pump assembly in fuel tank. Replace fuel filter or fuel pump assembly with new one, referring to “Fuel Pump Assembly Removal and Installation: in Section 1G” for proper procedure.

Fuel Tank Inspection

S4RS0A0206012

Check fuel tank damage, cracks, fuel leakage, corrosion and tank bolts looseness.
If a problem is found, repair or replace.



I4RS0A020019-

PCV Valve Inspection

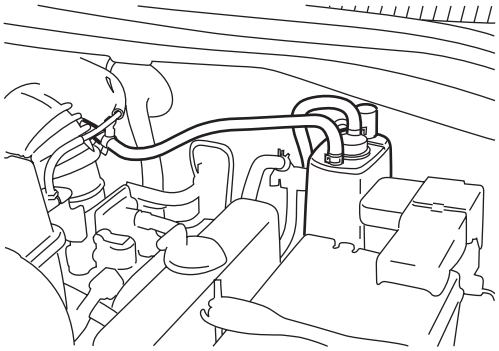
S4RS0A0206013

Check crankcase ventilation hose and PCV hose for leaks, cracks or clog, and PCV valve for stick or clog. Refer to “PCV Valve Inspection: in Section 1B” for PCV valve checking procedure.

Fuel Evaporative Emission Control System Inspection

S4RS0A0206014

1) Visually inspect hoses for cracks, damage, or excessive bends. Inspect all clamps for damage and proper position.
2) Check EVAP canister for operation and clog, referring to “EVAP Canister Inspection: in Section 1B”.
   If a malfunction is found, repair or replace.

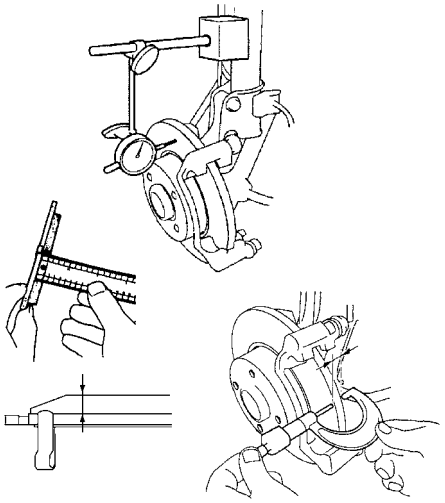


I4RS0A020006-

Brake Discs and Pads (Front) Inspection

S4RS0A0206015

1) Remove wheel and caliper but don’t disconnect brake hose from caliper.
2) Check front disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For details, refer to “Front Disc Brake Pad Inspection: in Section 4B” and “Front Brake Disc Inspection: in Section 4B”.
   Be sure to torque caliper pin bolts to specification.

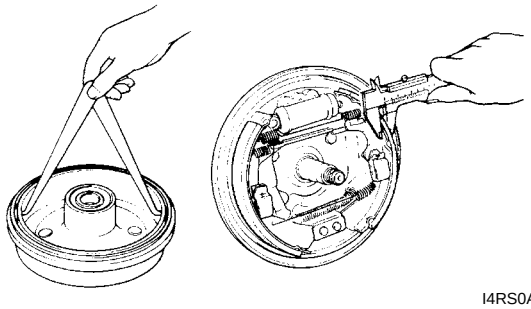


I3RM0A020006-

Brake Drums and Shoes (Rear) Inspection

S4RS0A0206016

1) Remove wheel and brake drum.
2) Check rear brake drums and brake linings for excessive wear and damage, while wheels and drums are removed. At the same time, check wheel cylinders for leaks. Replace these parts as necessary.
   For details, refer to “Rear Brake Drum and Shoe Inspection: in Section 4C” and “Rear Brake Shoe Inspection: in Section 4C”.



I4RS0A020007-

Brake Hoses and Pipes Inspection

S4RS0A0206017

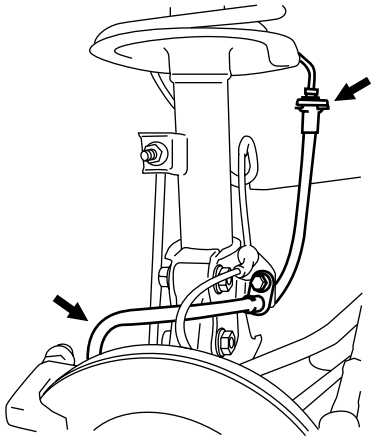
Perform this inspection where these is enough light and use a mirror as necessary.

- Check brake hoses and pipes for proper hookup, leaks, cracks, chafing and other damage.
- Check that hoses and pipes are clear of sharp edges and moving parts.

Repair or replace any of these parts as necessary.

CAUTION:

After replacing any brake pipe or hose, be sure to carry out air purge operation.



I4RS0A020008-

Brake Fluid Replacement

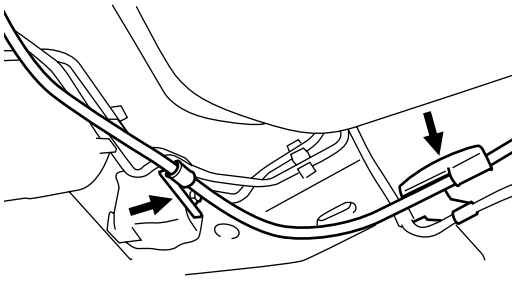
S4RS0A0206018

Change brake fluid as follows.
Drain existing fluid from brake system completely, fill system with specified fluid and carry out air purge operation.
For air purging procedure, refer to “Air Bleeding of Brake System: in Section 4A”.

Brake Lever and Cable Inspection

S4RS0A0206019

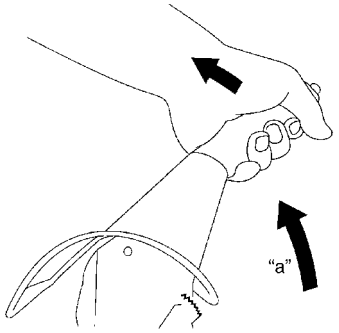
1) Inspect brake cable for damage and smooth movement.
   Replace cable if it is in deteriorated condition.



I4RS0A020009-

2) Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking lever.
3) Check parking brake lever for proper operation and stroke, and adjust it if necessary.
   For checking and adjusting procedures, refer to “Parking Brake Inspection and Adjustment: in Section 4D”.

Parking brake lever stroke
“a”: 4 – 9 notches (with 200 N (20 kg, 44 lbs) of pull pressure)

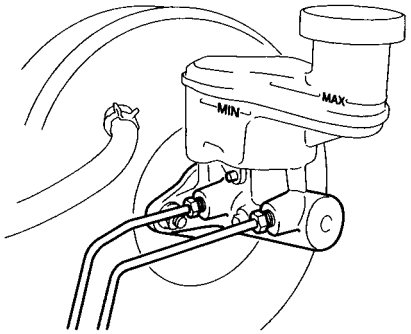


I4RS0A020010-

Clutch fluid Inspection

S4RS0A0206020

1) Check clutch system for evidence of fluid leakage. Repair leaky point if any.
2) Check reservoir for fluid level referring to “Clutch Fluid Level Inspection: in Section 5C”.
   If fluid is lower than minimum level of reservoir, refill reservoir with specified brake fluid indicated on reservoir cap.

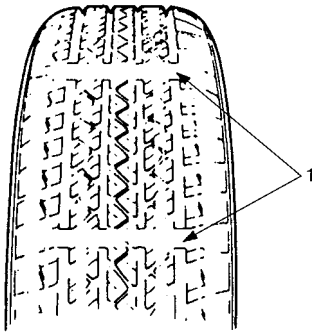


I4RS0A410006-

Tires Inspection

S4RS0A0206021

1) Check tires for uneven or excessive wear, or damage. If defective, replace.
   Refer to “Irregular and/or Premature Wear Description: in Section 2D” and “Wear Indicators Description: in Section 2D” for details.



I2RH01020022-

1. Wear indicator

2) Check inflating pressure of each tire and adjust pressure to specification as necessary.

NOTE:

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner’s manual which came with the vehicle.**

3) Rotate tires. For details, refer to “Tire Rotation: in Section 2D”.

Wheel Discs Inspection

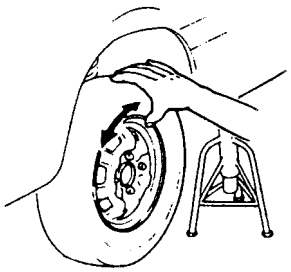
S4RS0A0206022

Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.

Wheel Bearing Inspection

S4RS0A0206023

1) Check front wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to “Front Wheel Hub, Disc, Nut and Bearing Check: in Section 2B”.
2) Check rear wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to “Rear Wheel Disc, Nut and Bearing Inspection: in Section 2C”.

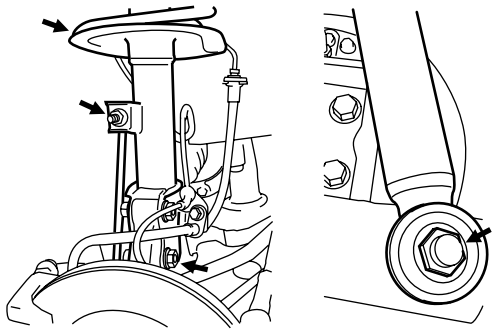


I2RH01020023-

Suspension System Inspection

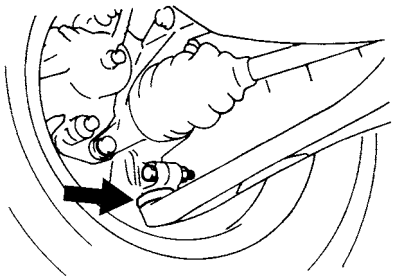
S4RS0A0206024

- Inspect front struts and rear shock absorbers for evidence of oil leakage, dents or any other damage on sleeves; and inspect anchor ends for deterioration. Replace defective parts, if any.
- Check front and rear suspension systems for damaged, loose or missing parts; also for parts showing signs of wear or lack of lubrication. Repair or replace defective parts, if any.



I4RS0A020011-

- Check front suspension arm ball joint stud dust seals for leakage, detachment, tear or any other damage. Replace defective boot, if any.



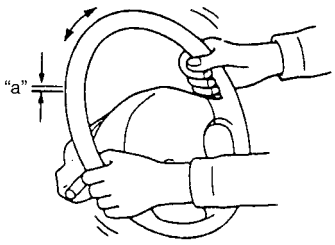
I4RS0A020012-

Steering System Inspection

S4RS0A0206025

1) Check steering wheel for play and rattle, holding vehicle straight on ground.

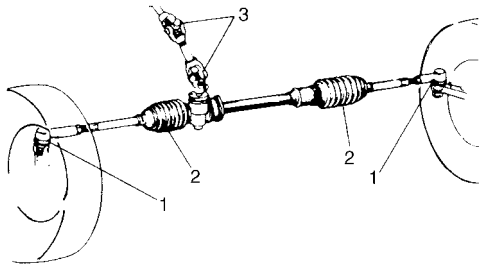
Steering wheel play
“a”: 0 – 30 mm (0 – 1.1 in.)



I2RH01020026-

2) Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.
3) Check steering linkage for looseness and damage. Repair or replace defective parts, if any.

4) Check boots (1) and (2) of steering linkage and steering gear case for damage (leak, detachment, tear, etc.). If damage is found, replace defective boot with new one.
   If any dent is found on steering gear case boots, correct it to original shape by turning steering wheel to the right or left as far as it stops and holding it for a few seconds.
5) Check universal joints (3) of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.



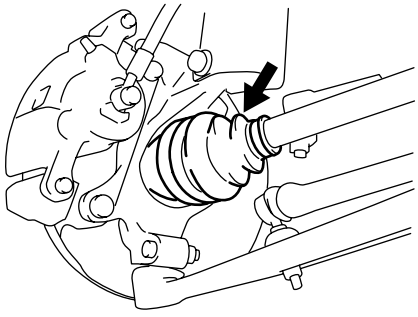
I4RS0A020013-

6) Check that steering wheel can be turned fully to the right and left. Repair or replace defective parts, if any.
7) If equipped with power steering system, check also, in addition to check items, that steering wheel can be turned fully to the right and left more lightly when engine is running at idle speed than when it is stopped. Repair, if found faulty.
8) Check wheel alignment referring to “Front Wheel Alignment Inspection and Adjustment: in Section 2B”.

Drive Shaft (Axle) Boots Inspection

S4RS0A0206026

Check drive shaft boots (wheel side and differential side) for leaks, detachment, tear or other damage.
Replace defective parts as necessary.

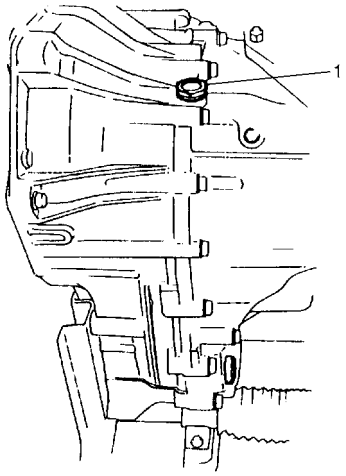


I2RH01310001-

Manual Transaxle Oil Inspection

S4RS0A0206028

1) Inspect transaxle case for evidence of oil leakage. Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Remove oil filler/level plug (1) of transaxle.



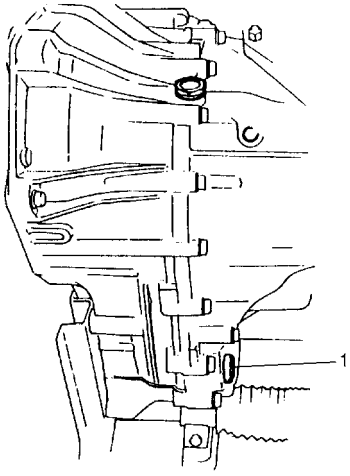
I4RS0A020014-

4) Check oil level.
   Oil level can be checked roughly by means of filler/level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified oil up to level hole. For specified oil, refer to “Manual Transaxle Oil Change: in Section 5B”.
5) Apply sealant to filler/level plug and tighten it to specified torque.

Manual Transaxle Oil Replacement

S4RS0A0206029

1) Place the vehicle level and drain oil by removing drain plug (1).



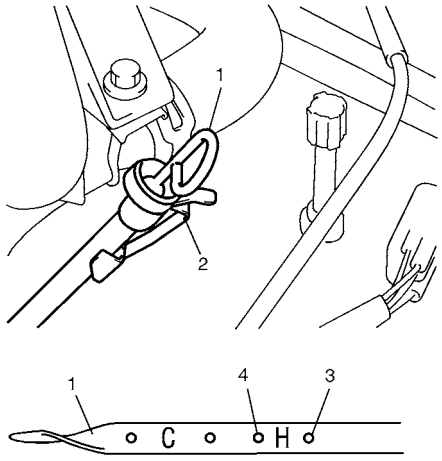
I4RS0A020015-

2) Apply sealant to drain plug after cleaning it and tighten drain plug to specified torque.
3) Pour specified oil up to level hole.
4) Tighten filler plug to specified torque.
   For recommended oil, its amount and tightening torque data, refer to “Manual Transaxle Oil Change: in Section 5B”.

Automatic Transaxle Fluid Level Inspection

S4RS0A0206039

1) Inspect transaxle case for evidence of fluid leakage. Repair leaky point, if any.
2) Make sure that vehicle is placed level for fluid level check.
3) Pull out dipstick and check fluid level.
   For fluid level checking procedure, refer to “A/T Fluid Level Check: in Section 5A” and be sure to perform it under specified conditions.
   If fluid level is low, replenish specified fluid.



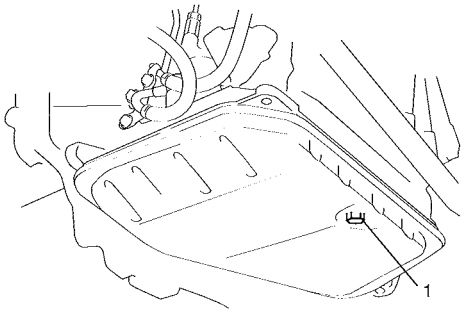
I4RS0A020016-

1. Dipstick	3. FULL HOT mark
2. Clamp	4. LOW HOT mark

Automatic Transaxle Fluid Replacement

S4RS0A0206040

1) Inspect transaxle case for evidence of fluid leakage. Repair leaky point, if any.
2) Make sure that vehicle is placed level for fluid level check.
3) Change fluid. For its procedure, refer to “A/T Fluid Change: in Section 5A”.



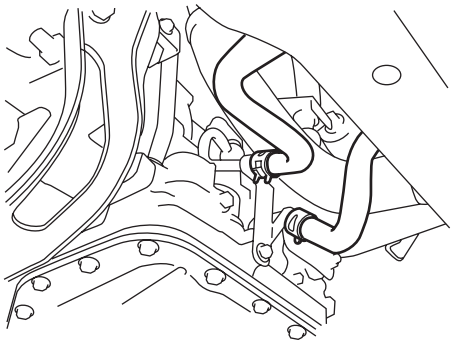
I4RS0A020017-

1. Drain plug

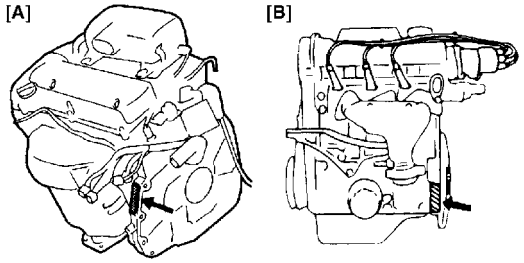
Automatic Transaxle Fluid Cooler Hose Inspection

S4RS0A0206041

Check automatic transaxle fluid cooler hose for fluid leakage, cracks, damage and deterioration.
Replace hose and/or clamp if any faulty condition is found.



I4RS0A020020-



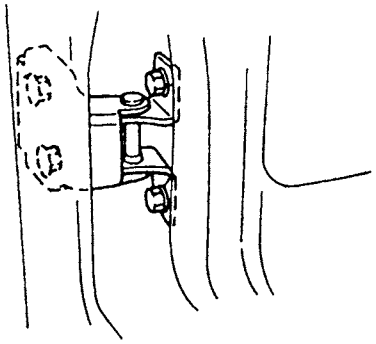
I3RB0A010004-

All Latches, Hinges and Locks Inspection

S4RS0A0206035

Doors

Check that each door of front, rear and back doors opens and closes smoothly and locks securely when closed.
If any malfunction is found, lubricate hinge and latch or repair door lock system.



I2RH01020033-

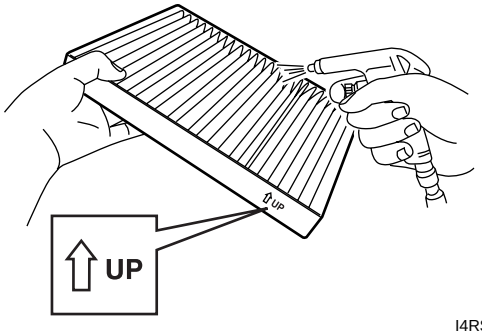
Engine Hood

Check that secondary latch operates properly (check that secondary latch keeps hood from opening all the way even when pulling hood release handle inside vehicle.) Also check that hood opens and closes smoothly and properly and hood locks securely when closed.
If any malfunction is found, lubricate hinge and latch, or repair hood lock system.

Air Conditioning Filter (If Equipped) Inspection

S4RS0A0206036

1) Remove the air conditioning filter from the HVAC unit referring to “Air Filter Removal and Installation: in Section 7A”.
2) Check for dirt and dust. If the air conditioning filter is excessively dirty, replace the air conditioning filter with the new one. If not, go to the next step.
3) Blow compressed air on the air outlet side of the air conditioning filter for removing dust.



I4RS0A020018-

4) Install the air conditioning filter into the HVAC unit referring to “Air Filter Removal and Installation: in Section 7A”.

Air Conditioning Filter (If Equipped) Replacement

S4RS0A0206038

Replace air conditioning filter with new one referring to “Air Filter Removal and Installation: in Section 7A”.

Final Inspection for Maintenance Service

S4RS0A0206037

WARNING:

When carrying out road tests, select a safe place where no man or no running vehicle is seen so as to prevent any accident.

Seats
Check that seat slides smoothly and locks securely at any position. Also check that reclining mechanism of front seat back allows it to be locked at any angle.

Seat Belt
Inspect belt system including webbing, buckles, latch plates, retractors and anchors for damage or wear. Check that seat belt is securely locked. If “REPLACE BELT” label on front seat belt is visible, replace belt.

Battery Electrolyte Level Check
Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case. If battery is equipped with built-in indicator, check battery condition by the indicator.

Accelerator Pedal Operation
Check that pedal operates smoothly without getting caught or interfered by any other part.

Engine Start
Check engine start for readiness.

WARNING:

Before performing the following check, be sure to have enough room around the vehicle. Then, firmly apply both the parking brake and the regular brakes. Do not use the accelerator pedal. If the engine starts, be ready to turn off the ignition promptly. Take these precautions because the vehicle could move without warning and possibly cause personal injury or property damage.

On automatic transaxle vehicles, try to start the engine in each select lever position. The starting motor should crank only in “P” (Park) or “N” (Neutral).
On manual transaxle vehicles, place the shift lever in “Neutral,” depress clutch pedal fully and try to start.

Exhaust System Check
Check for leakage, cracks or loose supports.

Clutch (for Manual Transaxle)
Check for the following.

- Clutch is completely released when depressing clutch pedal,
- No slipping clutch occurs when releasing pedal and accelerating.
- Clutch itself is free from any abnormal condition.

Gearshift or Select Lever (Transaxle)
Check gear shift or select lever for smooth shifting to all positions and for good performance of transaxle in any position.
With automatic transaxle equipped vehicle, also check that shift indicator indicates properly according to which position select lever is shifted to.
With automatic transaxle equipped vehicle, make sure that vehicle is at complete stop when shifting select lever to “P” range position and release all brakes.

Brake

Foot brake
Check the following:

- that brake pedal has proper travel,
- that brake works properly,
- that it is free from noise,
- that vehicle does not pull to one side when brake is applied.
- and that brake do not drag.

Parking brake
Check that lever has proper travel.

WARNING:

With vehicle parked on a fairly steep slope, make sure nothing is in the way downhill to avoid any personal injury or property damage. Be prepared to apply regular brake quickly even if vehicle should start to move.

Check to ensure that parking brake is fully effective when the vehicle is stopped on the safe slope and brake lever is pulled all the way.

Steering

- Check to ensure that steering wheel is free from instability, or abnormally heavy feeling.
- Check that the vehicle does not wander or pull to one side.

Engine

- Check that engine responds readily at all speeds.
- Check that engine is free from abnormal noise and abnormal vibration.

Body, Wheels and Power Transmitting System
Check that body, wheels and power transmitting system are free from abnormal noise and abnormal vibration or any other abnormal condition.

Meters and Gauge
Check that speedometer, odometer, fuel meter, temperature gauge, etc. are operating accurately.

Lights
Check that all lights operate properly.

Windshield Defroster
Periodically check that air comes out from defroster outlet when operating heater or air conditioning.
Set mode control lever to defroster position and fan switch lever to “HI” position for this check.

Specifications

Tightening Torque Specifications

S4RS0A0207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Engine oil drain plug	35	3.5	25.5	☞
Oil filter	14	1.4	10.5	(for reference) ☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

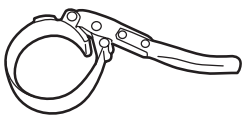
Recommended Fluids and Lubricants

S4RS0A0208001

Engine oil	SG, SH, SJ or SL grade (Refer to “Engine Oil and Filter Change: ” for engine oil viscosity.)
Engine coolant (Ethylene glycol base coolant)	“Antifreeze/Anticorrosion coolant”
Brake fluid	DOT 3 or SAE J1703
Manual transaxle oil	Refer to “Manual Transaxle Oil Change: in Section 5B”.
Automatic transaxle fluid	Refer to “A/T Fluid Change: in Section 5A”.
Door hinges	Engine oil or water resistance chassis grease
Hood latch assembly	Engine oil or water resistance chassis grease
Key lock cylinder	Spray lubricant

Special Tool

S4RS0A0208002

09915–47331 Oil filter wrench ☞ 	

Section 1

Engine

CONTENTS

Precautions 1-1
Precautions 1-1
Precautions for Engine 1-1

Engine General Information and Diagnosis 1A-1
Precautions 1A-1
Precautions on Engine Service 1A-1
Precautions in Diagnosing Trouble 1A-1
Precautions of ECM Circuit Inspection 1A-1
General Description 1A-2
Statement on Cleanliness and Care 1A-2
Engine Diagnosis General Description 1A-2
On-Board Diagnostic System Description 1A-2
Engine and Emission Control System Description 1A-5
CAN Communication System Description 1A-5
Air Intake System Description 1A-6
Electronic Control System Description 1A-7
Engine and Emission Control Input / Output Table 1A-13
Schematic and Routing Diagram 1A-14
Engine and Emission Control System Diagram 1A-14
Component Location 1A-15
Electronic Control System Components Location 1A-15
Diagnostic Information and Procedures 1A-16
Engine and Emission Control System Check 1A-16
Malfunction Indicator Lamp (MIL) Check 1A-19
DTC Check 1A-19
DTC Clearance 1A-20
DTC Table 1A-20
Fail-Safe Table 1A-24
Scan Tool Data 1A-24
Visual Inspection 1A-28
Engine Basic Inspection 1A-29
Engine Symptom Diagnosis 1A-32
Malfunction Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started) 1A-38
Malfunction Indicator Lamp Remains ON after Engine Starts 1A-40
DTC P0010: Camshaft Position Actuator Circuit 1A-42
DTC P0011 / P0012: Camshaft Position - Timing Over-Advanced or System Performance / -Retarded 1A-44
DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1) 1A-46
DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2) 1A-48
DTC P0101: Mass Air Flow Circuit Range / Performance 1A-50
DTC P0102: Mass Air Flow Circuit Low Input 1A-54
DTC P0103: Mass Air Flow Circuit High Input 1A-56
DTC P0106: Manifold Absolute Pressure Range / Performance 1A-58
DTC P0107: Manifold Absolute Pressure Circuit Low Input 1A-60
DTC P0108: Manifold Absolute Pressure Circuit High Input 1A-62
DTC P0111: Intake Air Temperature Circuit Range / Performance 1A-64
DTC P0112: Intake Air Temperature Sensor Circuit Low 1A-67
DTC P0113: Intake Air Temperature Sensor Circuit High 1A-70
DTC P0116: Engine Coolant Temperature Circuit Range / Performance 1A-73
DTC P0117: Engine Coolant Temperature Circuit Low 1A-76
DTC P0118: Engine Coolant Temperature Circuit High 1A-78
DTC P0121: Throttle Position Sensor Circuit Range / Performance 1A-80
DTC P0122: Throttle Position Sensor Circuit Low 1A-85
DTC P0123: Throttle Position Sensor Circuit High 1A-88
DTC P0131 / P0132: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-1) 1A-91
DTC P0133: O2 Sensor (HO2S) Circuit Slow Response (Sensor-1) 1A-94
DTC P0134: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-1) 1A-95
DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2) 1A-98
DTC P0140: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-2) 1A-101

DTC P0171 / P0172: Fuel System Too Lean / Rich 1A-103
DTC P0300 / P0301 / P0302 / P0303 / P0304: Random Misfire Detected / Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Misfire Detected 1A-105
DTC P0327 / P0328: Knock Sensor Circuit Low / High 1A-107
DTC P0335: Crankshaft Position (CKP) Sensor Circuit 1A-109
DTC P0340: Camshaft Position (CMP) Sensor Circuit 1A-111
DTC P0401 / P0402: Exhaust Gas Recirculation Flow Insufficient Detected / Excessive Detected 1A-114
DTC P0403: Exhaust Gas Recirculation Control Circuit 1A-117
DTC P0420: Catalyst System Efficiency below Threshold 1A-119
DTC P0443: Evaporative Emission System Purge Control Valve Circuit 1A-121
DTC P0462: Fuel Level Sensor Circuit Low 1A-123
DTC P0463: Fuel Level Sensor Circuit High 1A-125
DTC P0480: Fan 1 (Radiator Cooling Fan) Control Circuit 1A-127
DTC P0500: Vehicle Speed Sensor (VSS) Malfunction 1A-131
DTC P0505: Idle Air Control System 1A-134
DTC P0532: A/C Refrigerant Pressure Sensor Circuit Low 1A-136
DTC P0533: A/C Refrigerant Pressure Sensor Circuit High 1A-138
DTC P0601 / P0602: Internal Control Module Memory Check Sum Error / Control Module Programming Error 1A-140
DTC P0616: Starter Relay Circuit Low 1A-141
DTC P0617: Starter Relay Circuit High 1A-142
DTC P1510: ECM Back-Up Power Supply Malfunction 1A-144
DTC P1603: TCM Trouble Code Detected 1A-145
DTC P1674: CAN Communication (Bus Off Error) 1A-146
DTC P1675: CAN Communication (Transmission Error) 1A-150
DTC P1676: CAN Communication (Reception Error for TCM) 1A-153
DTC P1678: CAN Communication (Reception Error for BCM) 1A-156
DTC P2227 / P2228 / P2229: Barometric Pressure Circuit Malfunction 1A-158
Inspection of ECM and Its Circuits 1A-160
ECM Power and Ground Circuit Check 1A-177
Fuel Injector Circuit Check 1A-180
Fuel Pump and Its Circuit Check 1A-182
Fuel Pressure Check 1A-185
Idle Air Control System Check 1A-186
A/C System Circuits Check 1A-188
Electric Load Signal Circuit Check 1A-192
Radiator cooling fan Low Speed Control System Check 1A-193
Radiator cooling fan High Speed Control System Check 1A-195
Repair Instructions 1A-198
Idle Speed / Idle Air Control (IAC) Duty Inspection 1A-198
Special Tools and Equipment 1A-199
Special Tool 1A-199

Aux. Emission Control Devices 1B-1

Diagnostic Information and Procedures 1B-1
EGR System Inspection 1B-1
Repair Instructions 1B-1
EVAP Canister Purge Inspection 1B-1
EVAP Canister Purge Valve and Its Circuit Inspection 1B-1
Vacuum Passage Inspection 1B-2
Vacuum Hose Inspection 1B-3
EVAP Canister Purge Valve Inspection 1B-3
EVAP Canister Inspection 1B-3
EGR Valve Removal and Installation 1B-4
EGR Valve Inspection 1B-4
PCV Hose Inspection 1B-4
PCV Valve Inspection 1B-4
Special Tools and Equipment 1B-5
Special Tool 1B-5

Engine Electrical Devices 1C-1

Repair Instructions 1C-1
Idle Air Control (IAC) Valve Operation Inspection 1C-1
Idle Air Control (IAC) Valve On-Vehicle Inspection 1C-1
Idle Air Control (IAC) Valve Removal and Installation 1C-2
Engine Control Module (ECM) Removal and Installation 1C-2
Manifold Absolute Pressure (MAP) Sensor Inspection 1C-3
Throttle Position (TP) Sensor On-Vehicle Inspection 1C-3
Throttle Position (TP) Sensor Removal and Installation 1C-4
Engine Coolant Temperature (ECT) Sensor Removal and Installation 1C-4
Engine Coolant Temperature (ECT) Sensor Inspection 1C-5
Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection 1C-5
Heated Oxygen Sensor (HO2S-1 and HO2S-2) Removal and Installation 1C-5
Camshaft Position (CMP) Sensor Removal and Installation 1C-6
Camshaft Position (CMP) Sensor Inspection 1C-6
Crankshaft Position (CKP) Sensor Removal and Installation 1C-7
Crankshaft Position (CKP) Sensor Inspection 1C-7

Vehicle Speed Sensor (VSS) Inspection (M/T model)....1C-8
Knock Sensor Removal and Installation....1C-8
Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection....1C-9
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection....1C-9
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Removal and Installation....1C-10
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection....1C-10
Specifications....1C-11
Tightening Torque Specifications....1C-11
Special Tools and Equipment....1C-11
Special Tool....1C-11

Engine Mechanical 1D-1

General Description....1D-1
Engine Construction Description....1D-1
Camshaft Position Control (VVT Variable Valve Timing) System Description....1D-1
Diagnostic Information and Procedures....1D-4
Compression Check....1D-4
Engine Vacuum Check....1D-5
Valve Lash (Clearance) Inspection....1D-6
Repair Instructions....1D-8
Air Cleaner Element Removal and Installation....1D-8
Air Cleaner Element Inspection and Cleaning....1D-9
Cylinder Head Cover Removal and Installation....1D-9
Accelerator Cable Adjustment....1D-11
Throttle Body Components....1D-11
Throttle Body On-Vehicle Inspection....1D-12
Throttle Body Removal and Installation....1D-12
Throttle Body Cleaning....1D-13
Throttle Body and Intake Manifold Components....1D-14
Intake Manifold Removal and Installation....1D-15
Engine Mountings Components....1D-16
Engine Assembly Removal and Installation....1D-17
Timing Chain Cover Components....1D-20
Timing Chain Cover Removal and Installation....1D-21
Timing Chain Cover Inspection....1D-23
Oil Control Valve Removal and Installation....1D-23
Oil Control Valve Inspection....1D-24
Timing Chain and Chain Tensioner Components....1D-24
Timing Chain and Chain Tensioner Removal and Installation....1D-25
Timing Chain and Chain Tensioner Inspection....1D-27
Camshaft, Tappet and Shim Components....1D-28
Camshaft, Tappet and Shim Removal and Installation....1D-29
Camshaft, Tappet and Shim Inspection....1D-31
Valves and Cylinder Head Components....1D-34
Valves and Cylinder Head Removal and Installation....1D-35
Valves and Cylinder Head Disassembly and Assembly....1D-37
Valves and Valve Guides Inspection....1D-39
Cylinder Head Inspection....1D-42
Valve Spring Inspection....1D-42
Pistons, Piston Rings, Connecting Rods and Cylinders Components....1D-43
Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation....1D-44
Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly....1D-45
Cylinders, Pistons and Piston Rings Inspection....1D-46
Piston Pins and Connecting Rods Inspection....1D-48
Crank Pin and Connecting Rod Bearings Inspection....1D-49
Main Bearings, Crankshaft and Cylinder Block Components....1D-53
Main Bearings, Crankshaft and Cylinder Block Removal and Installation....1D-54
Crankshaft Inspection....1D-56
Main Bearings Inspection....1D-58
Sensor Plate Inspection....1D-63
Rear Oil Seal Inspection....1D-63
Flywheel Inspection....1D-63
Cylinder Block Inspection....1D-63
Specifications....1D-64
Tightening Torque Specifications....1D-64
Special Tools and Equipment....1D-65
Recommended Service Material....1D-65
Special Tool....1D-65

Engine Lubrication System 1E-1

General Description....1E-1
Engine Lubrication Description....1E-1
Diagnostic Information and Procedures....1E-3
Oil Pressure Check....1E-3
Repair Instructions....1E-4
Oil Pan and Oil Pump Strainer Components....1E-4
Oil Pan and Oil Pump Strainer Removal and Installation....1E-5
Oil Pan and Oil Pump Strainer Cleaning....1E-6
Oil Pump Components....1E-7
Oil Pump Removal and Installation....1E-7
Oil Pump Disassembly and Reassembly....1E-7
Oil Pump Inspection....1E-8
Specifications....1E-10
Tightening Torque Specifications....1E-10
Special Tools and Equipment....1E-10
Recommended Service Material....1E-10
Special Tool....1E-10

Engine Cooling System 1F-1
- **General Description 1F-1**
  - Cooling System Description 1F-1
  - Coolant Description 1F-1
- **Schematic and Routing Diagram 1F-2**
  - Coolant Circulation 1F-2
- **Diagnostic Information and Procedures 1F-3**
  - Engine Cooling Symptom Diagnosis 1F-3
- **Repair Instructions 1F-4**
  - Cooling System Components 1F-4
  - Coolant Level Check 1F-5
  - Engine Cooling System Inspection and Cleaning 1F-5
  - Cooling System Draining 1F-5
  - Cooling System Flush and Refill 1F-6
  - Cooling Water Pipes or Hoses Removal and Installation 1F-7
  - Thermostat Removal and Installation 1F-7
  - Thermostat Inspection 1F-8
  - Radiator Cooling Fan Motor On-Vehicle Inspection 1F-8
  - Radiator Cooling Fan Relay Inspection 1F-9
  - Radiator Cooling Fan Removal and Installation 1F-9
  - Radiator On-Vehicle Inspection and Cleaning 1F-9
  - Radiator Removal and Installation 1F-10
  - Water Pump / Generator Drive Belt Tension Inspection and Adjustment 1F-10
  - Water Pump / Generator Drive Belt Removal and Installation 1F-11
  - Water Pump Removal and Installation 1F-11
  - Water Pump Inspection 1F-12
- **Specifications 1F-12**
  - Tightening Torque Specifications 1F-12
- **Special Tools and Equipment 1F-12**
  - Recommended Service Material 1F-12

Fuel System 1G-1
- **Precautions 1G-1**
  - Precautions on Fuel System Service 1G-1
- **General Description 1G-1**
  - Fuel System Description 1G-1
  - Fuel Delivery System Description 1G-1
  - Fuel Pump Description 1G-2
- **Schematic and Routing Diagram 1G-2**
  - Fuel Delivery System Diagram 1G-2
- **Diagnostic Information and Procedures 1G-2**
  - Fuel Pressure Inspection 1G-2
  - Fuel Cut Operation Inspection 1G-3
- **Repair Instructions 1G-4**
  - Fuel System Components 1G-4
  - Fuel Hose Disconnecting and Reconnecting 1G-6
  - Fuel Pressure Relief Procedure 1G-8
  - Fuel Leakage Check Procedure 1G-8
  - Fuel Lines On-Vehicle Inspection 1G-8
  - Fuel Pipe Removal and Installation 1G-8
  - Fuel Injector On-Vehicle Inspection 1G-9
  - Fuel Injector Removal and Installation 1G-9
  - Fuel Injector Inspection 1G-10
  - Fuel Filler Cap Inspection 1G-11
  - Fuel Tank Inlet Valve Removal and Installation 1G-12
  - Fuel Tank Inlet Valve Inspection 1G-13
  - Fuel Tank Removal and Installation 1G-13
  - Fuel Tank Inspection 1G-14
  - Fuel Tank Purging Procedure 1G-14
  - Fuel Pump On-Vehicle Inspection 1G-15
  - Fuel Pump Assembly Removal and Installation 1G-15
  - Fuel Level Sensor Removal and Installation 1G-16
  - Fuel Pump Inspection 1G-17
- **Specifications 1G-17**
  - Tightening Torque Specifications 1G-17
- **Special Tools and Equipment 1G-18**
  - Special Tool 1G-18

Ignition System 1H-1
- **General Description 1H-1**
  - Ignition System Construction 1H-1
- **Schematic and Routing Diagram 1H-2**
  - Ignition System Wiring Circuit Diagram 1H-2
- **Component Location 1H-3**
  - Ignition System Components Location 1H-3
- **Diagnostic Information and Procedures 1H-4**
  - Ignition System Symptom Diagnosis 1H-4
  - Reference Waveform of Ignition System 1H-4
  - Ignition System Check 1H-5
  - Ignition Spark Test 1H-6
- **Repair Instructions 1H-7**
  - High-Tension Cord Removal and Installation 1H-7
  - High-Tension Cord Inspection 1H-7
  - Spark Plug Removal and Installation 1H-8
  - Spark Plug Inspection 1H-8
  - Ignition Coil Assembly (Including ignitor) Removal and Installation 1H-8
  - Ignition Coil Assembly (Including ignitor) Inspection 1H-9
  - Ignition Timing Inspection 1H-9
- **Specifications 1H-10**
  - Tightening Torque Specifications 1H-10
- **Special Tools and Equipment 1H-10**
  - Special Tool 1H-10

Starting System 1I-1
- **Schematic and Routing Diagram 1I-1**
  - Cranking System Circuit Diagram 1I-1
- **Diagnostic Information and Procedures 1I-1**
  - Cranking System Symptom Diagnosis 1I-1
  - Cranking System Test 1I-3
- **Repair Instructions 1I-4**
  - Starting Motor Dismounting and Remounting 1I-4
  - Starting Motor Components 1I-5
  - Starting Motor Inspection 1I-6

Specifications 1I-9
Cranking System Specifications 1I-9
Tightening Torque Specifications 1I-9
Special Tools and Equipment 1I-9
Recommended Service Material 1I-9

Charging System 1J-1
General Description 1J-1
Battery Description 1J-1
Generator Description 1J-2
Diagnostic Information and Procedures 1J-3
Battery Inspection 1J-3
Generator Symptom Diagnosis 1J-3
Generator Test (Undercharged Battery Check) 1J-4
Generator Test (Overcharged Battery Check) 1J-5
Repair Instructions 1J-6
Jump Starting in Case of Emergency 1J-6
Battery Dismounting and Remounting 1J-6
Generator Dismounting and Remounting 1J-7
Generator Components 1J-7
Generator Inspection 1J-8
Specifications 1J-10
Charging System Specifications 1J-10
Tightening Torque Specifications 1J-10

Exhaust System 1K-1
General Description 1K-1
Exhaust System Description 1K-1
Diagnostic Information and Procedures 1K-1
Exhaust System Check 1K-1
Repair Instructions 1K-2
Exhaust System Components 1K-2
Exhaust Manifold Removal and Installation 1K-3
Exhaust Pipe and Muffler Removal and Installation 1K-4
Specifications 1K-5
Tightening Torque Specifications 1K-5

Precautions

Precautions

Precautions for Engine

S4RS0A1000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Precautions on Engine Service
Refer to “Precautions on Engine Service: in Section 1A”.

Precautions in Diagnosing Trouble
Refer to “Precautions in Diagnosing Trouble: in Section 1A”.

Precautions of ECM Circuit Inspection
Refer to “Precautions of ECM Circuit Inspection: in Section 1A”.

Precautions on Fuel System Service
Refer to “Precautions on Fuel System Service: in Section 1G”.

Precaution for CAN Communication System
Refer to “Precaution for CAN Communication System: in Section 00”.

Precautions for Catalytic Converter
Refer to “Precautions for Catalytic Converter: in Section 00”.

Precautions for Electrical Circuit Service
Refer to “Precautions for Electrical Circuit Service: in Section 00”.

Engine General Information and Diagnosis

Precautions

Precautions on Engine Service

S4RS0A1100001

CAUTION:

The following information on engine service should be noted carefully, as it is important in preventing damage, and in contributing to reliable engine performance.

- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer, resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits.
  When performing any work where electrical terminals can be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, throttle body or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.

Precautions in Diagnosing Trouble

S4RS0A1100002

- Don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse before confirming diagnostic information (DTC, freeze frame data, etc.) stored in ECM memory. Such disconnection will erase memorized information in ECM memory.
- Diagnostic information stored in ECM memory can be cleared as well as checked by using SUZUKI scan tool or OBD generic scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
  It is indistinguishable which module turns on MIL because not only ECM but also TCM turns on MIL (For details of on-board diagnostic system for A/T, refer to "On-Board Diagnostic System Description: in Section 5A"). Therefore, check both ECM and TCM for DTC when MIL lights on.
  When checking ECM for DTC, keep in mind that DTC is displayed on the scan tool as follows depending on the scan tool used.
  - SUZUKI scan tool displays DTC detected by ECM.
  - OBD-II generic scan tool displays DTC detected by each of ECM and TCM simultaneously.
- Priorities for diagnosing troubles
  If two or more DTCs are stored, proceed to the DTC flow which has been detected earliest in the order and follow the instruction in that flow.
  If no instructions are given, troubleshoot DTCs according to the following priorities.
  a. DTCs other than DTC P0171 / P0172 (Fuel system too lean / too rich), DTC P0300 / P0301 / P0302 / P0303 / P0304 (Misfire detected) and DTC P0401 / P0402 (EGR flow malfunction)
  b. DTC P0171 / P0172 (Fuel system too lean / too rich) and DTC P0401 / P0402 (EGR flow malfunction)
  c. DTC P0300 / P0301 / P0302 / P0303 / P0304 (Misfire detected)
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00" before inspection and observe what is written there.
- ECM replacement:
  When substituting a known-good ECM, check for the following conditions. Neglecting this check may cause damage to a known-good ECM.
  - Resistance value of all relays, actuators is as specified respectively.
  - MAP sensor, A/C refrigerant pressure sensor (if equipped with A/C) and TP sensor are in good condition and none of power circuits of these sensors is shorted to ground.
- Communication of ECUs, ECM, BCM, combination meter and TCM, is established by CAN (Controller Area Network). (For more detail of CAN communication for ECM, refer to "CAN Communication System Description: "). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System: in Section 00".
- Immobilizer transponder code registration after replacing ECM
  When ECM is replaced with new one or with another one, make sure to register immobilizer transponder code to ECM correctly according to "Procedure after ECM Replacement: in Section 10C".

Precautions of ECM Circuit Inspection

S4RS0A1100003

- ECM connectors are waterproofed. Each terminal of the ECM connectors is sealed up with the grommet. Therefore, when measuring circuit voltage, resistance and/or pulse signal at ECM connector, do not insert the tester's probe into the sealed terminal at the harness side. When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to the ECM connectors. And, insert the tester's probe into the special tool's

connectors at the harness side, and then measure voltage, resistance and/or pulse signal. Or, ECM and its circuits may be damaged by water.

- Wire colors of the special tool's connectors are different from the ones of the ECM connectors. However, the circuit arrangement of the special tool's connectors is same as the one of the ECM connectors. Therefore, measure circuit voltage and resistance by identifying the terminal location subject to the measurement.

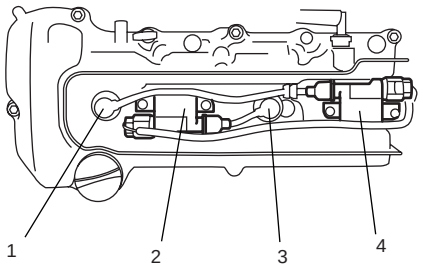
General Description

Statement on Cleanliness and Care

S4RS0A1101001

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands of an inch).
Accordingly, when any internal engine parts are serviced, care and cleanliness are important.
It should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.
  At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine.
  Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- The four cylinders of the engine are identified by numbers; No.1 (1), No.2 (2), No.3 (3) and No.4 (4) counted from crankshaft pulley side to flywheel side.



I3RM0A110001-

Engine Diagnosis General Description

S4RS0A1101002

This vehicle is equipped with an engine and emission control system which are under control of ECM.
The engine and emission control system in this vehicle are controlled by ECM. ECM has an On-Board Diagnostic system which detects a malfunction in this system and abnormality of those parts that influence the engine exhaust emission. When diagnosing engine troubles, be sure to have full understanding of the outline of "On-Board Diagnostic System Description: " and each item in "Precautions in Diagnosing Trouble: " and execute diagnosis according to "Engine and Emission Control System Check: ".
There is a close relationship between the engine mechanical, engine cooling system, ignition system, exhaust system, etc. and the engine and emission control system in their structure and operation. In case of an engine trouble, even when the malfunction indicator lamp (MIL) doesn't turn ON, it should be diagnosed according to "Engine and Emission Control System Check: ".

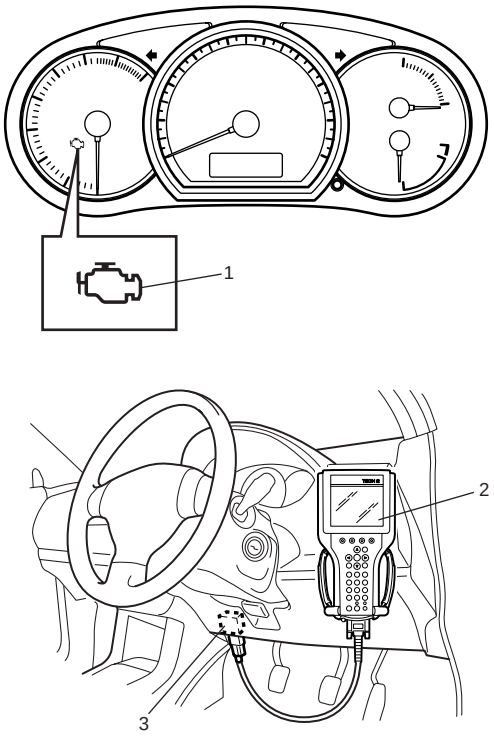
On-Board Diagnostic System Description

S4RS0A1101003

ECM in this vehicle has the following functions.

- When the ignition switch is turned ON with the engine at a stop, malfunction indicator lamp (MIL) (1) turns ON to check the circuit of the malfunction indicator lamp (1).
- When ECM detects a malfunction which gives an adverse effect to vehicle emission while the engine is running, it makes the malfunction indicator lamp (1) in the meter cluster of the instrument panel turn ON or flash (flashing only when detecting a misfire which can cause damage to the catalyst) and stores the malfunction area in its memory.
  (If it detects that continuously 3 driving cycles are normal after detecting a malfunction, however, it makes MIL (1) turn OFF although DTC stored in its memory will remain.)
- As a condition for detecting a malfunction in some areas in the system being monitored by ECM and turning ON the malfunction indicator lamp (1) due to that malfunction, 2 driving cycle detection logic is adopted to prevent erroneous detection.

- When a malfunction is detected, engine and driving conditions then are stored in ECM memory as freeze frame data. (For the details, refer to description on “Freeze Frame Data: ”.)
- It is possible to communicate by using not only SUZUKI scan tool (2) but also OBD generic scan tool. (Diagnostic information can be accessed by using a scan tool.)



I4RS0A110001-

3. DLC

Warm-Up Cycle

A warm-up cycle means sufficient vehicle operation such that the coolant temperature has risen by at least 22 °C (40 °F) from engine starting and reaches a minimum temperature of 70 °C (160 °F).

Driving Cycle

A “Driving Cycle” consists of engine startup and engine shutoff.

2 Driving Cycle Detection Logic

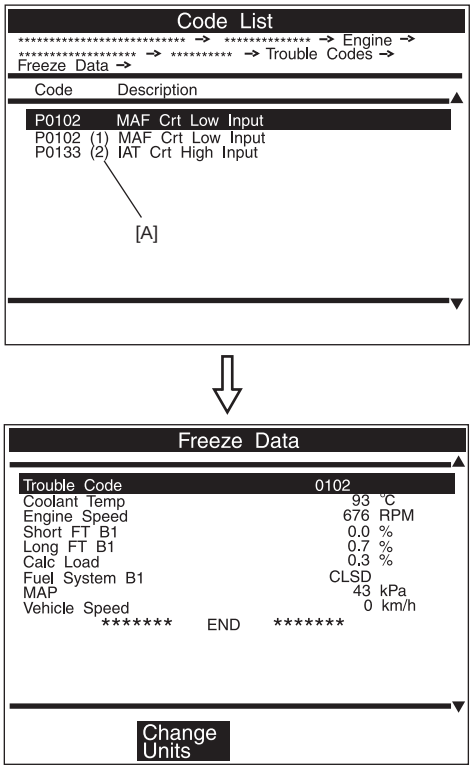
The malfunction detected in the first driving cycle is stored in ECM memory (in the form of pending DTC) but the malfunction indicator lamp does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

Pending DTC

Pending DTC means a DTC detected and stored temporarily at 1 driving cycle of the DTC which is detected in the 2 driving cycle detection logic.

Freeze Frame Data

ECM stores the engine and driving conditions (in the form of data as shown in the figure) at the moment of the detection of a malfunction in its memory. This data is called “Freeze frame data”.
Therefore, it is possible to know engine and driving conditions (e.g., whether the engine was warm or not, where the vehicle was running or stopped, where air/fuel mixture was lean or rich) when a malfunction was detected by checking the freeze frame data. Also, ECM has a function to store each freeze frame data for three different malfunctions in the order as each malfunction is detected. Utilizing this function, it is possible to know the order of malfunctions that have been detected. Its use is helpful when rechecking or diagnosing a trouble.



I3RB0A110002-

[A]: 1st or 2nd in parentheses here represents which position in the order the malfunction is detected.

Priority of freeze frame data:
ECM has 4 frames where the freeze frame data can be stored. The first frame stores the freeze frame data of the malfunction which was detected first. However, the freeze frame data stored in this frame is updated according to the priority described. (If malfunction as described in the upper square “1” is detected while the freeze frame data in the lower square “2” has been stored, the freeze frame data “2” will be updated by the freeze frame data “1”.)

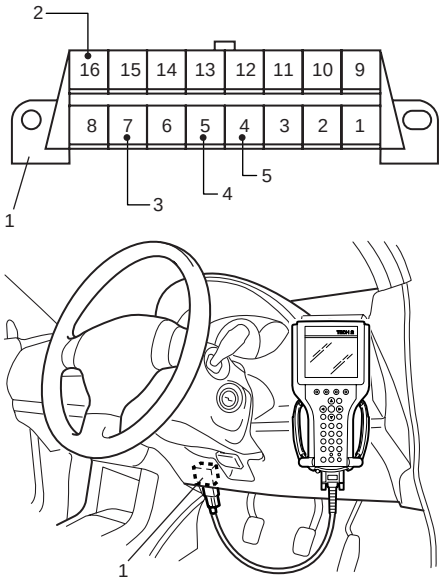
Priority	Freeze frame data in frame 1
1	Freeze frame data at initial detection of malfunction among misfire detected (P0300 – P0304), fuel system too lean (P0171) and fuel system too rich (P0172)
2	Freeze frame data when a malfunction other than those in “1” is detected

In the 2nd through the 4th frames, the freeze frame data of each malfunction is stored in the order as each malfunction is detected. These data are not updated.
Shown in the table are examples of how freeze frame data are stored when two or more malfunctions are detected.

Malfunction detected order		Frame			
		Frame 1	Frame 2	Frame 3	Frame 4
		Freeze frame data to be updated	1st freeze frame data	2nd freeze frame data	3rd freeze frame data
No malfunction		No freeze frame data			
1	P0401 (EGR) detected	Data at P0401 detection	Data at P0401 detection	—	—
2	P0171 (Fuel system) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	—
3	P0300 (Misfire) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	Data at P0300 detection
4	P0301 (Misfire) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	Data at P0300 detection

Freeze frame data clearance:
The freeze frame data is cleared at the same time as clearance of DTC.

Data Link Connector (DLC)
DLC (1) is in compliance with SAE J1962 in the shape of connector and pin assignment.
OBD serial data line (3) (K line of ISO 9141) is used for SUZUKI scan tool or OBD generic scan tool to communicate with ECM, Air bag SDM, immobilizer control module (in ECM), BCM (Body electrical Control Module), TCM (Transmission Control Module) and ABS control module.



I4RS0A110002-

2. B + (Unswitched vehicle battery positive)
4. ECM ground (Signal ground)
5. Vehicle body ground (Chassis ground)

Engine and Emission Control System Description

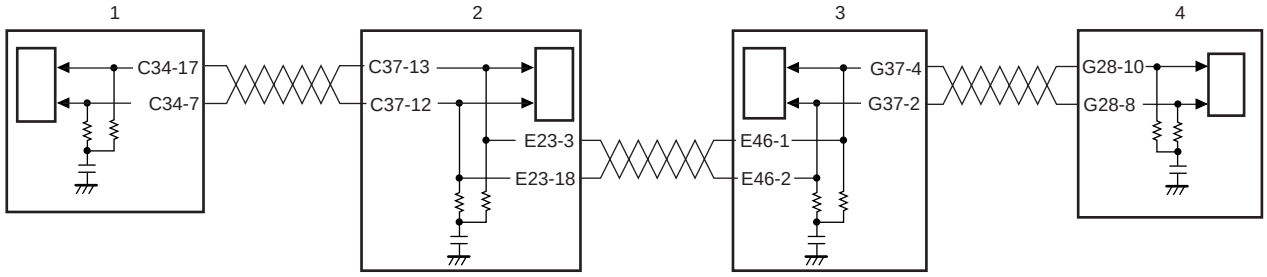
S4RS0A1101004

The engine and emission control system is divided into 4 major sub-systems: air intake system, fuel delivery system, electronic control system and emission control system.
Air intake system includes air cleaner, throttle body, IAC valve and intake manifold.
Fuel delivery system includes fuel pump, delivery pipe, etc.
Electronic control system includes ECM, various sensors and controlled devices.
Emission control system includes EGR, EVAP and PCV system.

CAN Communication System Description

S4RS0A1101008

ECM (2), TCM (equipped with A/T) (1), BCM (3) and combination meter (4) of this vehicle communicate control data between each control module.
Communication of each control module is established by CAN (Controller Area Network) communication system.



I4RS0A110085-

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a function to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. ECM communicates control data with each control module as follows.

ECM Transmission Data

				TCM	BCM	Combination Meter
ECM	Transmit	DATA	Engine torque driver requested	○		
			Engine speed	○		○
			Top gear inhibit	○		
			Torque converter clutch control inhibit	○		
			Lock up / slip control inhibit signal	○		
			Throttle position	○		
			Immobilizer indication			○
			Engine emissions related malfunction			○
			Vehicle speed		○	○
			Engine coolant temperature	○	○	○
			Fuel level percent			○
			Brake pedal switch active	○		
			A/C refrigerant pressure		○	
			Distance kilometers per liter of fuel		○	
			Stand by to engage air conditioning compressor clutch	○		

I4RS0A110003-

NOTE:

In communication between ECM and combination meter, data is transmitted only from ECM to combination meter. (Combination meter does not transmit data to ECM.)

ECM Reception Data

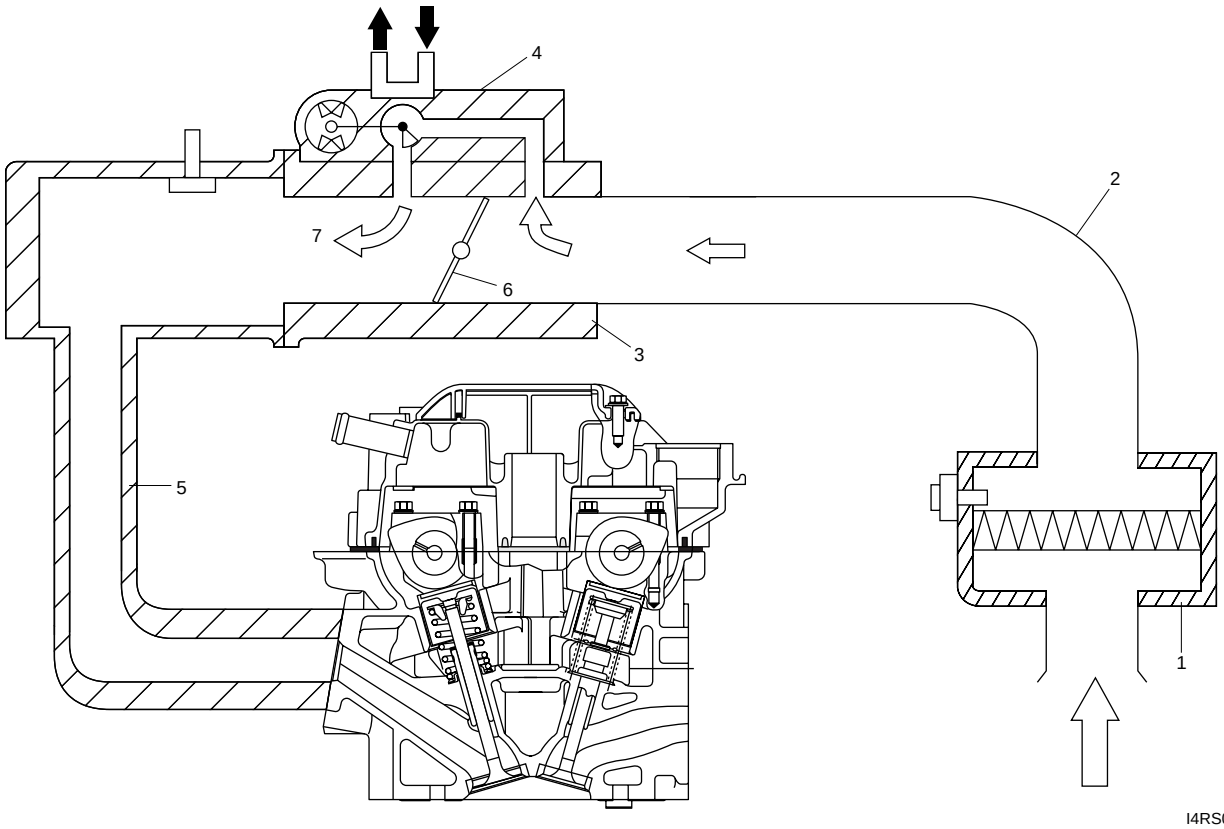
				TCM	BCM
ECM	Receive	DATA	Torque down ignition delay request	○	
			Coast slip control signal	○	
			Vehicle speed pulse	○	
			TCM data validity	○	
			Transmission gear selector position	○	
			Transmission actual gear	○	
			A/C switch ON		○
			Electric load active (small light)		○
			Electric load active (rear defogger)		○
			Ignition key switch ON		○

I4RS0A110004-

Air Intake System Description

S4RS0A1101005

The main components of the air intake system are air cleaner (1), air cleaner outlet hose (2), throttle body (3), idle air control valve (4) and intake manifold (5).
The air (by the amount corresponding to throttle valve (6) opening and engine speed) is filtered by the air cleaner, passes through the throttle body, distributed by the intake manifold and finally drawn into each combustion chamber. When the idle air control valve is opened according to the signal from ECM, the air (7) bypasses the throttle valve through bypass passage and is finally drawn into the intake manifold.



I4RS0A110005-

Electronic Control System Description

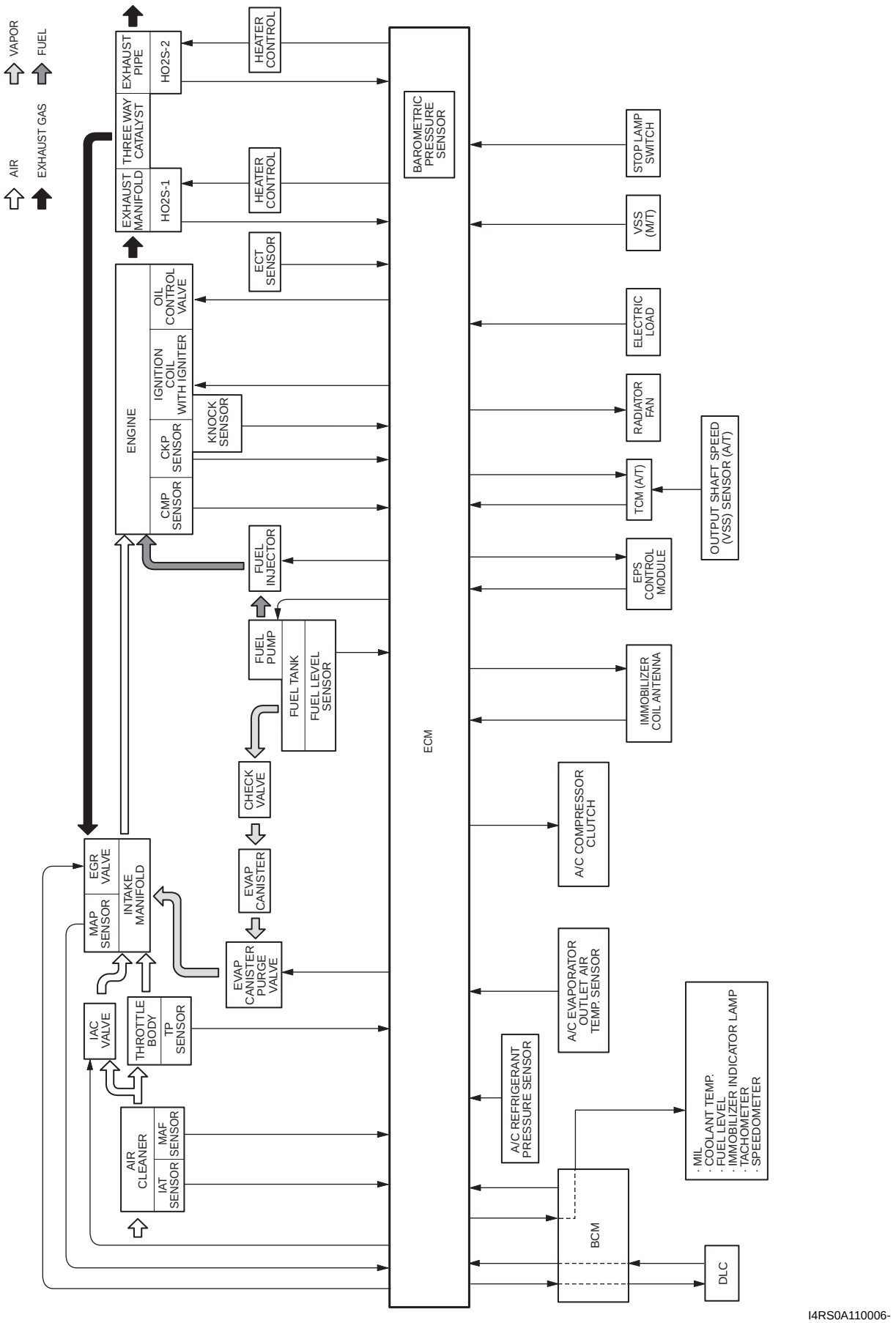
S4RS0A1101006

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices. Functionally, it is divided into the following sub systems:

- Fuel injection control system
- Ignition control system
- Idle speed control system
- Fuel pump control system
- Radiator cooling fan control system
- Evaporative emission control system
- EGR system
- Oxygen sensor heater control system
- A/C control system (if equipped)
- Camshaft position control system
- Immobilizer control system
- Controller (computer) communication system

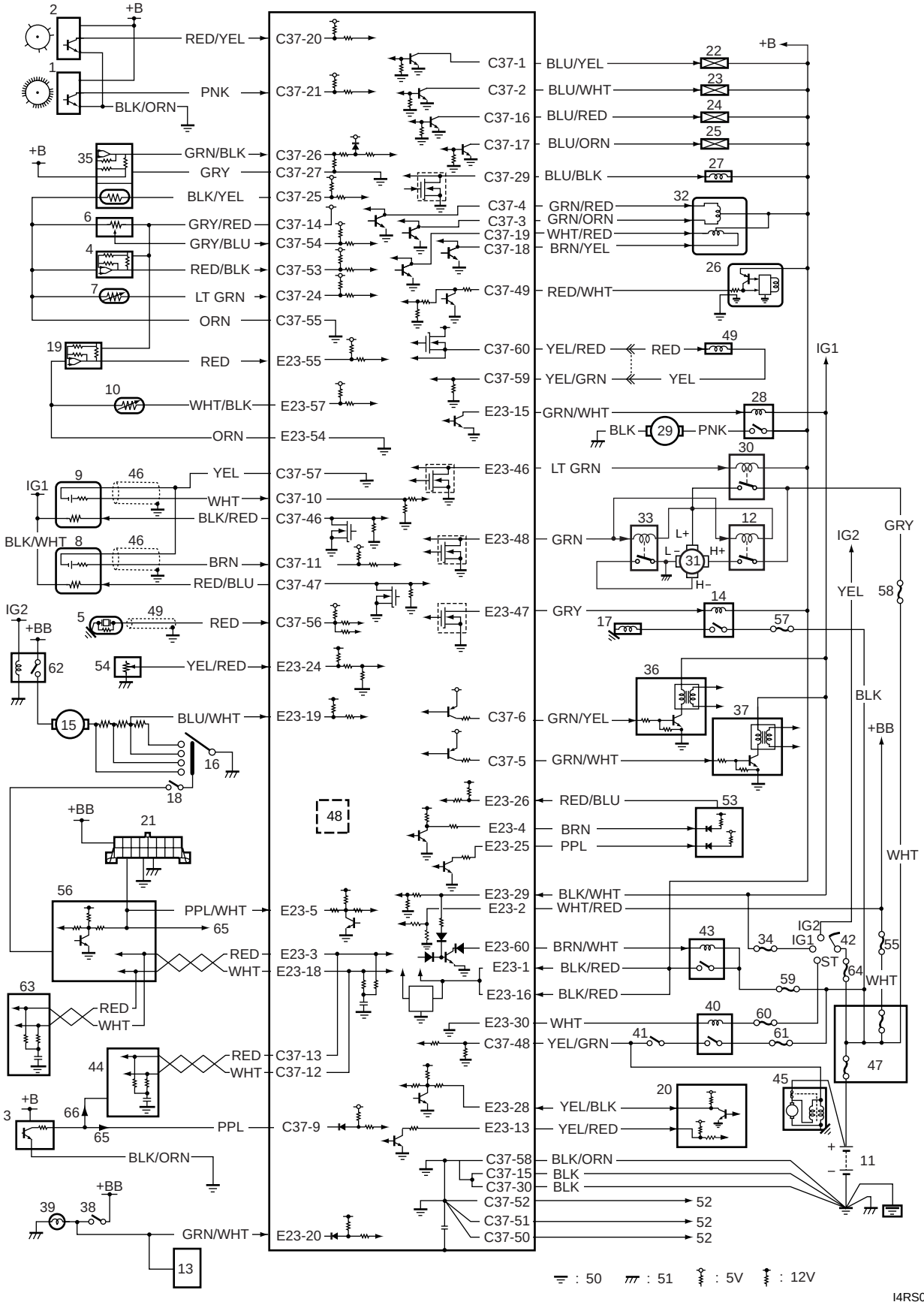
Especially, ECM (Engine Control Module), BCM (Body electrical Control Module), combination meter and TCM (Transmission Control Module (For A/T vehicle only)) intercommunicate by means of CAN (Controller Area Network) communication.

Engine and Emission Control System Flow Diagram



I4RS0A110006-

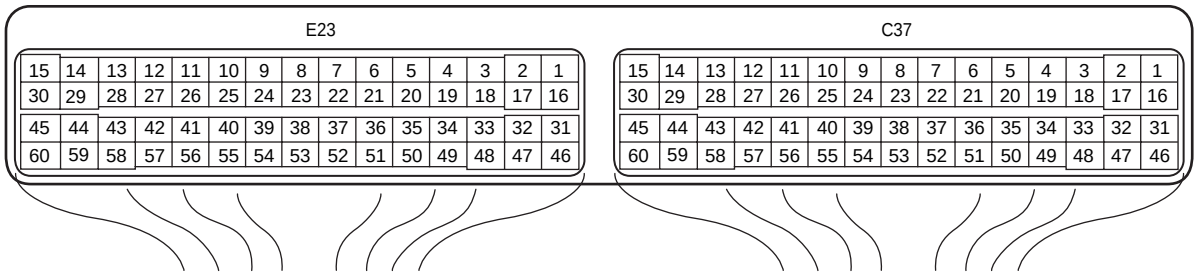
ECM Input / Output Circuit Diagram



1. CKP sensor	23. Injector No.2	45. Starting motor
2. CMP sensor	24. Injector No.3	46. Shield wire
3. VSS	25. Injector No.4	47. Main fuse box

4. MAP sensor	26. IAC valve	48. Barometric pressure sensor
5. Knock sensor	27. EVAP canister purge valve	49. Oil control valve (Camshaft position control)
6. TP sensor	28. Fuel pump relay	50. Engine ground
7. ECT sensor	29. Fuel pump	51. Body ground
8. Heated oxygen sensor-2	30. Radiator cooling fan relay No.1	52. Shield ground
9. Heated oxygen sensor-1	31. Radiator cooling fan motor	53. EPS control module
10. A/C evaporator outlet air temp. sensor	32. EGR valve	54. Fuel level sensor
11. Battery	33. Radiator cooling fan relay No.3	55. “RADIO” fuse
12. Radiator cooling fan relay No.2	34. “IG COIL” fuse	56. BCM
13. ABS control module	35. MAF and IAT sensor	57. “A/C COMP” fuse
14. A/C compressor relay	36. Ignition coil assembly (for No.1 and No.4 spark plugs)	58. “RDTR FAN” fuse
15. Blower motor	37. Ignition coil assembly (for No.2 and No.3 spark plugs)	59. “FI” fuse
16. Blower speed selector	38. Stop lamp switch	60. “ST SIG” fuse
17. Magnet clutch of compressor	39. Stop lamp	61. “ST MOT” fuse
18. A/C switch	40. Starting motor control relay	62. Blower motor relay
19. A/C refrigerant pressure sensor	41. Transmission range switch (A/T)	63. Combination meter
20. Immobilizer coil antenna	42. Ignition switch	64. “IG ACC” fuse
21. Data link connector	43. Main relay	65. Only for M/T vehicle
22. Injector No.1	44. TCM (A/T)	66. Only for A/T vehicle

Terminal Arrangement of ECM Coupler (Viewed from Harness Side)



I4RS0A110008-

Connector: C37

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLU/YEL	Fuel injector No.1 output	31	—	—
2	BLU/WHT	Fuel injector No.2 output	32	—	—
3	GRN/ORN	EGR valve (stepper motor coil 2) output	33	—	—
4	GRN/RED	EGR valve (stepper motor coil 1) output	34	—	—
5	GRN/WHT	Ignition coil No.2 and No.3 output	35	—	—
6	GRN/YEL	Ignition coil No.1 and No.4 output	36	—	—
7	—	—	37	—	—
8	—	—	38	—	—
9	PPL	Vehicle speed sensor signal (M/T)	39	—	—
10	WHT	Oxygen signal of heated oxygen sensor-1	40	—	—
11	BRN	Oxygen signal of heated oxygen sensor-2	41	—	—
12	WHT	CAN (low) communication line (active low signal) to TCM	42	—	—
13	RED	CAN (high) communication line (active high signal) to TCM	43	—	—
14	GRY/RED	Output of 5 V power source for TP sensor, MAP sensor, A/C refrigerant pressure sensor	44	—	—
15	BLK	Ground for ECM	45	—	—

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
16	BLU/RED	Fuel injector No.3 output	46	BLK/RED	Heater output of heated oxygen sensor-1
17	BLU/ORN	Fuel injector No.4 output	47	RED/BLU	Heater output of heated oxygen sensor-2
18	BRN/YEL	EGR valve (stepper motor coil 4) output	48	YEL/GRN	Starting motor signal
19	WHT/RED	EGR valve (stepper motor coil 3) output	49	RED/WHT	IAC valve output
20	RED/YEL	CMP sensor signal	50	—	Ground of ECM for shield wire
21	PNK	CKP sensor signal	51	—	Ground of ECM for shield wire
22	—	—	52	—	Ground of ECM for shield wire
23	—	—	53	RED/BLK	Manifold absolute pressure (MAP) sensor signal
24	LT GRN	Engine coolant temp. (ECT) sensor signal	54	GRY/BLU	Throttle position (TP) sensor signal
25	BLK/YEL	Intake air temp. (IAT) sensor signal	55	ORN	Ground for sensors
26	GRN/BLK	Mass air flow (MAF) sensor signal	56	RED	Knock sensor signal
27	GRY	Ground for MAF sensor	57	YEL	Ground for sensors
28	—	—	58	BLK/ORN	Ground for ECM
29	BLU/BLK	EVAP canister purge valve output	59	YEL/GRN	Oil control valve ground
30	BLK	Ground for ECM	60	YEL/RED	Oil control valve output

Connector: E23

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLK/RED	Main power supply	31	—	—
2	WHT/RED	Power source for ECM internal memory	32	—	—
3	RED	CAN communication line (active high signal) for BCM, combination meter	33	—	—
4	BRN	Engine revolution signal output for EPS control module	34	—	—
5	PPL/WHT	Serial communication line of data link connector 12 V	35	—	—
6	—	—	36	—	—
7	—	—	37	—	—
8	—	—	38	—	—
9	—	—	39	—	—
10	—	—	40	—	—
11	—	—	41	—	—
12	—	—	42	—	—
13	YEL/RED	Clock signal for immobilizer coil antenna	43	—	—
14	—	—	44	—	—
15	GRN/WHT	Fuel pump relay output	45	—	—
16	BLK/RED	Main power supply	46	LT GRN	Radiator cooling fan relay No.1 output
17	—	—	47	GRY	A/C compressor relay output
18	WHT	CAN communication line (active low signal) for BCM, combination meter	48	GRN	Radiator cooling fan relay No.2 and No.3 output
19	BLU/WHT	Electric load signal for heater blower motor	49	—	—
20	GRN/WHT	Stop lamp switch signal	50	—	—
21	—	—	51	—	—
22	—	—	52	—	—

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
23	—	—	53	—	—
24	YEL/RED	Fuel level sensor signal	54	ORN	Ground for sensors
25	PPL	Vehicle speed signal output for EPS control module	55	RED	A/C refrigerant pressure sensor signal
26	RED/BLU	EPS signal	56	—	—
27	—	—	57	WHT/BLK	A/C evaporator outlet air temp. sensor signal
28	YEL/BLK	Serial communication line for immobilizer coil antenna	58	—	—
29	BLK/WHT	Ignition switch signal	59	—	—
30	WHT	Starting motor control relay output	60	BRN/WHT	Main power supply relay output

Engine and Emission Control Input / Output Table

S4RS0A1101007

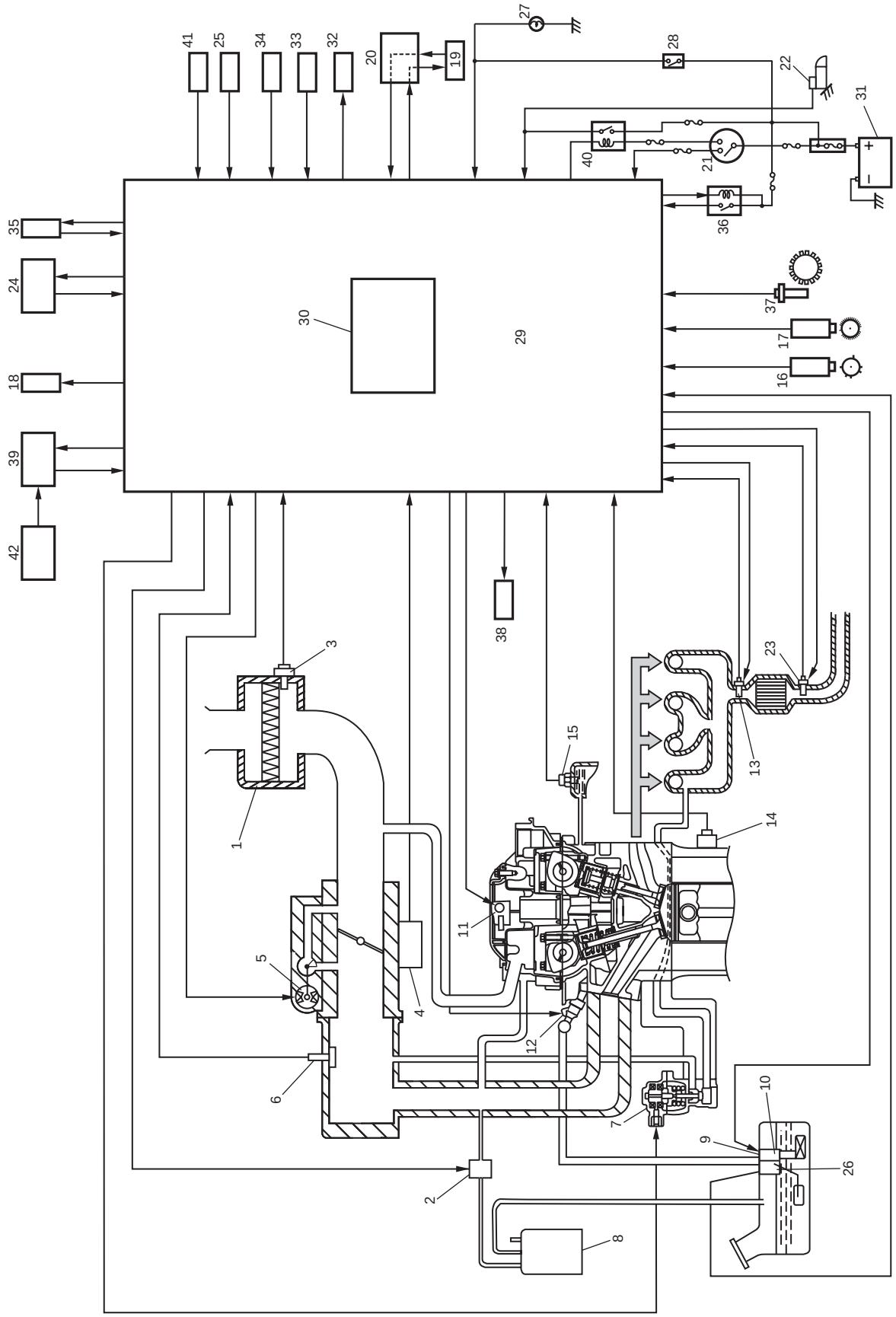
INPUT \ OUTPUT		ELECTRIC CONTROL DEVICE												
		FUEL PUMP RELAY	FUEL INJECTOR	HO2S HEATER	IAC VALVE	IGNITION COIL WITH IGNITER	EGR VALVE	EVAP CANISTER PURGE VALVE	A/C COMPRESSOR RELAY	RADIATOR FAN RELAY	MIL	MAIN RELAY	OIL CONTROL VALVE
SIGNAL FROM SENSOR, SWITCH AND CONTROL MODULE	FUEL LEVEL SENSOR	For detecting fuel level											
	BAROMETRIC PRESSURE SENSOR		○		○	○	○	○			○		
	STOP LAMP SWITCH		○		○								
	START SWITCH	○	○		○	○			○				
	IGNITION SWITCH	○	○	○	○	○	○	○	○	○	○	○	○
	A/C REFRIGERANT PRESSURE SENSOR		○		○				○	○			
	BLOWER SWITCH				○				○				
	A/C SWITCH		○		○			○	○	○			
	A/C EVAP OUTLET AIR TEMP. SENSOR		○		○				○	○			
	VSS		○	○	○	○	○	○	○	○	○		○
	HEATED OXYGEN SENSOR-1		○					○			○		
	HEATED OXYGEN SENSOR-2		○								○		
	MAF SENSOR		○	○	○	○	○	○			○		○
	IAT SENSOR		○		○	○	○	○			○		
	ECT SENSOR		○	○	○	○	○	○	○	○	○		○
	TP SENSOR		○	○	○	○	○	○	○		○		○
	MAP SENSOR		○			○	○				○		
	CMP SENSOR		○			○					○		○
	CKP SENSOR	○	○	○	○	○	○	○	○		○		○
	KNOCK SENSOR					○					○		
	ABS CONTROL MODULE				○								
	IMMOBILIZER CONTROL MODULE (IN ECM)	○	○			○					○		

I4RS0A110009-

Schematic and Routing Diagram

Engine and Emission Control System Diagram

S4RS0A1102001



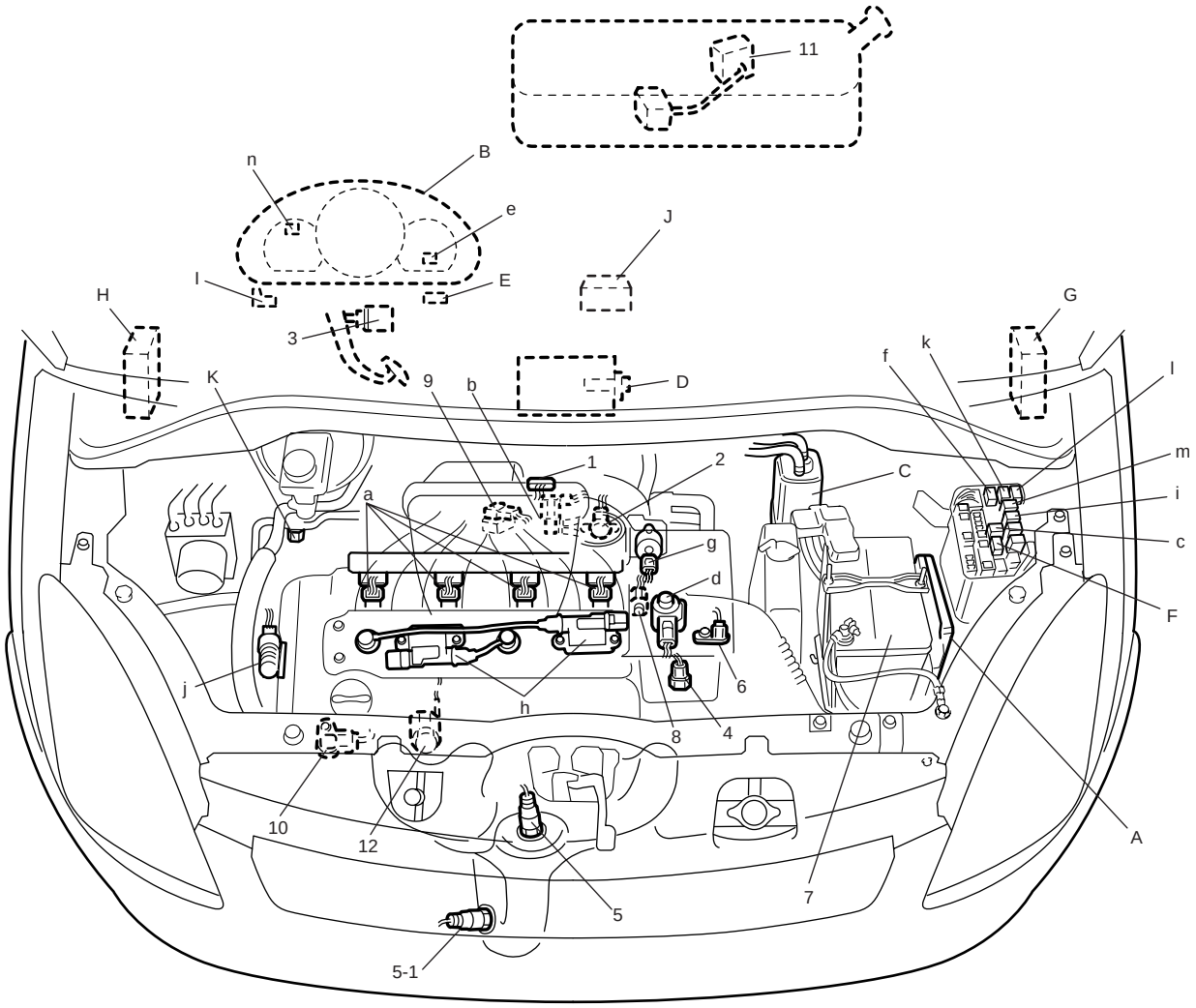
I4RS0A110011-

1. Air cleaner	15. ECT sensor	29. ECM
2. EVAP canister purge valve	16. CMP sensor	30. Barometric pressure sensor
3. MAF and IAT sensor	17. CKP sensor	31. Battery
4. TP sensor	18. Radiator cooling fan	32. A/C compressor relay
5. IAC valve	19. Combination meter	33. A/C switch
6. MAP sensor	20. BCM	34. A/C evaporator outlet air temp. sensor
7. EGR valve	21. Ignition switch	35. Immobilizer coil antenna
8. EVAP canister	22. Starter magnetic switch	36. Main relay
9. Tank pressure control valve (built-in fuel pump)	23. Heated oxygen sensor (HO2S)-2	37. VSS (M/T)
10. Fuel pump (with pressure regulator)	24. DLC	38. Oil control valve
11. Ignition coil assembly	25. Electric load	39. TCM (A/T)
12. Fuel injector	26. Fuel level sensor	40. Starting motor control relay
13. Heated oxygen sensor (HO2S)-1	27. Stop lamp	41. A/C refrigerant pressure sensor
14. Knock sensor	28. Stop lamp switch	42. Output shaft speed (VSS) sensor

Component Location

Electronic Control System Components Location

S4RS0A1103001



I4RS0A110010-

Information sensors	Control devices	Others
1. MAF and IAT sensor	a: Fuel injector	A: ECM
2. TP sensor	b: EVAP canister purge valve	B: Combination meter
3. Stop lamp switch	c: Fuel pump relay	C: EVAP canister
4. ECT sensor	d: EGR valve	D: A/C evaporator outlet air temp. sensor
5. Heated oxygen sensor-1	e: Malfunction indicator lamp	E: Data link connector
5-1. Heated oxygen sensor-2	f: Radiator cooling fan relay No.1	F: A/C compressor relay

Information sensors	Control devices	Others
6. VSS	g: IAC valve	G: TCM (A/T)
7. Battery	h: Ignition coil assembly (with ignitor)	H: BCM (included in junction block assembly)
8. CMP sensor	i: Main relay	I: Immobilizer coil antenna
9. MAP sensor	j: Oil control valve	J: EPS control module
10. CKP sensor	k: Radiator cooling fan relay No.2	K: A/C refrigerant pressure sensor
11. Fuel level sensor	l: Radiator cooling fan relay No.3	
12. Knock sensor	m: Starting motor control relay	
	n: Immobilizer indicator lamp	

Diagnostic Information and Procedures

Engine and Emission Control System Check

S4RS0A1104001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis referring to “Customer Complaint Analysis”. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	☞ **DTC / Freeze frame data check, record and clearance** 1) Check for DTC (including pending DTC) referring to “DTC / Freeze Frame Data Check, Record and Clearance”. *Is there any DTC(s)?*	Print DTC and freeze frame data or write them down and clear them by referring to “DTC Clearance: ”, and go to Step 3.	Go to Step 4.
3	☞ **Visual inspection** 1) Perform visual inspection referring to “Visual Inspection”. *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 11.	Go to Step 5.
4	☞ **Visual inspection** 1) Perform visual inspection referring to “Visual Inspection”. *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 11.	Go to Step 8.
5	☞ **Trouble symptom confirmation** 1) Confirm trouble symptom referring to “Trouble Symptom Confirmation”. *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	☞ **Rechecking and record of DTC / Freeze frame data** 1) Recheck for DTC and freeze frame data referring to “DTC Check: ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 8.
7	☞ **Rechecking and record of DTC / Freeze frame data** 1) Recheck for DTC and freeze frame data referring to “DTC Check: ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	☞ **Engine basic inspection and engine symptom diagnosis** 1) Check and repair according to “Engine Basic Inspection: ” and “Engine Symptom Diagnosis: ”. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.
9	☞ **Troubleshooting for DTC** 1) Check and repair according to applicable DTC diag. flow. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.

Step	Action	Yes	No
10	☞ **Intermittent problems check** 1) Check for intermittent problems referring to “Intermittent Problems Check”. *Is there any faulty condition?*	Repair or replace malfunction part(s), and go to Step 11.	Go to Step 11.
11	☞ **Final confirmation test** 1) Clear DTC if any. 2) Perform final confirmation test referring to “Final Confirmation Test”. *Is there any problem symptom, DTC or abnormal condition?*	Go to Step 6.	End.

Step 1: Customer Complaint Analysis
Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of such an inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

PROBLEM SYMPTOMS	
☐ **Difficult Starting** ☐ No cranking ☐ No initial combustion ☐ No combustion ☐ Poor starting at (☐cold ☐warm ☐always) ☐ Other_____	☐ **Poor Driveability** ☐ Hesitation on acceleration ☐ Back fire/☐After fire ☐ Lack of power ☐ Surging ☐ abnormal knocking ☐ Other_____
☐ **Poor Idling** ☐ Poor fast idle ☐ Abnormal idling speed (☐High ☐Low) (r/min.) ☐ Unstable ☐ Hunting (r/min. to r/min.) ☐ Other_____	☐ **Engine Stall when** ☐ Immediately after start ☐ Accel. pedal is depressed ☐ Accel. pedal is released ☐ Load is applied ☐ A/C ☐Electric load ☐P/S ☐ Other_____ ☐ Other_____
☐ OTHERS:	

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather Temperature Frequency Road	☐Fair ☐Cloudy ☐Rain ☐Snow ☐Always ☐Other_____ ☐Hot ☐Warm ☐Cool ☐Cold (°F/ °C) ☐Always ☐Always ☐Sometimes (times/ day, month) ☐Only once ☐Under certain condition ☐Urban ☐Suburb ☐Highway ☐Mountainous (☐Uphill ☐Downhill) ☐Tarmacadam ☐Gravel ☐Other_____
Vehicle Condition	
Engine condition	☐Cold ☐Warming up phase ☐Warmed up ☐Always ☐Other at starting ☐Immediately after start ☐Racing without load ☐Engine speed (r/min)
Vehicle condition	During driving: ☐Constant speed ☐Accelerating ☐Decelerating ☐Right hand corner ☐Left hand corner ☐When shifting (Lever position) ☐At stop ☐Vehicle speed when problem occurs (km/h, Mile/h) ☐Other

Malfunction indicator lamp condition	☐Always ON ☐Sometimes ON ☐Always OFF ☐Good condition	
Diagnostic trouble code	First check:	☐No code ☐Malfunction code ( )
	Second check:	☐No code ☐Malfunction code ( )

I2RH01110010-

NOTE:

The form is a standard sample. It should be modified according to conditions characteristic of each market.

Step 2: DTC / Freeze Frame Data Check, Record and Clearance
First, check DTC (including pending DTC), referring to "DTC Check: ". If DTC is indicated, print it and freeze frame data or write them down and then clear them by referring to "DTC Clearance: ". DTC indicates malfunction that occurred in the system but does not indicate whether it exists now or it occurred in the past and the normal condition has been restored now. To check which case applies, check the symptom in question according to Step 5 and recheck DTC according to Step 6 and 7.
Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC in this step will lead to incorrect diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting.

Step 3 and 4: Visual Inspection
As a preliminary step, be sure to perform visual check of the items that support proper function of the engine referring to "Visual Inspection: ".

Step 5: Trouble Symptom Confirmation
Based on information obtained in "Step 1: Customer Complaint Analysis: " and "Step 2: DTC / Freeze Frame Data Check, Record and Clearance: ", confirm trouble symptoms. Also, reconfirm DTC according to "DTC Confirmation Procedure" described in each DTC diag. flow.

Step 6 and 7: Rechecking and Record of DTC / Freeze Frame Data
Refer to "DTC Check: " for checking procedure.

Step 8: Engine Basic Inspection and Engine Symptom Diagnosis
Perform basic engine check according to "Engine Basic Inspection: " first. When the end of the flow has been reached, check the parts of the system suspected as a possible cause referring to "Engine Symptom Diagnosis: " and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or basic engine check) and repair or replace faulty parts, if any.

Step 9: Troubleshooting for DTC (See each DTC Diag. Flow)
Based on the DTC indicated in Step 6 or 7 and referring to the applicable DTC diag. flow, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ECM or other part and repair or replace faulty parts.

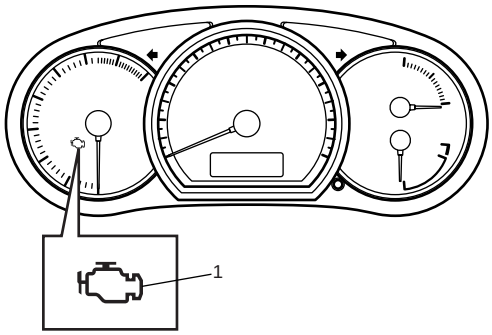
Step 10: Intermittent Problems Check
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to "Intermittent and Poor Connection Inspection: in Section 00" and related circuit of DTC recorded in Step 2.

Step 11: Final Confirmation Test
Confirm that the problem symptom has gone and the engine is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once, perform DTC confirmation procedure and confirm that no DTC is indicated.

Malfunction Indicator Lamp (MIL) Check

S4RS0A1104002

1) Turn ON ignition switch (with engine at stop) and check that MIL (1) lights.
   If MIL does not light up (or MIL dims), go to "Malfunction Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started): " for troubleshooting.
   If MIL does not light with ignition switch ON and engine does not start though it is cranked up, go to "ECM Power and Ground Circuit Check: ".
2) Start engine and check that MIL turns OFF.
   If MIL remains ON and no DTC is stored in ECM, go to "Malfunction Indicator Lamp Remains ON after Engine Starts: " for troubleshooting.



I4RS0A110012-

DTC Check

S4RS0A1104003

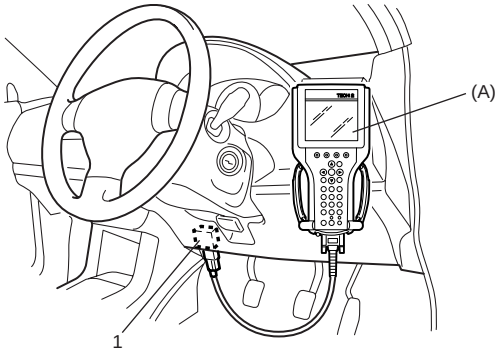
NOTE:

The MIL is turned on when the ECM and/or TCM detect malfunction(s). Each ECM and TCM stores diagnostic information as the diagnostic trouble code (DTC) in its memory and outputs the DTC to the scan tool. Therefore, check both of the ECM and TCM for any DTC with the scan tool because the DTC stored in ECM and TCM is not read and displayed at a time. However, each of the ECM and TCM needs not to be checked with the generic scan tool because the DTC stored in ECM and TCM is read and displayed at a time.

1) Prepare OBD generic scan tool or SUZUKI scan tool.

2) With ignition switch turned OFF, connect it to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0A110013-

3) Turn ignition switch ON and confirm that MIL lights.
4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print them or write them down. Refer to scan tool operator's manual for further details.
If communication between scan tool and ECM is not possible, check if scan tool is communicable by connecting it to ECM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible. If OK, check that power supply and ground circuits of ECM and DLC are in good condition referring to "ECM Power and Ground Circuit Check: ".
5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector.

DTC Clearance

S4RS0A1104004

1) Connect OBD generic scan tool or SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch OFF and then ON.
3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.

NOTE:

DTC and freeze frame data stored in ECM memory are also cleared in the following cases. Be careful not to clear them before keeping their record.

- **When power to ECM is cut off (by disconnecting battery cable, removing fuse or disconnecting ECM connectors).**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles. (See "Warm-Up Cycle" of "On-Board Diagnostic System Description: ".)**

DTC Table

S4RS0A1104005

NOTE:

- **With the generic scan tool, only star (*) marked DTC No. in the following table can be read.**
- **1 driving cycle: MIL lights up when DTC is detected during 1 driving cycle.**
- **2 driving cycles: MIL lights up when the same DTC is detected also in the next driving cycle after DTC is detected and stored temporarily in the first driving cycle.**
- ***2 driving cycles:**
  MIL blinks or lights up. Refer to "DTC P0300 / P0301 / P0302 / P0303 / P0304: Random Misfire Detected / Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Misfire Detected: " for details.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0010	Camshaft position actuator circuit	Oil control valve circuit open or short.	1 driving cycle
☞ *P0011	Camshaft position – timing over-advanced or system performance	Actual value of advanced valve timing does not reach target value, or valve timing is advanced although ECM command is most retarding.	2 driving cycles
☞ *P0012	Camshaft position – timing over-retarded		2 driving cycles
☞ *P0031	HO2S heater control circuit low (Sensor-1)	Heater current is less than specification while heater ON.	2 driving cycles
☞ *P0032	HO2S heater control circuit high (Sensor-1)	Heater current is more than specification while heater ON.	2 driving cycles

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0037	HO2S heater control circuit low (Sensor-2)	Heater current is less than specification while heater ON.	2 driving cycles
☞ *P0038	HO2S heater control circuit high (Sensor-2)	Heater current is more than specification while heater ON.	2 driving cycles
☞ *P0101	Mass air flow circuit range/ performance	MAF sensor volume is more than specification or less than specification.	2 driving cycles
☞ *P0102	Mass air flow circuit low input	Output voltage of MAF sensor is less than specification.	1 driving cycle
☞ *P0103	Mass air flow circuit high input	Output voltage of MAF sensor is more than specification.	1 driving cycle
☞ *P0106	Manifold absolute pressure circuit range/performance	Difference between Max. manifold absolute pressure value and Min. manifold pressure value is less than specification or difference between barometric pressure value and manifold pressure value is less than specification	2 driving cycles
☞ *P0107	Manifold absolute pressure circuit low input	Output voltage of MAP sensor is less than specification.	1 driving cycle
☞ *P0108	Manifold absolute pressure circuit high input	Output voltage of MAP sensor is more than specification.	1 driving cycle
☞ *P0111	Intake air temperature sensor circuit range/performance	Variation of intake air temperature from engine start is less than specification.	2 driving cycles
☞ *P0112	Intake air temperature sensor circuit low	Circuit voltage of IAT sensor is less than specification.	1 driving cycle
☞ *P0113	Intake air temperature sensor circuit high	Circuit voltage of IAT sensor is more than specification.	1 driving cycle
☞ *P0116	Engine coolant temperature circuit range/performance	Engine coolant temperature is less than specified temperature for specified time from engine start.	2 driving cycles
☞ *P0117	Engine coolant temperature circuit low	Circuit voltage of ECT sensor is less than specification.	1 driving cycle
☞ *P0118	Engine coolant temperature circuit high	Circuit voltage of ECT sensor is more than specification.	1 driving cycle
☞ *P0121	Throttle position sensor circuit range/performance	Difference between actual throttle opening and opening calculated by ECM is out of specification.	2 driving cycles
☞ *P0122	Throttle position sensor circuit low	Output voltage of TP sensor is less than specification.	1 driving cycle
☞ *P0123	Throttle position sensor circuit high	Output voltage of TP sensor is more than specification.	1 driving cycle
☞ *P0131	O2 sensor (HO2S) circuit low voltage (Sensor-1)	Max. output voltage of HO2S-1 is less than specification.	2 driving cycles
☞ *P0132	O2 sensor (HO2S) circuit high voltage (Sensor-1)	Min. output voltage of HO2S-1 is more than specification.	2 driving cycles
☞ *P0133	O2 sensor (HO2S) circuit slow response (Sensor-1)	Response time of HO2S-1 output voltage between rich and lean is longer than specification.	2 driving cycles
☞ *P0134	O2 sensor (HO2S) circuit no activity detected (Sensor-1)	Output voltage of HO2S-1 is more than specification or less than specification. (or HO2S-1 circuit open or short)	2 driving cycles
☞ *P0137	O2 sensor (HO2S) circuit low voltage (Sensor-2)	Output voltage of HO2S-2 is less than specification while engine is idling after driving with high engine load and Max. output voltage of HO2S-2 minus Min. output voltage of HO2S-2 is less than specification.	2 driving cycles
☞ *P0138	O2 sensor (HO2S) circuit high voltage (Sensor-2)	Output voltage of HO2S-2 is more than specification while engine is idling after driving with high engine load and Max. output voltage of HO2S-2 minus Min. output voltage of HO2S-2 is less than specification.	2 driving cycles
☞ *P0140	O2 sensor (HO2S) circuit no activity detected (Sensor-2)	Output voltage of HO2S-2 is more than specification after warming up engine.	2 driving cycles
☞ *P0171	System too lean	Total fuel trim is larger than specification for specified time or longer. (Fuel trim toward rich side is large.)	2 driving cycles

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0172	System too rich	Total fuel trim is smaller than specification for specified time or longer. (Fuel trim toward lean side is large.)	2 driving cycles
☞ *P0300	Random misfire detected	Misfire of such level as to cause damage to three way catalyst.	*2 driving cycles
☞ *P0301 *P0302 *P0303 *P0304	Cylinder 1 misfire detected Cylinder 2 misfire detected Cylinder 3 misfire detected Cylinder 4 misfire detected	Misfire of such level as to deteriorate emission but not to cause damage to three way catalyst.	*2 driving cycles
☞ *P0327	Knock sensor circuit low	Output voltage of knock sensor is less than specification.	1 driving cycle
☞ *P0328	Knock sensor circuit high	Output voltage of knock sensor is more than specification.	1 driving cycle
☞ *P0335	Crankshaft position sensor circuit	No signal of CKP sensor for specified time even if starting motor signal is input.	1 driving cycle
☞ *P0340	Camshaft position sensor circuit	CMP sensor pulse is out of specification.	1 driving cycle
☞ *P0401	Exhaust gas recirculation flow detected as insufficient	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is less than specification.	2 driving cycles
☞ *P0402	Exhaust gas recirculation flow detected as excessive	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is more than specification.	2 driving cycles
☞ *P0403	Exhaust gas recirculation control circuit	Output voltage is different from output command with more than one pole out of 4 poles.	1 driving cycle
☞ *P0420	Catalyst system efficiency below threshold	Output waveforms of HO2S-1 and HO2S-2 are similar.	2 driving cycles
☞ *P0443	Evaporative emission system purge control valve circuit	Monitor signal of EVAP canister purge valve is different from command signal. (circuit open or shorted to ground)	2 driving cycles
☞ P0462	Fuel level sensor circuit low	Circuit voltage of fuel level sensor is less than specification.	—
☞ P0463	Fuel level sensor circuit high	Circuit voltage of fuel level sensor is more than specification.	—
☞ *P0480	Fan 1 (Radiator cooling fan) control circuit	Monitor signal of radiator cooling fan relay is different from command signal.	1 driving cycle
☞ *P0500	Vehicle speed sensor (VSS) malfunction	No VSS signal during fuel cut for specified time or longer, or VSS signal is not input even if vehicle is driving with more than specified engine speed and D-range (A/T).	2 driving cycles
☞ *P0505	Idle air control system	IAC control duty pulse is not detected in its monitor signal.	2 driving cycles
☞ P0532	A/C refrigerant pressure sensor circuit low	Output voltage of A/C refrigerant pressure sensor is less than specification.	—
☞ P0533	A/C refrigerant pressure sensor circuit high	Output voltage of A/C refrigerant pressure sensor is more than specification.	—
☞ *P0601	Internal control module memory check sum error	Data write error or check sum error.	1 driving cycle
☞ P0602	Control module programming error	Data programming error.	1 driving cycle
☞ *P0616	Starter relay circuit low	Starter signal is low voltage even though engine is started with vehicle at stop.	2 driving cycles
☞ *P0617	Starter relay circuit high	Starter signal is high voltage for specified time while engine is running.	2 driving cycles
☞ *P1510	ECM backup power supply malfunction	Backup power voltage is out of specification after starting engine.	1 driving cycle
☞ *P1603	TCM trouble code detected	When ECM receives a trouble code from TCM, which indicates that some problem occurred in sensor circuits and its calculated values used for operations such as idle speed control, engine power control and so on by TCM, this DTC is detected by ECM.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P1674	CAN communication (buss off error)	Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	1 driving cycle
☞ *P1675	CAN communication (transmission error)	Transmission error of communication data for ECM is detected for longer than specified time continuously.	1 driving cycle
☞ *P1676	CAN communication (reception error for TCM)	Reception error of communication data for TCM is detected for longer than specified time continuously.	1 driving cycle
☞ P1678	CAN communication (reception error for BCM)	Reception error of communication data for BCM is detected for longer than specified time continuously.	—
☞ *P2227	Barometric pressure circuit range/performance	Difference of barometric pressure value and intake manifold pressure value is more than specification at engine start.	2 driving cycles
☞ *P2228	Barometric pressure circuit low	Barometric pressure sensor voltage is less than specification.	1 driving cycle
☞ *P2229	Barometric pressure circuit high	Barometric pressure sensor voltage is more than specification.	1 driving cycle
P1614	Transponder response error	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle
P1621	Immobilizer communication error	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle
P1622	EEPROM error	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle
P1623	Unregistered transponder	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle
P1625	Immobilizer antenna error	Refer to “Diagnostic Trouble Code (DTC) Table: in Section 10C”.	1 driving cycle

For Vehicle Equipped with A/T

When using OBD generic scan tool, not only the previous star (*) marked ECM DTC(s) but also the following DTC(s) is displayed on OBD generic scan tool simultaneously.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)
*P0705	Transmission range sensor circuit malfunction (PRNDL input)	Refer to “DTC Table: in Section 5A”.
*P0707	Transmission range sensor circuit low	
*P0712	Transmission fluid temperature sensor circuit low	
*P0713	Transmission fluid temperature sensor circuit high	
*P0717	Input / Turbine speed sensor circuit no signal	
*P0722	Output speed sensor circuit no signal	
*P0741	Torque converter clutch circuit performance or stuck off	
*P0742	Torque converter clutch circuit stuck on	
*P0751	Shift solenoid-A (No.1) performance or stuck off	
*P0752	Shift solenoid-A (No.1) stuck on	
*P0756	Shift solenoid-B (No.2) performance or stuck off	
*P0757	Shift solenoid-B (No.2) stuck on	
*P0787	Shift / Timing solenoid control circuit low	
*P0788	Shift / Timing solenoid control circuit high	
*P0962	Pressure control solenoid control circuit low	
*P0963	Pressure control solenoid control circuit high	
*P0973	Shift solenoid-A (No.1) control circuit low	
*P0974	Shift solenoid-A (No.1) control circuit high	
*P0976	Shift solenoid-B (No.2) control circuit low	
*P0977	Shift solenoid-B (No.2) control circuit high	
*P1702	Internal control module memory check sum error	
*P1774	Control module communication bus off	
*P1775	High speed can communication bus (Transmission error)	
*P1777	TCM lost communication with ECM (Reception error)	
*P2763	Torque converter clutch pressure control solenoid control circuit high	
*P2764	Torque converter clutch pressure control solenoid control circuit low	

Fail-Safe Table

S4RS0A1104006

When any of the following DTCs is detected, ECM enters fail-safe mode as long as malfunction continues to exist but that mode is canceled when ECM detects normal condition after that.

DTC No.	Detected item	Fail-safe operation
☞ P0102	Mass air flow circuit low input	• ECM controls injector drive time (fuel injection volume) according to throttle valve opening (closed throttle position or not). • ECM stops EGR control.
☞ P0103	Mass air flow circuit high input	
☞ P0112	Intake air temperature sensor circuit low	ECM controls actuators assuming that intake air temperature is 20 °C (68 °F).
☞ P0113	Intake air temperature sensor circuit high	
☞ P0117	Engine coolant temperature circuit low	• ECM controls actuators assuming that engine coolant temperature is 80 °C (176 °F). • ECM operates radiator cooling fan.
☞ P0118	Engine coolant temperature circuit high	
☞ P0122	Throttle position sensor circuit low input	ECM controls actuators assuming that throttle opening is about 20°.
☞ P0123	Throttle position sensor circuit high input	
☞ P0335	Crankshaft position sensor circuit	• Ignition timing is fixed. • ECM changes injection control system from sequential injection to simultaneous one.
☞ P0340	Camshaft position sensor circuit	ECM changes injection control system from sequential injection to simultaneous one.
☞ P0500	Vehicle speed sensor	• ECM controls actuators assuming that vehicle speed is 0 km/h (0 mile/h). • ECM stops IAC feedback control.
☞ P2227	Barometric pressure sensor performance problem	ECM controls actuators assuming that barometric pressure is 101.33 kPa (762 mmHg).

Scan Tool Data

S4RS0A1104007

As the data values are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.
Also, conditions that can be checked by the scan tool are those detected by ECM and output from ECM as commands and there may be cases where the engine or actuator is not operating (in the condition) as indicated by the scan tool. Be sure to use the timing light to check the ignition timing.

NOTE:

- **With the generic scan tool, only star (*) marked data in the following table can be read.**
- **When checking the data with the engine running at idle or racing, be sure to shift M/T gear to the neutral gear position and A/T gear to the "Park" position and pull the parking brake fully. Also, if nothing or "no load" is indicated, turn OFF A/C, all electric loads, P/S and all the other necessary switches.**

	Scan tool data	Vehicle condition	Normal condition / reference values
*	☞ COOLANT TEMP (ENGINE COOLANT TEMP.)	At specified idle speed after warming up	80 – 100 °C, 176 – 212 °F
*	☞ INTAKE AIR TEMP.	At specified idle speed after warming up	–5 °C (23 °F) + environmental temp. to 40 °C (104 °F) + environmental temp.
*	☞ ENGINE SPEED	It idling with no load after warming up	Desired idle speed ± 50 r/min.
	☞ INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH)	At specified idle speed with no load after warming up	2.0 – 4.0 msec.
		At 2500 r/min. with no load after warming up	2.0 – 3.6 msec.

	Scan tool data	Vehicle condition		Normal condition / reference values
	☞ TP SENSOR VOLT (THROTTLE POSITION SENSOR OUTPUT VOLTAGE)	Ignition switch ON / warmed up engine stopped	Accelerator pedal released	0.5 – 1.0 V
			Accelerator pedal depressed fully	Less than 4.8 V
	☞ DESIRED IDLE (DESIRED IDLE SPEED)	It idling with radiator cooling fan stopped and all electrical parts turned OFF after warming up, M/T at neutral		700 r/min.
	☞ IAC FLOW DUTY (IDLE AIR CONTROL FLOW DUTY)	It idling with no load after warming up		5 – 55%
*	☞ SHORT FT B1 (SHORT TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
*	☞ LONG FT B1 (LONG TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
	☞ TOTAL FUEL TRIM B1	At specified idle speed after warming up		–35 – +35%
*	☞ MAF (MASS AIR FLOW RATE)	At specified idle speed with no load after warming up		1.0 – 4.0 g/s 0.14 – 0.52 lb/min.
		At 2500 r/min. with no load after warming up		4.0 – 12.0 g/s 0.53 – 1.58 lb/min.
*	☞ CALC LOAD (CALCULATED LOAD VALUE)	At specified idle speed with no load after warming up		0 – 10%
		At 2500 r/min. with no load after warming up		0 – 10%
*	☞ THROTTLE POSITION (ABSOLUTE THROTTLE POSITION)	Ignition switch ON / warmed up engine stopped	Accelerator pedal released	0 – 5%
			Accelerator pedal depressed fully	90 – 100%
*	☞ O2S B1 S1 (HEATED OXYGEN SENSOR-1)	At specified idle speed after warming up		0.1 – 0.95 V
*	☞ O2S B1 S2 (HEATED OXYGEN SENSOR-2)	At 2000 r/min. for 3 min. or longer after warming up.		0.1 – 0.95 V
*	☞ FUEL SYSTEM B1 (FUEL SYSTEM STATUS)	At specified idle speed after warming up		CLOSED (closed loop)
*	☞ MAP (INTAKE MANIFOLD ABSOLUTE PRESSURE)	At specified idle speed with no load after warming up		24 – 38 kPa, 7.1 – 11.2 in.Hg
	☞ BAROMETRIC PRESS	—		Barometric pressure is displayed
	☞ STEP EGR FLOW DUTY	At specified idle speed after warming up		0%
	☞ FUEL CUT	Engine at fuel cut condition		ON
		Engine at other than fuel cut condition		OFF

	Scan tool data	Vehicle condition		Normal condition / reference values
	☞ A/C PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE)	Engine running	A/C ON (A/C is operating) at ambient temperature: 30 °C (86 °F) and humidity: 50%	1350 – 1650 kPa For more details, refer to pressure of high pressure gage under “A/C System Performance Inspection: in Section 7B”.
			A/C OFF (A/C is not operating) at ambient temperature: 30 °C (86 °F) and engine coolant temperature: 90 – 100 °C (194 – 212 °F)	600 – 1000 kPa After longer than 10 min from A/C switch turned off
	☞ CLOSED THROTTLE POS (CLOSED THROTTLE POSITION)	Throttle valve at idle position		ON
		Throttle valve opens larger than idle position		OFF
	☞ CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY)	At specified idle speed after warming up		0%
*	☞ IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER)	At specified idle speed with no load after warming up		3 – 13° BTDC
	☞ BATTERY VOLTAGE	Ignition switch ON / engine at stop		10 – 14 V
	☞ FUEL PUMP	Within 3 seconds after ignition switch ON or engine running		ON
		Engine at stop with ignition switch ON		OFF
	☞ ELECTRIC LOAD	Ignition switch ON / Headlight, small light, all turned OFF		OFF
		Ignition switch ON / Headlight, small light, turned ON		ON
	☞ BRAKE SWITCH	Ignition switch ON	Brake pedal is released	OFF
			Brake pedal is depressed	ON
	☞ RADIATOR FAN (RADIATOR COOLING FAN CONTROL RELAY)	Ignition switch ON	Engine coolant temp.: Lower than 95 °C (203 °F)	OFF
			Engine coolant temp.: 97.5 °C (208 °F) or higher	ON
	☞ BLOWER FAN	Ignition switch ON	Blower fan switch: 2nd speed position or more	ON
			Blower fan switch: under 2nd speed position	OFF
	☞ A/C SWITCH	Engine running after warming up, A/C not operating		OFF
		Engine running after warming up, A/C operating		ON
	☞ A/C COMP RELAY	Engine running	A/C switch and blower motor switch turned ON	ON
			A/C switch and blower motor switch turned OFF	OFF
*	☞ VEHICLE SPEED	At stop		0 km/h (0 mph)
	☞ VVT GAP (TARGET-ACTUAL POSITION)	At specified idle speed after warming up		0 – 3°

Scan Tool Data Definitions

COOLANT TEMP (ENGINE COOLANT TEMPERATURE, °C, °F)
It is detected by engine coolant temp. sensor.

INTAKE AIR TEMP. (°C, °F)
It is detected by intake air temp. sensor.

ENGINE SPEED (rpm)
It is computed by reference pulses from the camshaft position sensor.

INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH, msec.)
This parameter indicates time of the injector drive (valve opening) pulse which is output from ECM (but injector drive time of NO.1 cylinder for multiport fuel injection).

TP SENSOR VOLT (THROTTLE POSITION SENSOR OUTPUT VOLTAGE, V)
The Throttle Position Sensor reading provides throttle valve opening information in the form of voltage.

DESIRED IDLE (DESIRED IDLE SPEED, rpm)
The Desired Idle Speed is an ECM internal parameter which indicates the ECM requested idle. If the engine is not running, this number is not valid.

IAC FLOW DUTY (IDLE AIR (SPEED) CONTROL DUTY, %)
This parameter indicates current flow time rate within a certain set cycle of IAC valve (valve opening rate) which controls the amount of bypass air (idle speed).

SHORT FT B1 (SHORT TERM FUEL TRIM, %)
Short term fuel trim value represents short term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

LONG FT B1 (LONG TERM FUEL TRIM, %)
Long term fuel trim value represents long term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

TOTAL FUEL TRIM B1 (%)
The value of Total Fuel Trim is obtained by calculating based on values of Short Term Fuel Trim and Long Term Fuel Trim. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

MAF (MASS AIR FLOW RATE, g/s, lb/min.)
It represents total mass of air entering intake manifold which is measured by mass air flow sensor.

CALC LOAD (CALCULATED LOAD VALUE, %)
Engine load displayed as a percentage of maximum possible load. Value is calculated mathematically using the formula: actual (current) intake air volume ÷ maximum possible intake air volume × 100%

THROTTLE POS (ABSOLUTE THROTTLE POSITION, %)
When throttle position sensor is at fully closed position, throttle opening is indicated as 0 – 5% and 90 – 100% full open position.

O2S SENSOR B1 S1 (HEATED OXYGEN SENSOR-1, V)
It indicates output voltage of HO2S-1 installed on exhaust manifold (pre-catalyst).

O2S SENSOR B1 S2 (HEATED OXYGEN SENSOR-2, V)
It indicates output voltage of HO2S-2 installed on exhaust pipe (post-catalyst). It is used to detect catalyst deterioration.

FUEL SYSTEM (FUEL SYSTEM STATUS)
Air/fuel ratio feedback loop status displayed as one of the followings.
OPEN: Open-loop has not yet satisfied conditions to go closed loop.
CLOSED: Closed-loop using oxygen sensor(s) as feedback for fuel control.
OPEN-DRIVE COND: Open-loop due to driving conditions (Power enrichment, etc.).
OPEN SYS FAULT: Open-loop due to detected system fault.

MAP (MANIFOLD ABSOLUTE PRESSURE, in.Hg, kPa)
This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.
It is detected by manifold absolute pressure sensor.

BAROMETRIC PRESS (kPa, in.Hg)
This parameter represents a measurement of barometric air pressure and is used for altitude correction of the fuel injection quantity and IAC valve control.

STEP EGR FLOW DUTY (%)
This parameter indicates opening rate of EGR valve which controls the amount of EGR flow.

FUEL CUT (ON/OFF)
ON: Fuel being cut (output signal to injector is stopped)
OFF: Fuel not being cut

A/C PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE, kPa)
This parameter indicates A/C refrigerant absolute pressure calculated by ECM.

CLOSED THROTTLE POS (CLOSED THROTTLE POSITION, ON/OFF)
This parameter reads ON when throttle valve is fully closed, or OFF when it is not fully closed.

CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY, %)
This parameter indicates valve ON (valve open) time rate within a certain set cycle of EVAP canister purge valve which controls the amount of EVAP purge.

IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER, °)
Ignition timing of No.1 cylinder is commanded by ECM. The actual ignition timing should be checked by using the timing light.

BATTERY VOLTAGE (V)
This parameter indicates battery positive voltage inputted from main relay to ECM.

FUEL PUMP (ON/OFF)
ON is displayed when ECM activates the fuel pump via the fuel pump relay switch.

ELECTRIC LOAD (ON/OFF)
ON: Headlight or small light ON signal inputted.
OFF: Above electric loads all turned OFF.

BRAKE SW (ON/OFF)
This parameter indicates the state of the brake switch.

RADIATOR COOLING FAN (RADIATOR COOLING FAN CONTROL RELAY, ON/OFF)
ON: Command for radiator cooling fan control relay operation being output.
OFF: Command for relay operation not being output.

BLOWER FAN (ON/OFF)
This parameter indicates the state of the blower fan motor switch.

A/C SWITCH (ON/OFF)
ON: Command for A/C operation being output from ECM to HVAC.
OFF: Command for A/C operation not being output.

A/C COMP RELAY (A/C COMPRESSOR RELAY, ON/OFF)
This parameter indicates the state of the A/C switch.

VEHICLE SPEED (km/h)
It is computed based on pulse signals from vehicle speed sensor.

VVT GAP (TARGET-ACTUAL POSITION, °)
It is calculated using the formula: target valve timing advance – actual valve timing advance.

Visual Inspection

S4RS0A1104008

Visually check the following parts and systems.

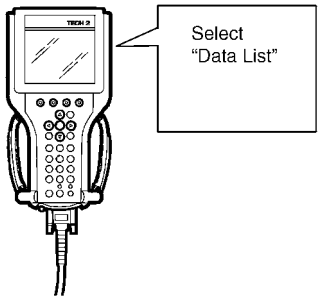
Inspection item	Reference section
• Engine oil – level, leakage	"Engine Oil and Filter Change: in Section 0B"
• Engine coolant – level, leakage	"Coolant Level Check: in Section 1F"
• Fuel – level, leakage	"Fuel Lines and Connections Inspection: in Section 0B"
• Air cleaner element – dirt, clogging	"Air Cleaner Filter Inspection: in Section 0B"
• Battery – fluid level, corrosion of terminal	"Battery Description: in Section 1J"
• Water pump belt – tension damage	"Accessory Drive Belt Inspection: in Section 0B"
• Throttle cable – play (under warm engine), installation	"Accelerator Cable Adjustment: in Section 1D"
• Vacuum hoses of air intake system – disconnection, looseness, deterioration, bend	"Vacuum Hose Inspection: in Section 1B"
• Connectors of electric wire harness – disconnection, friction	
• Fuses – burning	
• Parts – installation, bolt – looseness	
• Parts – deformation	
• Other parts that can be checked visually	
Also check the following items at engine start, if possible	
• Malfunction indicator lamp – Operation	"Malfunction Indicator Lamp (MIL) Check: "
• Charge warning lamp – Operation	"Generator Symptom Diagnosis: in Section 1J"
• Engine oil pressure warning lamp – Operation	"Oil Pressure Switch Inspection: in Section 9C"
• Engine coolant temp. meter – Operation	"Engine Coolant Temperature (ECT) Sensor Inspection: in Section 9C"
• Fuel level meter – Operation	"Fuel Level Sensor Inspection: in Section 9C"

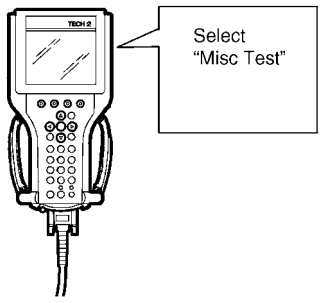
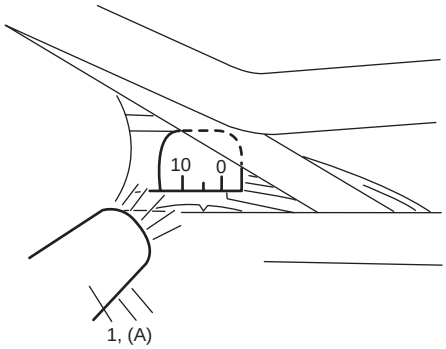
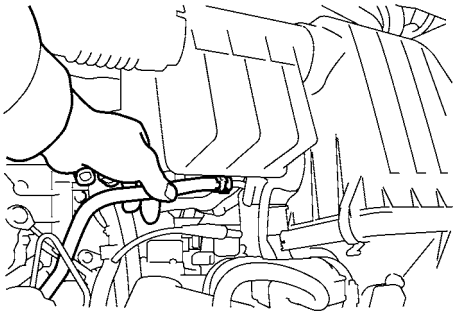
Inspection item	Reference section
• Tachometer – Operation • Abnormal air being inhaled from air intake system • Exhaust system – leakage of exhaust gas, noise • Other parts that can be checked visually	

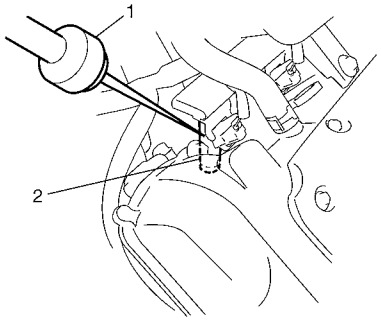
Engine Basic Inspection

S4RS0A1104009

This check is very important for troubleshooting when ECM has detected no DTC and no abnormality has been found in “Visual Inspection: ”.
Follow the flow carefully.

Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.
2	**Check battery voltage** *Is it 11 V or more?*	Go to Step 3.	Charge or replace battery.
3	*Is engine cranked?*	Go to Step 4.	Go to “Cranking System Symptom Diagnosis: in Section 1I”.
4	*Does engine start?*	Go to Step 5.	Go to Step 7.
5	**Check idle speed** 1) Warm up engine to normal operating temperature. 2) Shift transmission to neutral position for M/T (“P” position for A/T). 3) Make sure that a electrical loads are switched off. 4) Check engine idle speed with scan tool.  I2RH01110005- *Is it 650 – 750 r/min.?*	Go to Step 6.	Go to “Engine Symptom Diagnosis: ”.

Step	Action	Yes	No
6	**Check ignition timing** 1) Using SUZUKI scan tool, select “Misc Test” mode on SUZUKI scan tool and fix ignition timing to initial one.  I2RH01110006- 2) Using timing light, check initial ignition timing. **Special tool** **(A): 09930–76420**  I3RB0A180004- *Is it 5 °±3 °BTDC at specified idle speed?*	Go to “Engine Symptom Diagnosis: ”.	Check ignition control related parts referring to “Ignition Timing Inspection: in Section 1H”.
7	**Check immobilizer system malfunction** 1) Check immobilizer indicator lamp for flashing. *Is it flashing when ignition switch is turned to ON position?*	Go to “Diagnostic Trouble Code (DTC) Check: in Section 10C”.	Go to Step 8.
8	**Check fuel supply** 1) Check to make sure that enough fuel is filled in fuel tank. 2) Turn ON ignition switch for 3 seconds and then OFF. Repeat this a few times. *Is fuel pressure felt from fuel feed hose when ignition switch is turned ON?*  I3RM0A110014-	Go to Step 10.	Go to Step 9.

Step	Action	Yes	No
9	**Check fuel pump for operation** *Was fuel pump operating sound heard from fuel filler for about 3 seconds after ignition switch ON and stop?*	Go to “Fuel Pressure Check: ”.	Go to “Fuel Pump and Its Circuit Check: ”.
10	**Check ignition spark** 1) Disconnect injector couplers. 2) Remove spark plugs and connect them to high-tension cords or ignition coil assembly. 3) Ground spark plugs. 4) Crank engine and check if each spark plug sparks. *Is it in good condition?*	Go to Step 11.	Go to “Ignition Spark Test: in Section 1H”.
11	**Check fuel injector for operation** 1) Install spark plugs and connect injector connectors. 2) Using sound scope (1), check operating sound of each injector (2) when cranking engine.  I3RM0A110015- *Was injector operating sound heard from all injectors?*	Go to “Engine Symptom Diagnosis: ”.	Go to “Fuel Injector Circuit Check: ”.

Engine Symptom Diagnosis

S4RS0A1104010

Perform troubleshooting referring to the followings when ECM has detected no DTC and no abnormality has been found in “Visual Inspection: ” and “Engine Basic Inspection: ”.

Condition	Possible cause	Correction / Reference Item
Hard starting (Engine cranks OK)	Faulty spark plug	*“Spark Plug Inspection: in Section 1H”*
	Leaky high-tension cord	*“High-Tension Cord Inspection: in Section 1H”*
	Loose connection or disconnection of high-tension cord(s) or lead wire(s)	*“High-Tension Cord Removal and Installation: in Section 1H”*
	Faulty ignition coil	*“Ignition Coil Assembly (Including ignitor) Inspection: in Section 1H”*
	Dirty or clogged fuel hose or pipe	*“Fuel Pressure Check: ”*
	Malfunctioning fuel pump	*“Fuel Pressure Check: ”*
	Air drawn in through intake manifold gasket or throttle body gasket	
	Faulty idle air control system	*“Idle Air Control System Check: ”*
	Faulty ECT sensor or MAF sensor	*“Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C” or “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C”*
	Faulty ECM	
	Low compression	*“Compression Check: in Section 1D”*
	Poor spark plug tightening or faulty gasket	*“Spark Plug Removal and Installation: in Section 1H”*
	Compression leak from valve seat	*“Valves and Valve Guides Inspection: in Section 1D”*
	Sticky valve stem	*“Valves and Valve Guides Inspection: in Section 1D”*
	Weak or damaged valve springs	*“Valve Spring Inspection: in Section 1D”*
	Compression leak at cylinder head gasket	*“Cylinder Head Inspection: in Section 1D”*
	Sticking or damaged piston ring	*“Cylinders, Pistons and Piston Rings Inspection: in Section 1D”*
	Worn piston, ring or cylinder	*“Cylinders, Pistons and Piston Rings Inspection: in Section 1D”*
	Malfunctioning PCV valve	*“PCV Valve Inspection: in Section 1B”*
	Camshaft position control (VVT) system out of order	*“Oil Control Valve Inspection: in Section 1D”*
	Faulty EGR system	*“EGR System Inspection: in Section 1B”*
Low oil pressure	Improper oil viscosity	*“Engine Oil and Filter Change: in Section 0B”*
	Malfunctioning oil pressure switch	*“Oil Pressure Switch Inspection: in Section 9C”*
	Clogged oil strainer	*“Oil Pan and Oil Pump Strainer Cleaning: in Section 1E”*
	Functional deterioration of oil pump	*“Oil Pump Inspection: in Section 1E”*
	Worn oil pump relief valve	*“Oil Pump Inspection: in Section 1E”*
	Excessive clearance in various sliding parts	
Engine noise – Valve noise ***NOTE:*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Improper valve lash	*“Camshaft, Tappet and Shim Inspection: in Section 1D”*
	Worn valve stem and guide	*“Valves and Valve Guides Inspection: in Section 1D”*
	Weak or broken valve spring	*“Valve Spring Inspection: in Section 1D”*
	Warped or bent valve	*“Valves and Valve Guides Inspection: in Section 1D”*

Condition	Possible cause	Correction / Reference Item
Engine noise – Piston, ring and cylinder noise ***NOTE:*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Worn piston, ring and cylinder bore	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
Engine noise – Connecting rod noise ***NOTE:*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Worn piston, ring and cylinder bore	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
	Worn rod bearing	*"Crank Pin and Connecting Rod Bearings Inspection: in Section 1D"*
	Worn crank pin	*"Crank Pin and Connecting Rod Bearings Inspection: in Section 1D"*
	Loose connecting rod nuts	*"Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: in Section 1D"*
	Low oil pressure	*Condition "Low oil pressure"*
Engine noise – Crankshaft noise ***NOTE:*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Low oil pressure	*Condition "Low oil pressure"*
	Worn bearing	*"Main Bearings Inspection: in Section 1D"*
	Worn crankshaft journal	*"Crankshaft Inspection: in Section 1D"*
	Loose bearing cap bolts	*"Main Bearings, Crankshaft and Cylinder Block Removal and Installation: in Section 1D"*
	Excessive crankshaft thrust play	*"Crankshaft Inspection: in Section 1D"*
Engine overheating	Inoperative thermostat	*"Thermostat Inspection: in Section 1F"*
	Poor water pump performance	*"Water Pump Inspection: in Section 1F"*
	Clogged or leaky radiator	*"Radiator On-Vehicle Inspection and Cleaning: in Section 1F"*
	Improper engine oil grade	*"Engine Oil and Filter Change: in Section 0B"*
	Clogged oil filter or oil strainer	*"Oil Pressure Check: in Section 1E"*
	Poor oil pump performance	*"Oil Pressure Check: in Section 1E"*
	Faulty radiator cooling fan control system	*"Radiator cooling fan Low Speed Control System Check: " or "Radiator cooling fan High Speed Control System Check: "*
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis: in Section 4A"*
	Slipping clutch	*Condition "Slipping clutch" in "Clutch System Symptom Diagnosis: in Section 5C"*
	Blown cylinder head gasket	*"Cylinder Head Inspection: in Section 1D"*
	Air mixed in cooling system	

Condition	Possible cause	Correction / Reference Item
Poor gasoline mileage	Leaks or loose connection of high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty spark plug (improper gap, heavy deposits and burned electrodes, etc.)	*"Spark Plug Inspection: in Section 1H"*
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	High idle speed	*Condition "Improper engine idling or engine fails to idle"*
	Poor performance of ECT sensor, TP sensor or MAF sensor	*"Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C", "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Low compression	*"Compression Check: in Section 1D"*
	Poor valve seating	*"Valves and Valve Guides Inspection: in Section 1D"*
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis: in Section 4A"*
	Slipping clutch	*Condition "Slipping clutch" in"Clutch System Symptom Diagnosis: in Section 5C"*
	Thermostat out of order	*"Thermostat Inspection: in Section 1F"*
	Improper tire pressure	*"Tires Description: in Section 2D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*
Excessive engine oil consumption – Oil leakage	Blown cylinder head gasket	*"Cylinder Head Inspection: in Section 1D"*
	Leaky camshaft oil seals	*"Camshaft, Tappet and Shim Inspection: in Section 1D"*
Excessive engine oil consumption – Oil entering combustion chamber	Sticky piston ring	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
	Worn piston and cylinder	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
	Worn piston ring groove and ring	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D"*
	Improper location of piston ring gap	*"Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly: in Section 1D"*
	Worn or damaged valve stem seal	*"Valves and Valve Guides Inspection: in Section 1D"*
	Worn valve stem	*"Valves and Valve Guides Inspection: in Section 1D"*
Engine hesitates – Momentary lack of response as accelerator is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make vehicle move, as from a stop sign.	Spark plug faulty or plug gap out of adjustment	*"Spark Plug Inspection: in Section 1H"*
	Leaky high-tension cord	*"High-Tension Cord Inspection: in Section 1H"*
	Fuel pressure out of specification	*"Fuel Pressure Check: "*
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Poor performance of TP sensor, ECT sensor or MAF sensor	*"Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Engine overheating	*Condition "Engine overheating"*
	Low compression	*"Compression Check: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*

Condition	Possible cause	Correction / Reference Item
Surge – Engine power variation under steady throttle or cruise. Feels like vehicle speeds up and down with no change in accelerator pedal.	Leaky or loosely connected high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty spark plug (excess carbon deposits, improper gap, burned electrodes, etc.)	*"Spark Plug Inspection: in Section 1H"*
	Variable fuel pressure	*"Fuel Pressure Check: "*
	Kinky or damaged fuel hose and lines	
	Faulty fuel pump (clogged fuel filter)	
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Poor performance of MAF sensor	*"Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
Excessive detonation – Engine makes continuously sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.	Faulty spark plug	*"Spark Plug Inspection: in Section 1H"*
	Loose connection of high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Engine overheating	*Condition "Engine overheating"*
	Clogged fuel filter (faulty fuel pump) or fuel lines	*"Fuel Injector Circuit Check: " or "Fuel Pump and Its Circuit Check: "*
	Air drawn in through intake manifold or throttle body gasket	
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Poor performance of knock sensor, ECT sensor or MAF sensor	*"DTC P0327 / P0328: Knock Sensor Circuit Low / High: ", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Excessive combustion chamber deposits	*"Cylinders, Pistons and Piston Rings Inspection: in Section 1D" and/or "Piston Pins and Connecting Rods Inspection: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*

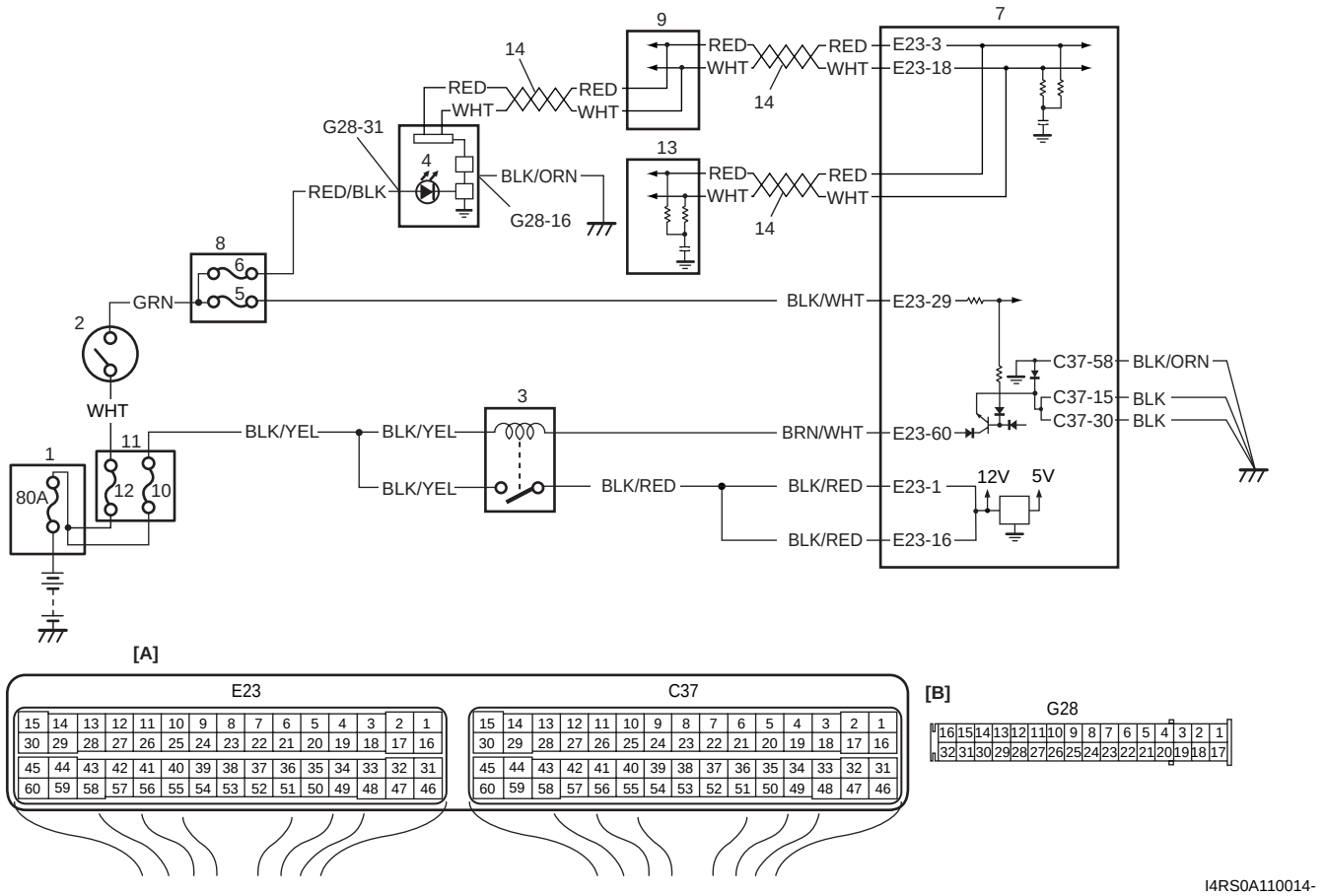
Condition	Possible cause	Correction / Reference Item
Engine has no power	Faulty spark plug	*"Spark Plug Inspection: in Section 1H"*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly (Including ignitor) Inspection: in Section 1H"*
	Leaks, loose connection or disconnection of high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty knock sensor	*"DTC P0327 / P0328: Knock Sensor Circuit Low / High: "*
	Clogged fuel hose or pipe	*"Fuel Pressure Check: "*
	Malfunctioning fuel pump	*"Fuel Pump and Its Circuit Check: "*
	Air drawn in through intake manifold gasket or throttle body gasket	
	Engine overheating	*Condition "Engine overheating"*
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Maladjusted accelerator cable play	*"Accelerator Cable Adjustment: in Section 1D"*
	Poor performance of TP sensor, ECT sensor or MAF sensor	*"Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis: in Section 4A"*
	Slipping clutch	*Condition "Slipping clutch" in "Clutch System Symptom Diagnosis: in Section 5C"*
	Low compression	*"Compression Check: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*
Improper engine idling or engine fails to idle	Faulty spark plug	*"Spark Plug Inspection: in Section 1H"*
	Leaky or disconnected high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly (Including ignitor) Inspection: in Section 1H"*
	Fuel pressure out of specification	*"Fuel Pressure Check: "*
	Leaky manifold, throttle body, or cylinder head gasket	
	Malfunctioning EGR valve	*"EGR Valve Inspection: in Section 1B"*
	Faulty idle air control system	*"Idle Air Control System Check: "*
	Faulty evaporative emission control system	*"EVAP Canister Purge Inspection: in Section 1B"*
	Faulty EGR system	*"EGR System Inspection: in Section 1B"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: "*
	Poor performance of ECT sensor, TP sensor or MAF sensor	*"Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C", "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty ECM	
	Loose connection or disconnection of vacuum hoses	
	Malfunctioning PCV valve	*"PCV Valve Inspection: in Section 1B"*
	Engine overheating	*Condition "Engine overheating"*
	Low compression	*"Compression Check: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*

Condition	Possible cause	Correction / Reference Item
Excessive hydrocarbon (HC) emission or carbon monoxide (CO)	Faulty spark plug	*"Spark Plug Inspection: in Section 1H"*
	Leaky or disconnected high-tension cord	*"High-Tension Cord Removal and Installation: in Section 1H"*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly (Including ignitor) Inspection: in Section 1H"*
	Low compression	*"Compression Check: in Section 1D"*
	Lead contamination of three way catalytic converter	*Check for absence of filler neck restrictor.*
	Faulty evaporative emission control system	*"EVAP Canister Purge Inspection: in Section 1B"*
	Fuel pressure out of specification	*"Fuel Pressure Check: "*
	Closed loop system (A/F feedback compensation) fails (Faulty TP sensor, Poor performance of ECT sensor or MAF sensor)	*"Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Engine not at normal operating temperature	
	Clogged air cleaner	*"Air Cleaner Element Inspection and Cleaning: in Section 1D"*
	Vacuum leaks	*"Engine Vacuum Check: in Section 1D"*
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*
Excessive nitrogen oxides (NOx) emission	Improper ignition timing	*"Ignition Timing Inspection: in Section 1H"*
	Lead contamination of catalytic converter	*Check for absence of filler neck restrictor.*
	Faulty EGR system	*"EGR System Inspection: in Section 1B"*
	Fuel pressure out of specification	*"Fuel Pressure Check: "*
	Closed loop system (A/F feedback compensation) fails (Faulty TP sensor, Poor performance of ECT sensor or MAF sensor)	*"Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C"or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C"*
	Faulty injector(s)	*"Fuel Injector Circuit Check: "*
	Faulty ECM	
	Camshaft position control (VVT) system out of order	*"Oil Control Valve Inspection: in Section 1D"*

Malfunction Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started)

S4RS0A1104011

Wiring Diagram



I4RS0A110014-

[A]: ECM connector (viewed from harness side)	3. Main relay	7. ECM	11. Relay box
[B]: Combination meter connector (viewed from harness side)	4. Malfunction indicator lamp in combination meter	8. Junction block assembly	12. “IG ACC” fuse
1. Main fuse box	5. “IG COIL” fuse	9. BCM	13. TCM
2. Ignition switch	6. “METER” fuse	10. “FI” fuse	14. CAN communication line

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of malfunction indicator lamp (MIL) to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting

NOTE:

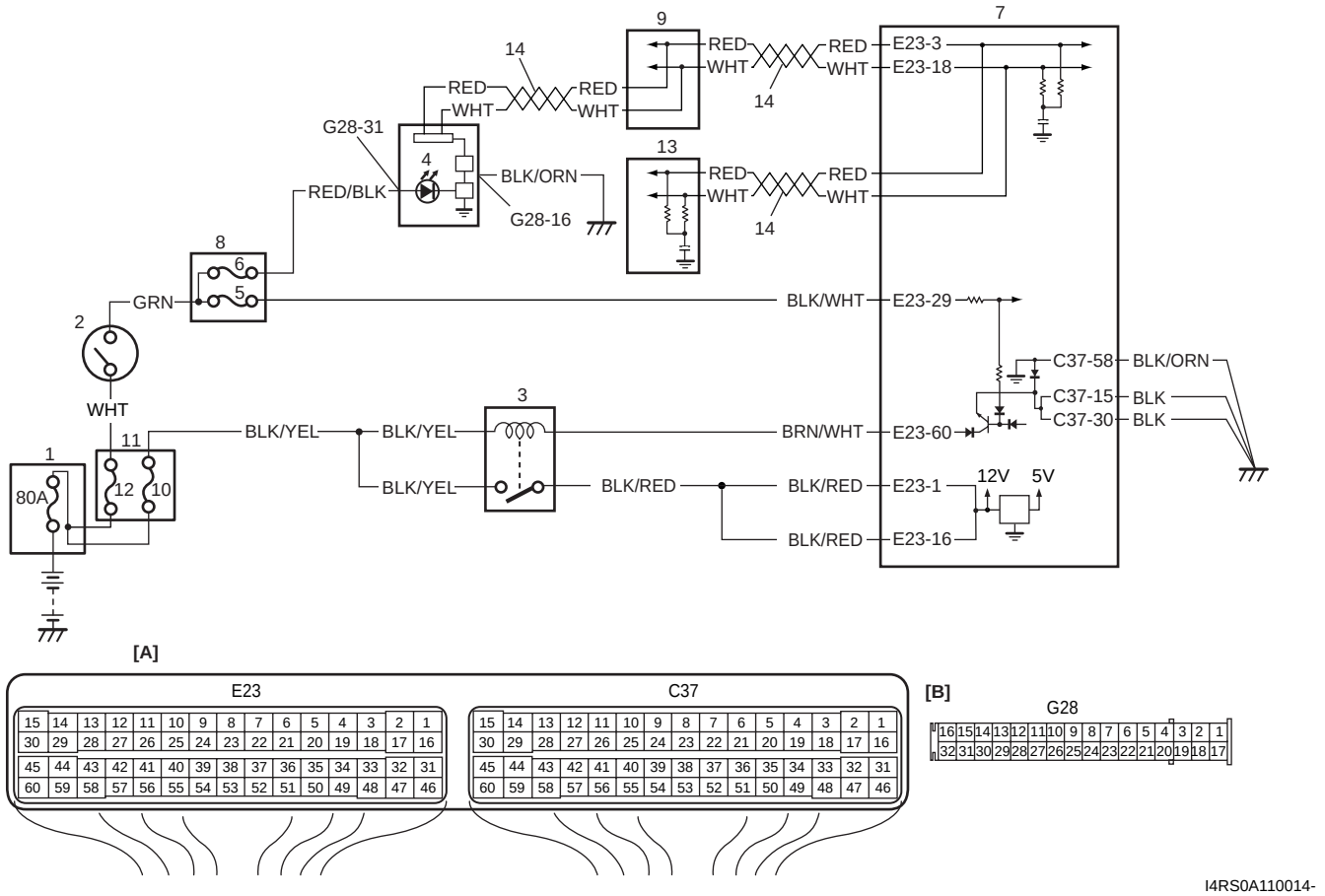
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	**MIL power supply check** 1) Turn ignition switch to ON position. *Do other warning lights come ON?*	Go to Step 2.	Go to Step 3.
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. *Is there DTC(s) P1674, P1675 and/or P1678?*	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.
3	**CAN communication line circuit check** 1) Check CAN communication circuit between combination meter and ECM or TCM (equipped with A/T) referring to Step 9 to 14 of "DTC P1674: CAN Communication (Bus Off Error): " *Is circuit in good condition?*	Go to Step 4.	Repair or replace.
4	**"METER" fuse check** 1) Turn ignition switch to OFF position. 2) Check for fuse blown at "METER" fuse in junction block assembly. *Is "METER" fuse in good condition?*	Go to Step 5.	Replace "METER" fuse and check for short.
5	**Combination meter power supply check** 1) Remove combination meter referring to "Combination Meter Removal and Installation: in Section 9C". 2) Check for proper connection to combination meter connector at "G28-31" and "G28-16" terminals. 3) If OK, then turn ignition switch to ON position and measure voltage between combination meter connector at "G28-31" terminal and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 6.	"RED/BLK" wire is open circuit.
6	**Combination meter circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "G28-16" terminal of combination meter connector and vehicle body ground. *Is resistance 1 Ω or less?*	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.	"BLK/ORN" wire is open or high resistance circuit.

Malfunction Indicator Lamp Remains ON after Engine Starts

S4RS0A1104012

Wiring Diagram



I4RS0A110014-

[A]: ECM connector (viewed from harness side)	3. Main relay	7. ECM	11. Relay box
[B]: Combination meter connector (viewed from harness side)	4. Malfunction indicator lamp in combination meter	8. Junction block assembly	12. “IG ACC” fuse
1. Main fuse box	5. “IG COIL” fuse	9. BCM	13. TCM
2. Ignition switch	6. “METER” fuse	10. “FI” fuse	14. CAN communication line

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of malfunction indicator lamp (MIL) to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting

NOTE:

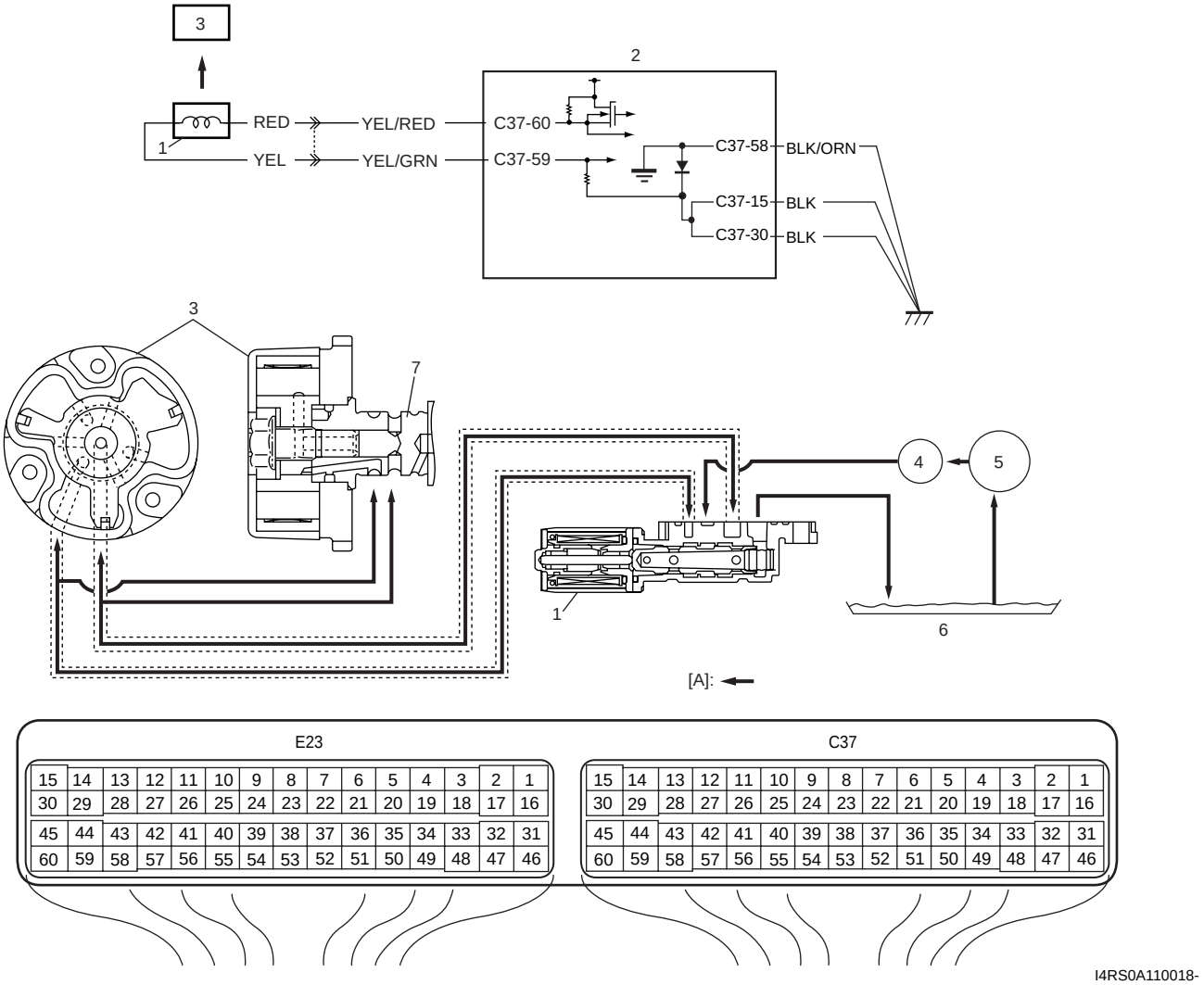
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	**DTC check** 1) Start engine and recheck DTC of ECM and TCM while engine running. *Is there any DTC(s)?*	Go to Step 2 of "Engine and Emission Control System Check: " or Step 2 of "A/T System Check: in Section 5A".	Go to Step 2.
2	**CAN communication line circuit check** 1) Check CAN communication line circuit between combination meter and ECM or TCM (equipped with A/T) referring to Step 9 to 14 "DTC P1674: CAN Communication (Bus Off Error): ". *Is circuit in good condition?*	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.	Repair or replace CAN communication circuit.

DTC P0010: Camshaft Position Actuator Circuit

S4RS0A1104014

System and Wiring Diagram



I4RS0A110018-

[A]: Oil flow	3. Camshaft timing sprocket	6. Oil pan
1. Oil control valve	4. Oil filter	7. Intake camshaft
2. ECM	5. Oil pump	

Circuit Description

Actual valve timing fails to become close to target advance level of each function although advance control function or retarded advance control function is at work.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of oil control valve is different from command signal. (Circuit open or short) (1 driving cycle detection logic)	• Oil control valve • Oil control valve circuit • ECM

DTC Confirmation Procedure

1) Clear DTC. Refer to “DTC Clearance: ”.
2) Start engine and keep it at idle for 10 seconds.
3) Check DTC. Refer to “DTC Check: ”.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Oil control valve electrical circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection at "C37-60" and "C37-59" terminals of ECM connector. 3) If OK, measure resistance between "C37-60" and "C37-59" terminals of ECM connector. *Is resistance below 10 Ω?*	Go to Step 3.	Go to Step 8.
3	**Oil control valve electrical circuit check** *Was resistance more than 6.5 Ω in Step 2?*	Go to Step 4.	Go to Step 7.
4	**Oil control valve electrical circuit for power short check** 1) Turn ON ignition switch. 2) Measure voltage between "C37-60" terminal of ECM connector and engine ground. *Is voltage below 1 V?*	Go to Step 5.	"RED", "YEL/RED", "YEL" or "YEL/GRN" wire is shorted to power supply circuit.
5	**Oil control valve electrical circuit for ground short check** 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between "C37-60" terminal of ECM connector and engine ground. *Is resistance infinity?*	Go to Step 6.	"YEL/RED" wire is shorted to ground circuit.
6	**Oil control valve electrical circuit for ground short check** 1) Measure resistance between "C37-59" terminal of ECM connector and engine ground. *Is resistance infinity?*	Go to Step 9.	"YEL/GRN" wire is shorted to ground circuit.
7	**Oil control valve electrical circuit for short check** 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between "C37-60" and "C37-59" terminals of ECM connector. *Is resistance infinity?*	Go to Step 9.	"YEL/RED" wire is shorted to "YEL/GRN" wire.

Step	Action	Yes	No
8	**Oil control valve electrical circuit check** 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between “C37-60” terminal of ECM connector and “YEL/RED” wire terminal of oil control valve connector and between “C37-59” terminal of ECM connector and “YEL/GRN” wire terminal of oil control valve connector. *Is resistance below 1 Ω?*	Go to Step 9.	“YEL/RED” wire or “YEL/GRN” wire circuit is open or high resistance.
9	**Oil control valve check** Check oil control valve referring to “Oil Control Valve Inspection: in Section 1D”. *Is resistance within specified value?*	Substitute a known-good ECM and recheck.	Faulty oil control valve.

DTC P0011 / P0012: Camshaft Position - Timing Over-Advanced or System Performance / -Retarded

S4RS0A1104015

System Description

Actual value of advanced valve timing does not reach target value.
Valve timing is advanced although ECM command is most retarding.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Actual value of advanced valve timing does not reach target value, or valve timing is advanced although ECM command is most retarding. (2 driving cycle detection logic)	• Oil control valve • Oil galleries of timing sprocket • Intake camshaft timing sprocket (Camshaft position control (VVT) actuator) • Oil control valve circuit • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and tester, on a level road.**

NOTE:

Check to make sure that the following conditions are satisfied when using this “DTC Confirmation Procedure”.

- **altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) Clear DTC. Refer to “DTC Clearance: ”.
2) Start engine and drive vehicle under usual driving condition for 5 minutes or longer until engine is warmed up to normal operating temperature.
3) Stop vehicle.
4) Run engine at idle speed for 1 minute.
5) Start vehicle and increase vehicle speed up to 80 km/h (50 mile/h).
6) Keep vehicle speed at 80 km/h (50 mile/h) for 1 minute or longer at 5th gear position or D range.
7) Decrease vehicle speed gradually.
8) Stop vehicle and turn OFF ignition switch OFF.
9) Repeat Step 4) to 7) one time.
10) Stop vehicle.

11) Check DTC. Refer to “DTC Check: ”.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

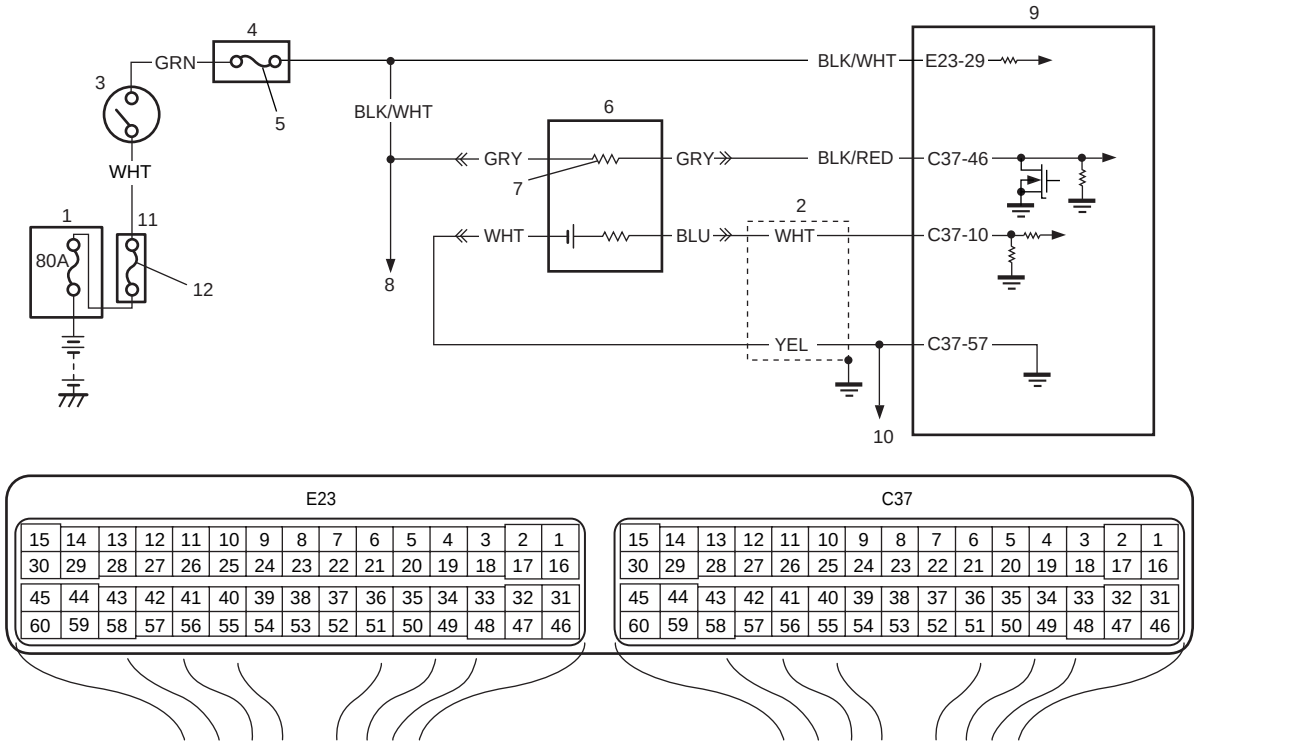
Step	Action	Yes	No
1	*Is DTC P0010 detected together?*	Go to “DTC P0010: Camshaft Position Actuator Circuit: ”.	Go to Step 2.
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 5.
3	**Camshaft position control check** 1) With ignition switch turned OFF, connect SUZUKI scan tool. 2) Start engine and warm up to normal operating temperature. 3) Select menu to DATA LIST. 4) Check that the “VVT GAP” displayed on SUZUKI scan tool is 0 – 5°. *Is it OK?*	Go to Step 4.	Check valve timing referring to “Timing Chain and Chain Tensioner Removal and Installation: in Section 1D”. If OK, go to Step 5.
4	**Camshaft position control check** 1) Drive vehicle under following conditions. • Vehicle speed at 80 km/h (50 mile/h). • Gear position at 5th or D range. 2) Check that “VVT GAP” displayed on SUZUKI scan tool is 0 – 5°. *Is it OK?*	Substitute a known-good ECM and recheck.	Go to Step 5.
5	**Oil control circuit visual inspection** 1) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: in Section 1D”. 2) Check oil pressure leakage from oil control circuit. *Is it in good condition?*	Go to Step 6.	Repair or replace.
6	**Oil control valve and oil gallery pipe check** 1) Remove oil control valve referring to “Oil Control Valve Removal and Installation: in Section 1D”. 2) Remove oil gallery pipe referring to “Timing Chain Cover Removal and Installation: in Section 1D”. 3) Check oil gallery pipe and oil control valve for clog or sludge. *Are they in good condition?*	Go to Step 7.	Clean oil control valve and oil gallery pipe. Replace oil control valve if a problem is not solved after cleaning oil control valve and oil gallery pipe.
7	**Oil control valve electrical circuit check** 1) Check that oil control valve circuit is in good condition referring to “DTC P0010: Camshaft Position Actuator Circuit: ”. *Is circuit in good condition?*	Repair circuit.	Go to Step 8.

Step	Action	Yes	No
8	**Oil control valve check** 1) Check oil control valve referring to“Oil Control Valve Inspection: in Section 1D”. *Is it in good condition?*	Replace camshaft timing sprocket.	Replace oil control valve.

DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1)

S4RS0A1104029

Wiring Diagram



I4RS0A110029-

1. Main fuse box	4. Junction block assembly	7. Heater	10. To other sensor
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-2 heater	11. Relay box
3. Ignition switch	6. HO2S-1	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Current of HO2S-1 heater is more than specified value or lower than specified value for 5 seconds continuously. (2 driving cycle detection logic)	• HO2S-1 heater circuit • HO2S-1 heater • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle speed for 1 min. or more.
5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

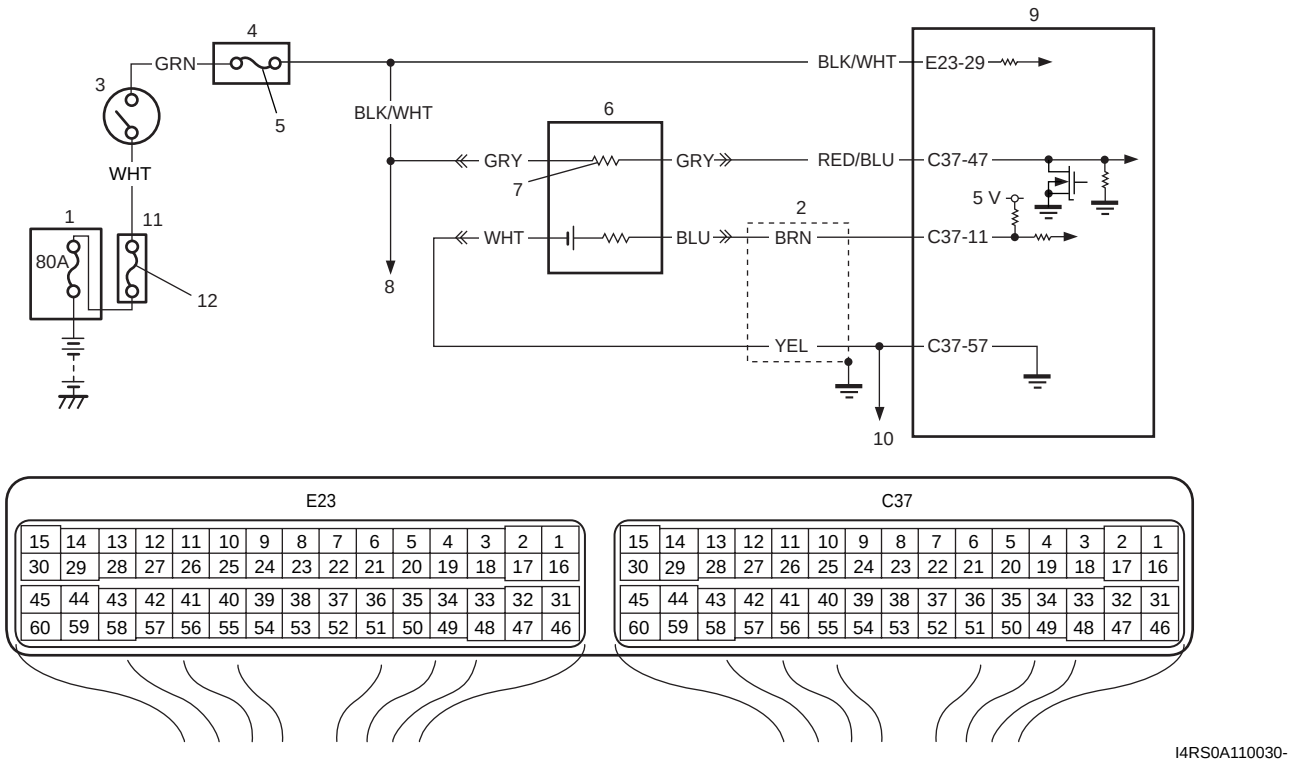
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**HO2S-1 heater power circuit check** 1) Disconnect connector from HO2S-1 with ignition switch turned OFF. 2) Check for proper connection to HO2S-1 at "BLK/WHT" and "BLK/RED" wire terminals. 3) If wire and connection are OK, measure voltage between "BLK/WHT" wire terminal and engine ground with ignition switch turned ON. *Is voltage over 10 V?*	Go to Step 3.	"BLK/WHT" wire is open circuit or shorted to ground circuit.
3	**HO2S-1 heater power circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/WHT" wire terminal of HO2S-1 connector and "E23-29" terminal of ECM connector. *Is resistance below 5 Ω?*	Go to Step 4.	"BLK/WHT" wire is high resistance circuit.
4	**HO2S-1 heater drive circuit check** 1) Measure resistance between "C37-46" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"BLK/RED" wire is shorted to ground circuit.
5	**HO2S-1 heater drive circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "C37-46" terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 6.	"BLK/RED" wire is shorted to power circuit.
6	**HO2S-1 heater drive circuit check** 1) Connect connector to HO2S-1 with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "C37-46" terminal of ECM connector and vehicle body ground with connector disconnected from ECM. *Is voltage over 10 V?*	Go to Step 7.	"BLK/RED" wire is open circuit.

Step	Action	Yes	No
7	**HO2S-1 heater check** 1) Disconnect HO2S-1 connector with ignition switch turned OFF. 2) Check HO2S-1 heater resistance referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C”. *Is resistance within specified value range?*	Go to Step 8.	Replace HO2S-1.
8	**HO2S-1 heater power circuit check** 1) Connect connector to HO2S-1 with ignition switch turned OFF. 2) Measure resistance between “E23-29” and “C37-46” terminals of ECM connector. *It resistance below 12 Ω?*	HO2S-1 heater circuit is OK. Substitute a known-good ECM and recheck.	“BLK/WHT”, “BLK/RED” and / or “GLY” wire is high resistance circuit.

DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2)

S4RS0A1104031

Wiring Diagram



I4RS0A110030-

1. Main fuse box	4. Junction block assembly	7. Heater	10. To other sensor
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-1 heater	11. Relay box
3. Ignition switch	6. HO2S-2	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Current of HO2S-2 heater is more than specified value or less than specified value for 5 seconds continuously (2 driving cycle detection logic)	• HO2S-2 heater • HO2S-2 heater circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle speed for 1 min.
5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

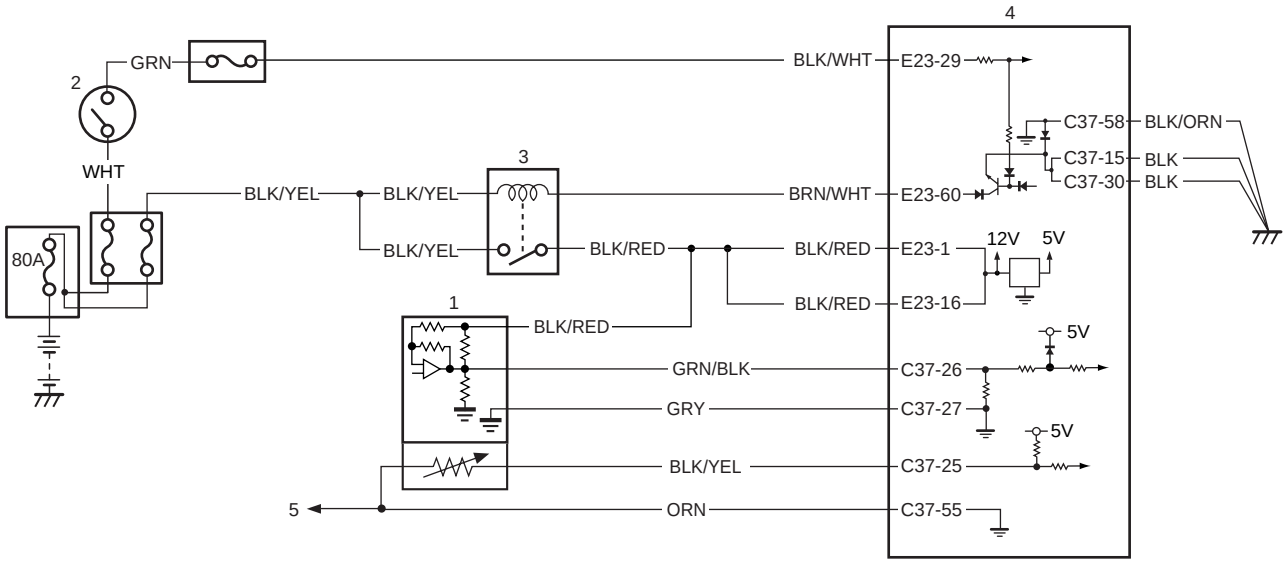
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**HO2S-2 heater power circuit check** 1) Disconnect connector from HO2S-2 with ignition switch turned OFF. 2) Check for proper connection to HO2S-2 at "BLK/WHT" and "RED/BLU" wire terminals. 3) If wire and connection are OK, measure voltage between "BLK/WHT" wire terminal of HO2S-2 connector and engine ground with ignition switch turned ON. *Is voltage over 10 V?*	Go to Step 3.	"BLK/WHT" wire is open circuit or shorted to ground circuit.
3	**HO2S-2 heater power circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/WHT" wire terminal of HO2S-2 connector and "E23-29" terminal wire of ECM connector. *Is resistance below 5 Ω?*	Go to Step 4.	"BLK/WHT" wire is high resistance circuit.
4	**HO2S-2 heater drive circuit check** 1) Measure resistance between "RED/BLU" wire terminal of HO2S-2 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"RED/BLU" wire is shorted to ground circuit.
5	**HO2S-2 heater drive circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "RED/BLU" wire terminal of HO2S-2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 6.	"RED/BLU" wire is shorted to power circuit.
6	**HO2S-2 heater drive circuit check** 1) Connect connector to HO2S-2 with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "C37-47" terminal of disconnected ECM connector and vehicle body ground. *Is voltage over 10 V?*	Go to Step 7.	"RED/BLU" wire is open circuit.

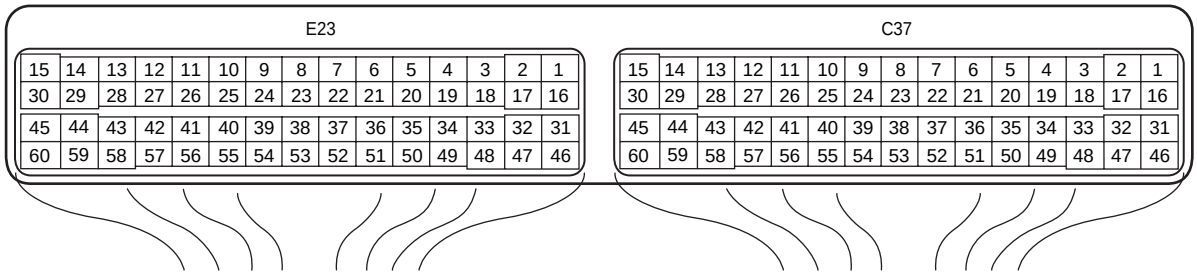
Step	Action	Yes	No
7	**HO2S-2 heater check** 1) Disconnect HO2S-2 connector with ignition switch turned OFF. 2) Check HO2S-2 heater resistance referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C”. *Is resistance within specified value?*	Go to Step 8.	Replace HO2S-2.
8	**HO2S-2 heater power circuit check** 1) Connect connector to HO2S-2 with ignition switch turned OFF. 2) Measure resistance between “E23-9” and “C37-47” terminals of ECM connector. *Is resistance below 30 Ω?*	HO2S-2 heater circuit is OK. Substitute a known-good ECM and recheck.	“RED/BLU” wire is high resistance circuit.

DTC P0101: Mass Air Flow Circuit Range / Performance

S4RS0A1104067

Wiring Diagram





I4RS0A110019-

1. MAF and IAT sensor	3. Main relay	5. To other sensors
2. Ignition switch	4. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• MAF volume is greater than 20 g/sec even if engine revolution is less than 900 rpm and intake manifold pressure is less than 40 kPa (5.80 psi) with TP less than 1.5°. • MAF volume is lower than 10 g/sec even if engine revolution is more than 2500 rpm and intake manifold pressure is more than 60 kPa (8.70 psi) with TP more than 12°. (2 driving cycle detection logic)	• Air intake system (clog or leakage) • MAF sensor and/or its circuit • TP sensor and/or its circuit • MAP sensor and/or its circuit • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

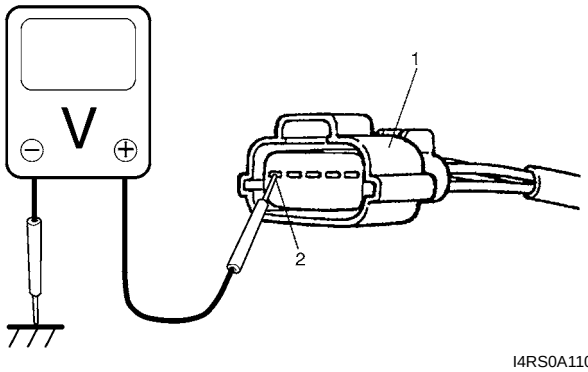
- **Intake air temperature at engine start: -10 °C (14°F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature. (ECT approx. 90 – 95 °C, 194 – 203 °F)
4) Drive vehicle with engine speed: more than 2500 rpm for 1 min.
5) Increase vehicle speed to 80 km/h (45 mile/h) at 5th gear or D range.
6) Release accelerator pedal to decrease vehicle speed to 40 km/h (25 mile/h).
7) Stop vehicle and run it idle for 1 min.
8) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

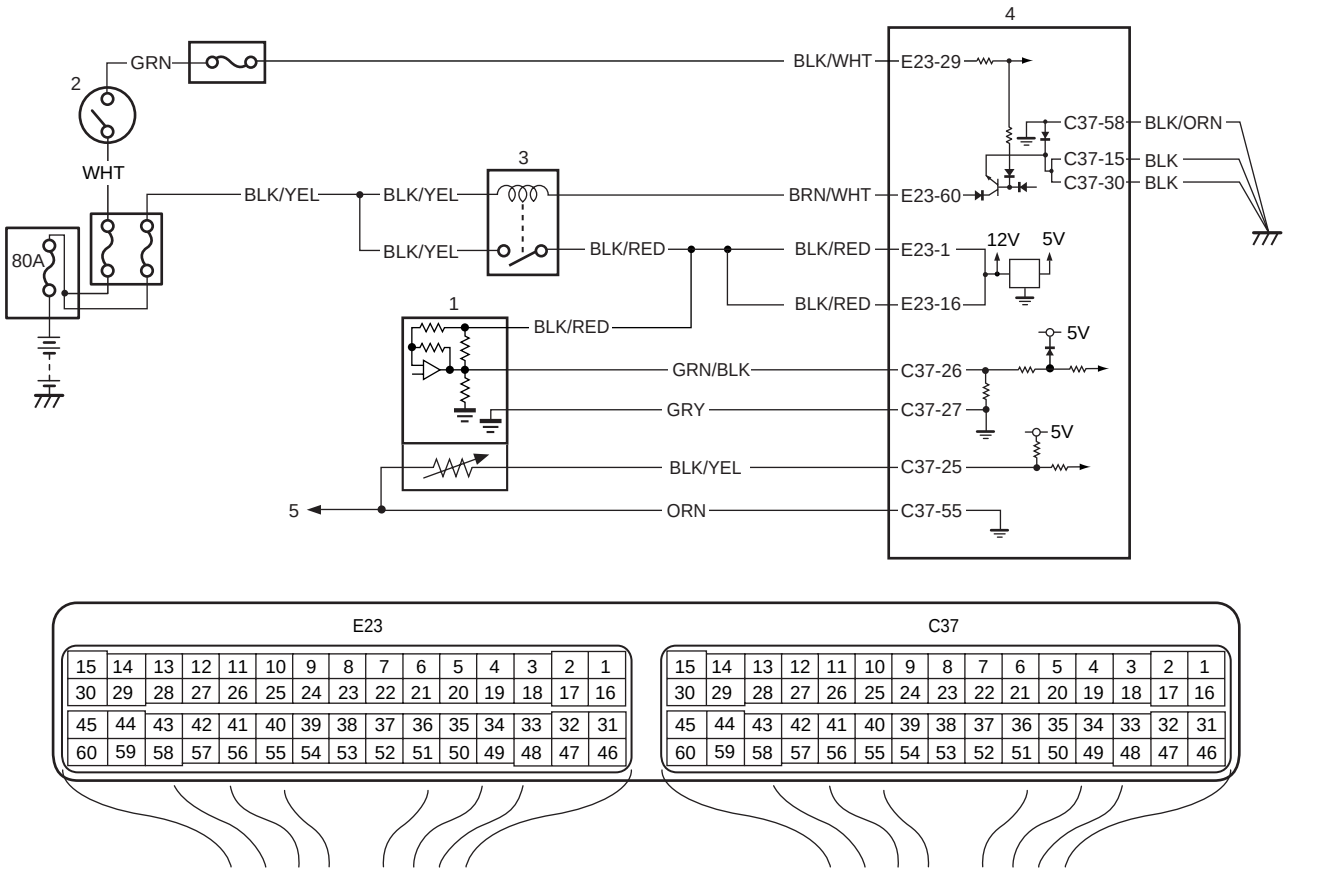
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Visual inspection** Check MAF sensor and air intake system for: • Objects which block measuring duct and resistor of MAF sensor. • Other air flow which does not pass the MAF sensor. *Are they in good condition?*	Go to Step 3.	Repair or replace.
3	**MAF sensor and its circuit check** 1) With ignition switch turned OFF, install scan tool. 2) Start engine and warm up to normal operation temperature. 3) Check MAF value using scan tool. (Refer to "Scan Tool Data: " for normal value.) *Is each value within specified range?*	Go to Step 11.	Go to Step 4.
4	**MAF sensor output voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure voltage between "C37-26" and "C37-27" terminals of ECM connector referring to "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection: in Section 1C". *Is each value within specified range?*	Poor "C37-26" and/or "C37-27" terminal connection. If OK, substitute a known-good ECM and recheck.	Go to Step 5.
5	**MAF sensor power supply voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal (2) of MAF and IAT sensor connector (1).  I4RS0A110020- *Is voltage 10 – 14 V?*	Go to Step 6.	"BLK/RED" wire is open circuit.
6	**MAF sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 8.	Go to Step 7.

Step	Action	Yes	No
7	**Ground circuit check** 1) Measure resistance between “C37-27” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“GRY” wire is open or high resistance circuit.	ECM grounds “C37-58”, “C37-15” and/or “C37-30” circuit is open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
8	**MAF sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between “GRN/BLK” wire terminal of MAF and IAT sensor connector and engine ground. *Is voltage 0 V?*	Go to Step 9.	“GRN/BLK” wire is shorted to others circuit.
9	**MAF sensor signal circuit check** 1) Turn OFF ignition switch, measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance infinity?*	Go to Step 10.	“GRN/BLK” wire is shorted to ground circuit.
10	**MAF sensor signal circuit check** 1) Measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and “C37-26” terminal of ECM connector. *Is resistance below 3 Ω?*	Faulty MAF and IAT sensor.	“GRN/BLK” wire is open or high resistance circuit.
11	*Is DTC P0121 detected?*	Go to “DTC P0121: Throttle Position Sensor Circuit Range / Performance: ”.	Go to Step 12.
12	*Is DTC P0106 displayed?*	Go to “DTC P0106: Manifold Absolute Pressure Range / Performance: ”.	Substitute a known-good ECM and recheck.

DTC P0102: Mass Air Flow Circuit Low Input

S4RS0A1104017

Wiring Diagram



I4RS0A110019-

1. MAF and IAT sensor	4. ECM
2. Ignition switch	5. To other sensors
3. Main relay	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of MAF sensor output is less than specified value for specified time continuously. (1 driving cycle detection logic)	• Open or short in MAF sensor circuit • MAF sensor • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

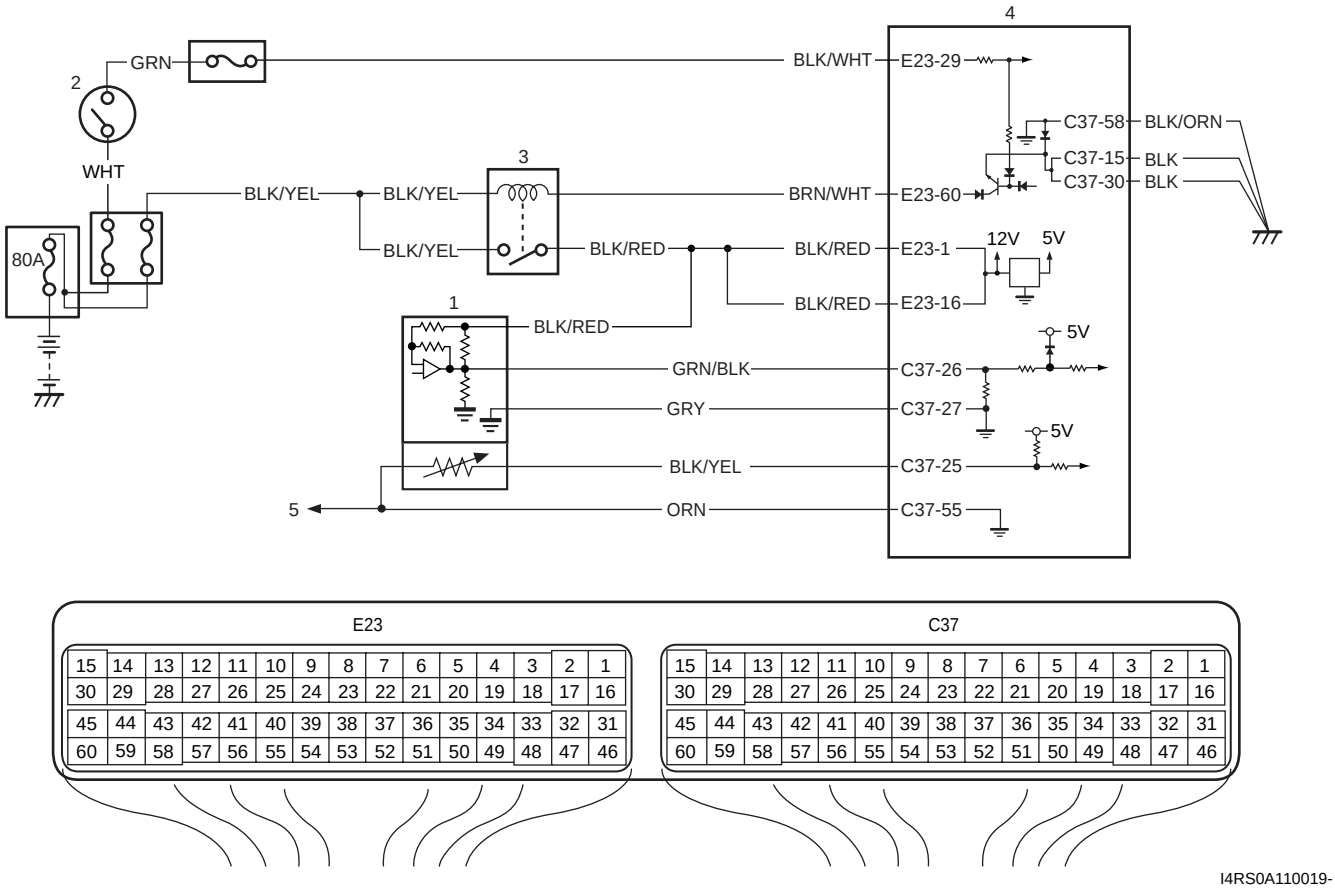
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAF sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data: " for normal value.) *Is normal value indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 3.
3	**MAF sensor power supply voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of MAF and IAT sensor connector. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLK/RED" wire is open circuit.
4	**MAF sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 6.	Go to Step 5.
5	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-27" terminal of ECM connector and engine ground. *Is resistance below 5 Ω?*	"GRY" wire is open or high resistance circuit.	ECM grounds "C37-58", "C37-15" and/or "C37-30" circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
6	**MAF sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between "GRN/BLK" wire terminal of MAF and IAT sensor connector and engine ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 7.	"GRN/BLK" wire is shorted to other circuit.
7	**MAF sensor signal circuit check** 1) Measure resistance between "GRN/BLK" wire terminal of MAF and IAT sensor connector and engine ground with ignition switch turned OFF. *Is resistance infinity?*	Go to Step 8.	"GRN/BLK" wire is shorted to ground circuit.

Step	Action	Yes	No
8	**MAF sensor signal circuit check** 1) Measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and “C37-26” terminal of ECM connector. *Is resistance below 3 Ω?*	Go to Step 9.	“GRN/BLK” wire is open or high resistance circuit.
9	**MAF sensor output signal check** 1) Connect connectors to MAF and IAT sensor and ECM with ignition switch turned OFF. 2) Measure voltage between “C37-26” and “C37-27” terminals of ECM connector referring to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection: in Section 1C”. *Is each value within specified range?*	Substitute a known-good ECM and recheck.	Faulty MAF and IAT sensor.

DTC P0103: Mass Air Flow Circuit High Input

S4RS0A1104018

Wiring Diagram



I4RS0A110019-

1. MAF and IAT sensor	4. ECM
2. Ignition switch	5. To other sensors
3. Main relay	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of MAF sensor output is more than specified value for specified time continuously. (1 driving cycle detection logic)	• Open or short in MAF sensor circuit • MAF sensor • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

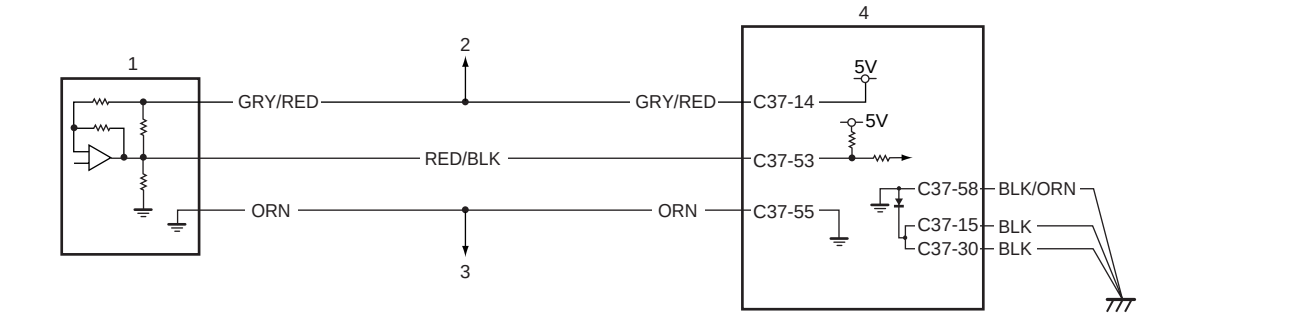
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAF sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data: " for normal value.) *Is normal value indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 3.
3	**MAF sensor power supply voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch tuned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of MAF and IAT sensor connector. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLK/RED" wire is open circuit.
4	**MAF sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 6.	Go to Step 5.
5	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-27" terminal of ECM connector and engine ground. *Is resistance below 5 Ω?*	"GRY" wire is open or high resistance circuit.	ECM grounds "C37-58", "C37-15" and/or "C37-30" circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.

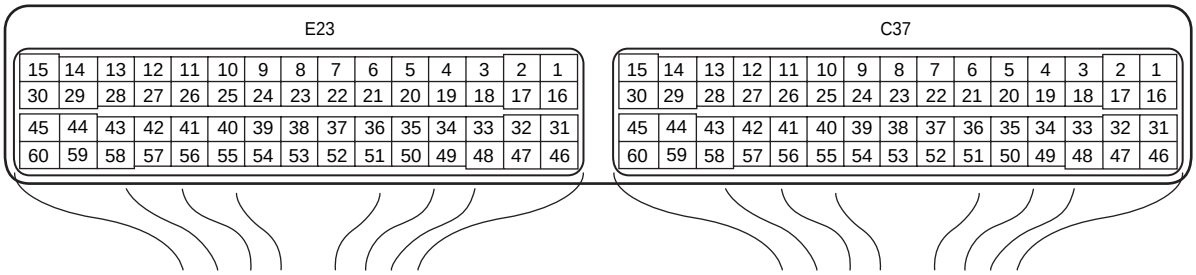
Step	Action	Yes	No
6	**MAF sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between “GRY/BLK” wire terminal of MAF and IAT sensor connector and engine ground. *Is voltage 0 V?*	Go to Step 7.	“GRY/BLK” wire is shorted to other circuit.
7	**MAF sensor output signal check** 1) Connect connector to MAF and IAT sensor and ECM with ignition switch turned OFF. 2) Measure voltage between “C37-26” and “C37-27” terminal of ECM connector referring to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection: in Section 1C”. *Is each value within specified range?*	Substitute a known-good ECM and recheck.	Faulty MAF and IAT sensor.

DTC P0106: Manifold Absolute Pressure Range / Performance

S4RS0A1104079

Wiring Diagram





I4RS0A110049-

1. Manifold absolute pressure sensor	3. To other sensors
2. To TP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• Difference between Max. manifold absolute pressure value and Min. manifold pressure value is less than 1.3 kPa (0.19 psi) when engine running at idle speed. • Difference between barometric pressure value and manifold pressure value is less than 33.3 kPa (4.83 psi) for 2 sec. at 2000 r/mini. or more. (2 driving cycle detection logic)	• Manifold absolute pressure sensor • Manifold absolute pressure sensor vacuum passage • Air intake system • ECM

DTC Confirmation Procedure

NOTE:

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

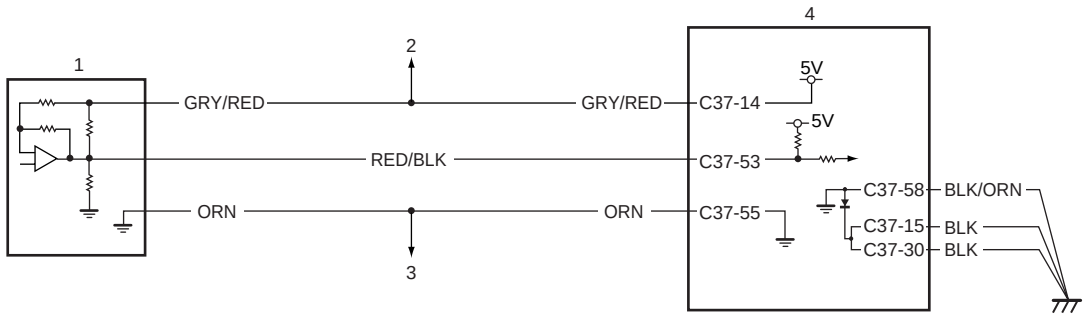
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

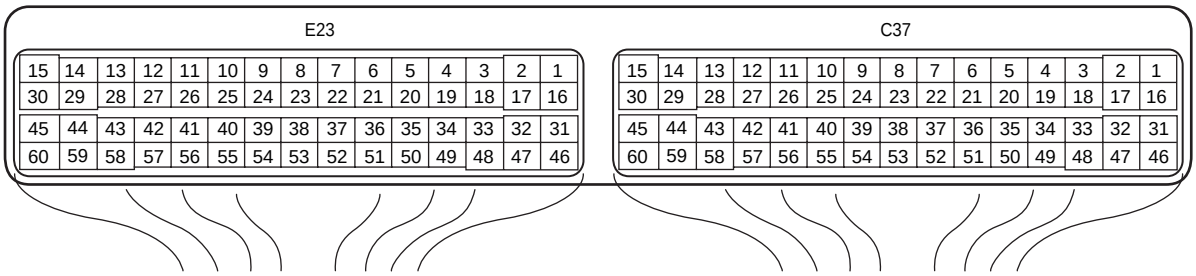
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check DTC. *Is there DTC P0107 or DTC P0108?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**MAP sensor output signal check** 1) Check MAP sensor according to "Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C". *Is it in good condition?*	Go to Step 4.	Faulty MAP sensor.
4	**MAP sensor circuit check** 1) Check MAP sensor circuit referring to Step 3 to 6 of "DTC P0107: Manifold Absolute Pressure Circuit Low Input: " or Step 3 to 8 of "DTC P0108: Manifold Absolute Pressure Circuit High Input: ". *Is circuit in good condition?*	Go to Step 5.	Repair or replace.
5	**Air intake system check** 1) Check air intake system for clog or leak. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace.

DTC P0107: Manifold Absolute Pressure Circuit Low Input

S4RS0A1104050

Wiring Diagram





I4RS0A110049-

1. Manifold absolute pressure sensor	3. To other sensors
2. To TP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Manifold absolute pressure sensor output voltage is lower than specified value for specified time continuously. (1 driving cycle detection logic)	• Manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • TP sensor • A/C refrigerant pressure sensor • ECM

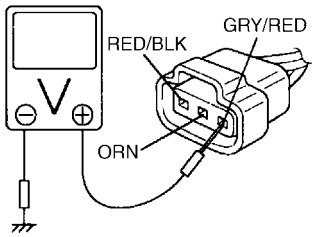
DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

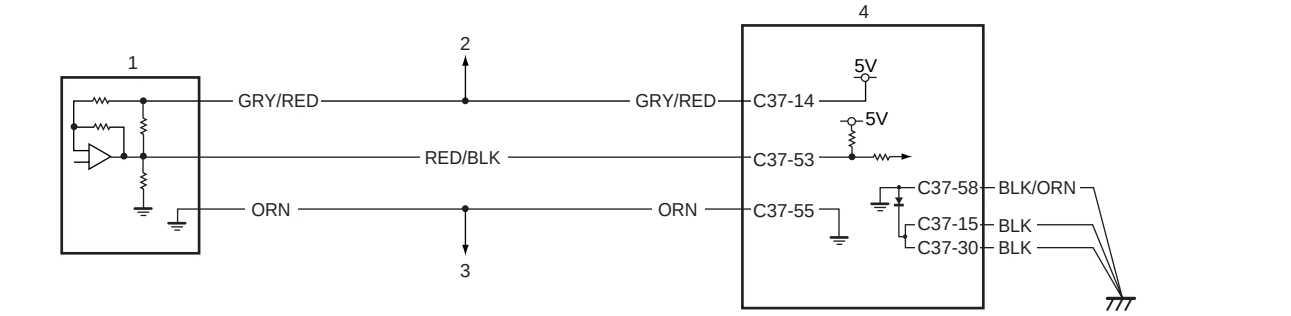
- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

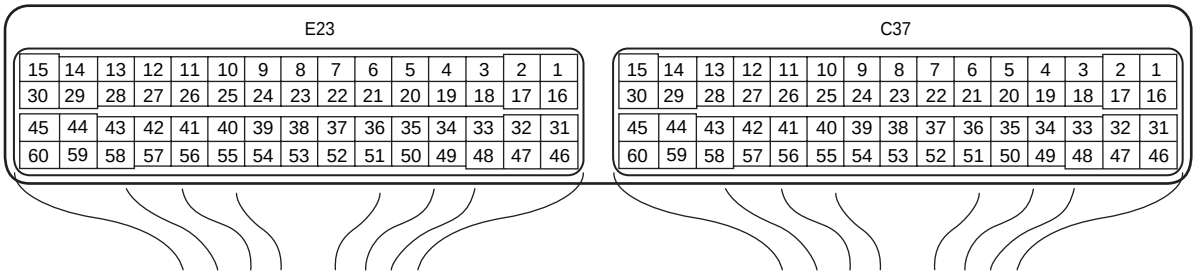
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake manifold pressure displayed on scan tool. *Is it 0 kPa (0 in.Hg)?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**MAP sensor power supply voltage check** 1) Disconnect connector from MAP sensor with ignition switch turned OFF. 2) Check for proper connection of MAP sensor at "GRY/RED", "RED/BLK" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector.  I4RS0A110050- *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 4.
4	**MAP sensor power supply circuit check** 1) Disconnect connectors from TP sensor and A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or A/C refrigerant pressure sensor.	"GRY/RED" wire is shorted to ground circuit. If wires are OK, substitute a known-good ECM and recheck.
5	**MAP sensor signal circuit check** 1) Measure voltage between "RED/BLK" wire terminal of MAP sensor connector and engine ground. *Is voltage 4 – 6 V?*	Go to Step 7.	Go to Step 6.
6	**MAP sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-53" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	"RED/BLK" wire is shorted to ground circuit.
7	**MAP sensor output signal check** 1) Check MAP sensor according to "Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty MAP sensor.

DTC P0108: Manifold Absolute Pressure Circuit High Input

S4RS0A1104051

Wiring Diagram





I4RS0A110049-

1. Manifold absolute pressure sensor	3. To other sensors
2. To TP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Manifold absolute pressure sensor output voltage is higher than specified value for specified time continuously. (1 driving cycle detection logic)	• Manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • TP sensor • A/C refrigerant pressure sensor • ECM

NOTE:

When DTC P0113, P0118 and P0123 are indicated together, it is possible that “ORN” wire circuit is open.

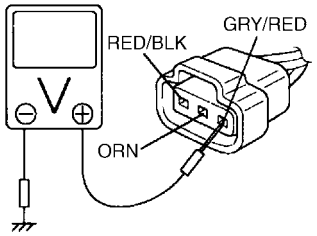
DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

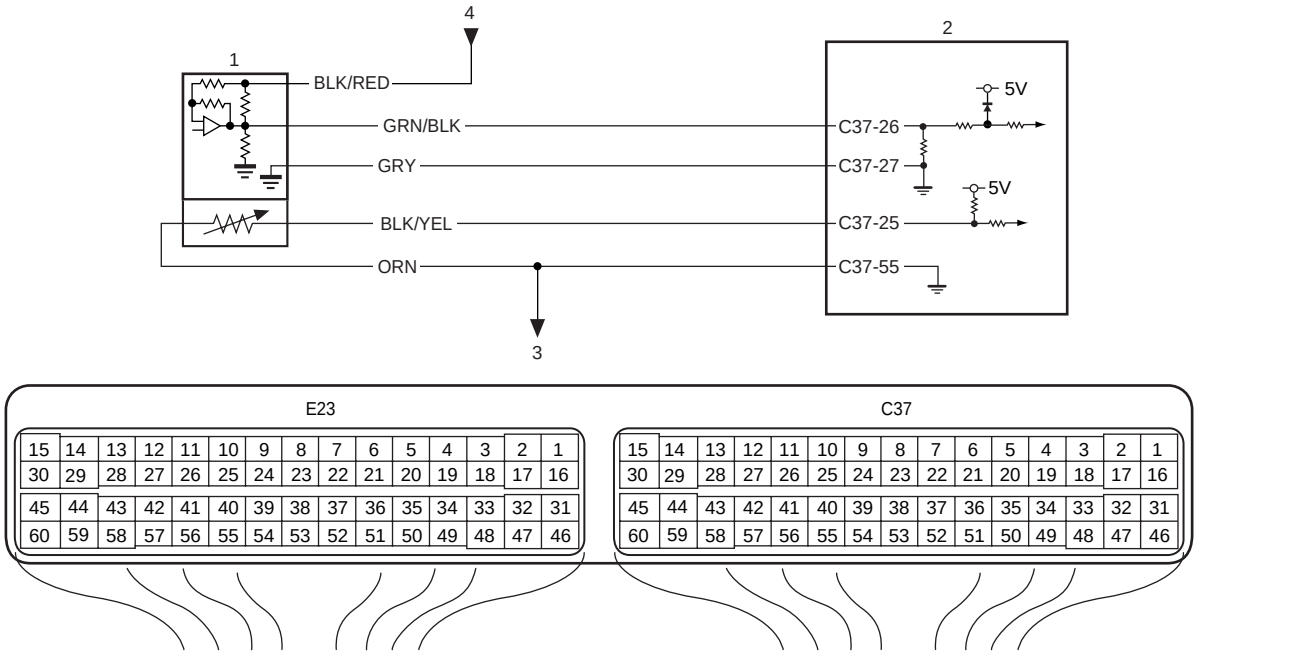
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**MAP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON. 3) Check intake manifold pressure displayed on scan tool. *Is it 127 kPa (37.5 in.Hg)?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**MAP sensor power supply voltage check** 1) Disconnect connector from MAP sensor with ignition switch turned OFF. 2) Check for proper connection of MAP sensor at "GRY/RED", "RED/BLK" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector.  I4RS0A110050- *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 4.
4	**MAP sensor power supply circuit check** 1) Disconnect connectors from TP sensor and A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or A/C refrigerant pressure sensor.	"GRY/RED" wire is open or shorted to power circuit.
5	**MAP sensor ground circuit check** 1) Measure resistance between "ORN" wire terminal of MAP sensor connector and engine ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 7.	Go to Step 6.

Step	Action	Yes	No
6	**Ground circuit check** 1) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open or high resistance circuit.	ECM grounds “C37-58”, “C37-15” and/or “C37-30” circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
7	**MAP sensor signal circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “RED/BLK” wire terminal of MAP sensor connector and engine ground. *Is voltage 4 – 6 V?*	Go to Step 9.	Go to Step 8.
8	**MAP sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “RED/BLK” wire terminal of MAP sensor connector and “C37-53” terminal of ECM connector. *Is resistance below 2 Ω?*	“RED/BLK” wire is shorted to power supply circuit.	“RED/BLK” wire is open or high resistance circuit.
9	**MAP sensor output signal check** 1) Check MAP sensor according to “Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty MAP sensor.

DTC P0111: Intake Air Temperature Circuit Range / Performance

S4RS0A1104068

Wiring Diagram



I4RS0A110021-

1. MAF and IAT sensor	3. To other sensors
2. ECM	4. From main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference of maximum IAT minus minimum IAT is less than 0.3 °C (32.5 °F) while ECT is over 70 °C (158 °F) after 10 min from cold engine start (ECT is lower than 30°C (86 °F) at engine start). (2 driving cycle detection logic)	• High resistance circuit • MAF and IAT sensor • ECM

DTC Confirmation Procedure

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature at engine start: less than 30 °C (86 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

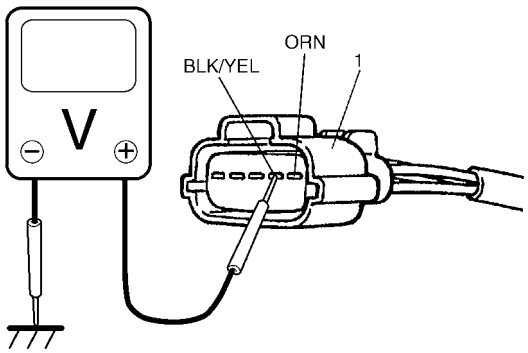
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch, clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature. (ECT approx. 70 – 205°C, 158 – 401°F)
4) Run engine at idle speed for 10 min. or more.
5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**IAT sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check intake air temp. displayed on scan tool. *Is –40 °C (–40 °F) or 119 °C (246 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".

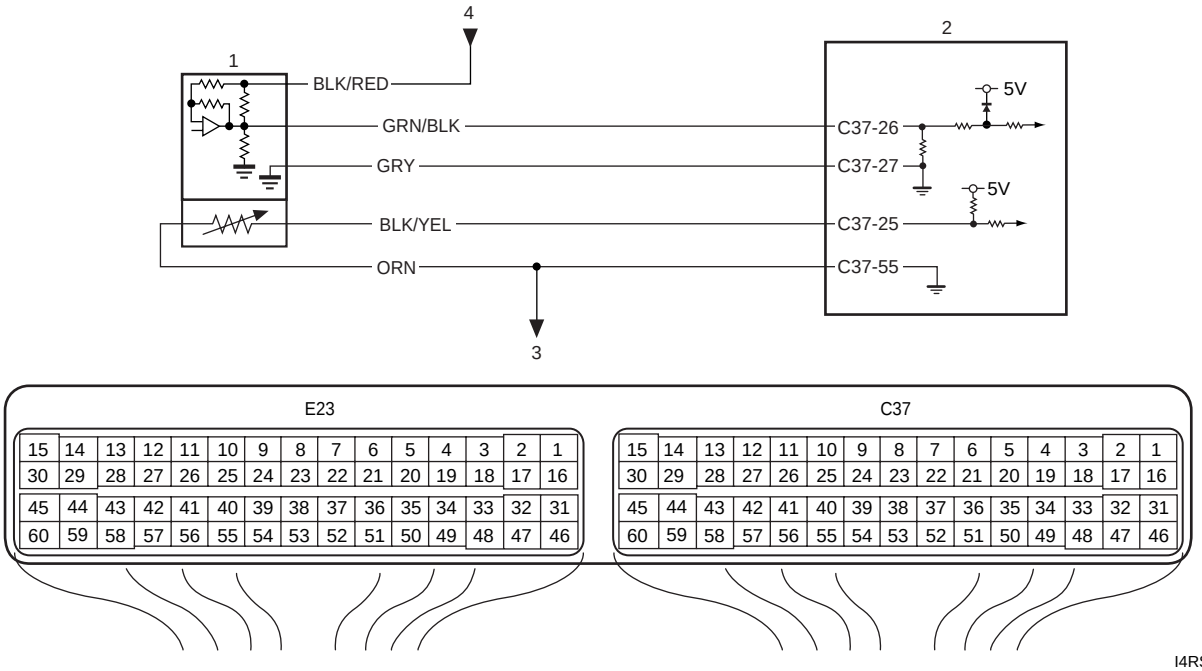
Step	Action	Yes	No
3	**Wire harness check** 1) Disconnect MAF and IAT sensor connector (1) with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor connector (1) at “BLK/YEL” and “ORN” wire terminals. 3) If OK, then with ignition switch turned ON, measure voltage between “BLK/YEL” wire terminal of MAF and IAT sensor connector and vehicle body ground.  I4RS0A110023- *Is measured voltage applied to “BLK/YEL” wire terminal about 4 – 6 V?*	Go to Step 8.	Go to Step 4.
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at “C37-25” terminal. 4) If OK, then turn ON ignition switch, measure voltage between “C37-25” terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V at terminal?*	“BLK/YEL” wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “BLK/YEL” wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	“BLK/YEL” wire is shorted to ground or other circuits. If wire is OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Turn ignition switch to ON position. 2) Measure voltage between “BLK/YEL” wire terminal of MAF and IAT sensor connector and body ground. *Is voltage about 0 V?*	Go to Step 7.	“BLK/YEL” wire is shorted to other circuits. If wire is OK, substitute a known-good ECM and recheck.
7	**Wire circuit check** 1) Measure resistance between “C37-25” terminal of ECM connector and “BLK/YEL” wire terminal of MAF and IAT sensor connector with ignition switch turned OFF. *Is resistance below 3 Ω?*	Go to Step 8.	“BLK/YEL” wire is high resistance circuit.

Step	Action	Yes	No
8	**Ground circuit check** 1) Connect connectors to ECM. 2) Check for proper connection of MAF and IAT sensor connector at “ORN” wire terminal. 3) Measure resistance between “ORN” wire terminal of MAF and IAT sensor connector and vehicle body ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 10.	Go to Step 9.
9	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 3 Ω?*	“ORN” wire is open or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
10	**IAT sensor check** 1) Check IAT sensor according to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0112: Intake Air Temperature Sensor Circuit Low

S4RS0A1104019

Wiring Diagram



I4RS0A110021-

1. MAF and IAT sensor	3. To other sensors
2. ECM	4. From main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of IAT sensor output is less than specified value (High intake air temperature (low voltage / low resistance)) (1 driving cycle detection logic)	• IAT sensor circuit • IAT sensor • ECM

DTC Confirmation Procedure

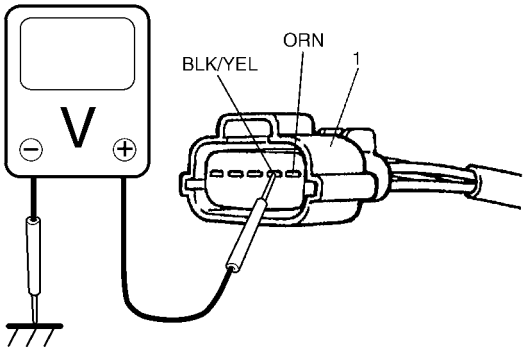
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

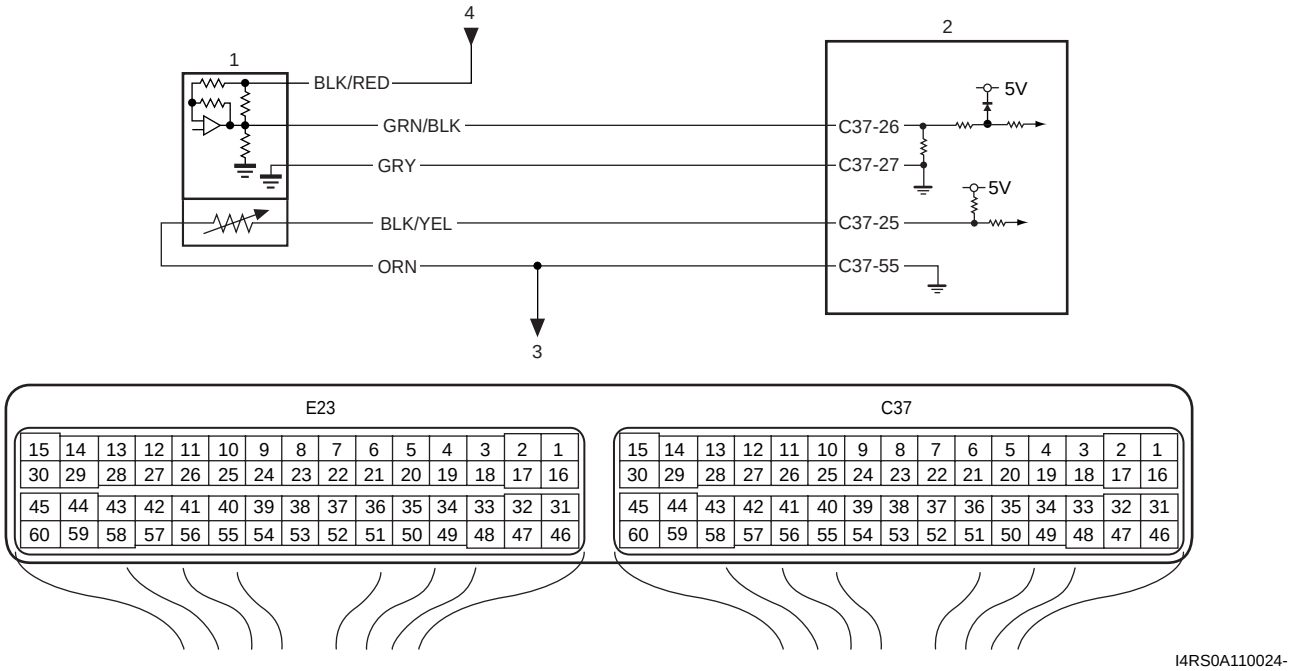
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**IAT sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake air temp. displayed on scan tool. *Is 119 °C (246 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".

Step	Action	Yes	No
3	**ECM voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor at "BLK/YEL" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector (1) and vehicle body ground.  I4RS0A110023- *Is voltage about 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**IAT short circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/YEL" wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"BLK/YEL" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
5	**IAT short circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"BLK/YEL" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**IAT sensor for performance check** 1) Check IAT sensor according to "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0113: Intake Air Temperature Sensor Circuit High

S4RS0A1104020

Wiring Diagram



I4RS0A110024-

1. MAF and IAT sensor	3. To other sensors
2. ECM	4. From main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of IAT sensor output is more than specified value (Low intake air temperature (high voltage / high resistance)) (1 driving cycle detection logic)	• IAT sensor circuit • IAT sensor • ECM

NOTE:

When DTC P0108, P0118 and P0123 are indicated together, it is possible that “ORN” wire circuit open.

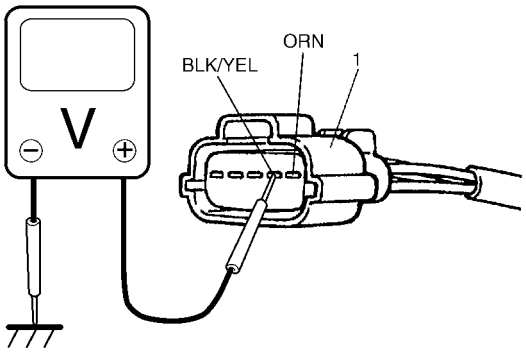
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

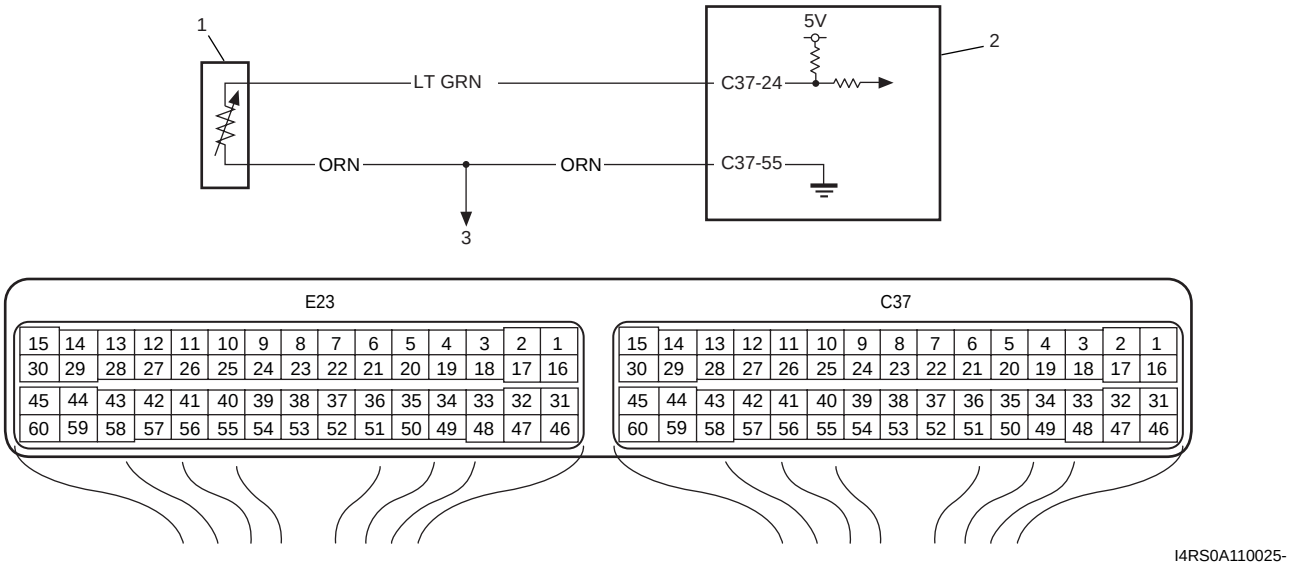
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**IAT sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake air temp. displayed on scan tool. *Is –40 °C (–40 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**IAT sensor voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor at "BLK/YEL" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector (1) and vehicle body ground.  I4RS0A110023- *Is voltage about 4 – 6 V?*	Go to Step 7.	Go to Step 4.
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-25" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-25" terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V?*	"BLK/YEL" wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"BLK/YEL" wire is shorted to other circuits. If wire is OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
6	**Wire circuit check** 1) Measure resistance between “C37-25” terminal of ECM connector and “BLK/YEL” wire terminal of MAF and IAT sensor connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 7.	“BLK/YEL” wire is high resistance circuit.
7	**Ground circuit check** 1) Connect connectors to ECM. 2) Measure resistance between “ORN” wire terminal of MAF and IAT sensor connector and body ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 9.	Go to Step 8.
8	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open circuit or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
9	**IAT sensor for performance check** 1) Check IAT sensor according to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0116: Engine Coolant Temperature Circuit Range / Performance

S4RS0A1104069

Wiring Diagram



1.	ECT sensor
2.	ECM
3.	To other sensors

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
ECT sensor values is less than –5 °C (23 °F) while engine is running under more than specified engine load (more than 1000 rpm) for 2 to 1112 min (depending on ECT at engine start) continuously from engine start. (2 driving cycle detecting logic)	• ECT sensor • ECT sensor circuit • Thermostat • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

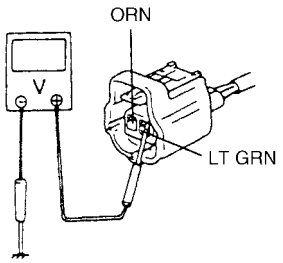
- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch, clear DTC.
3) Start engine.
4) Drive vehicle at 40 mph (60 km/h) or higher for 20 min. or more.
5) Stop vehicle.
6) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

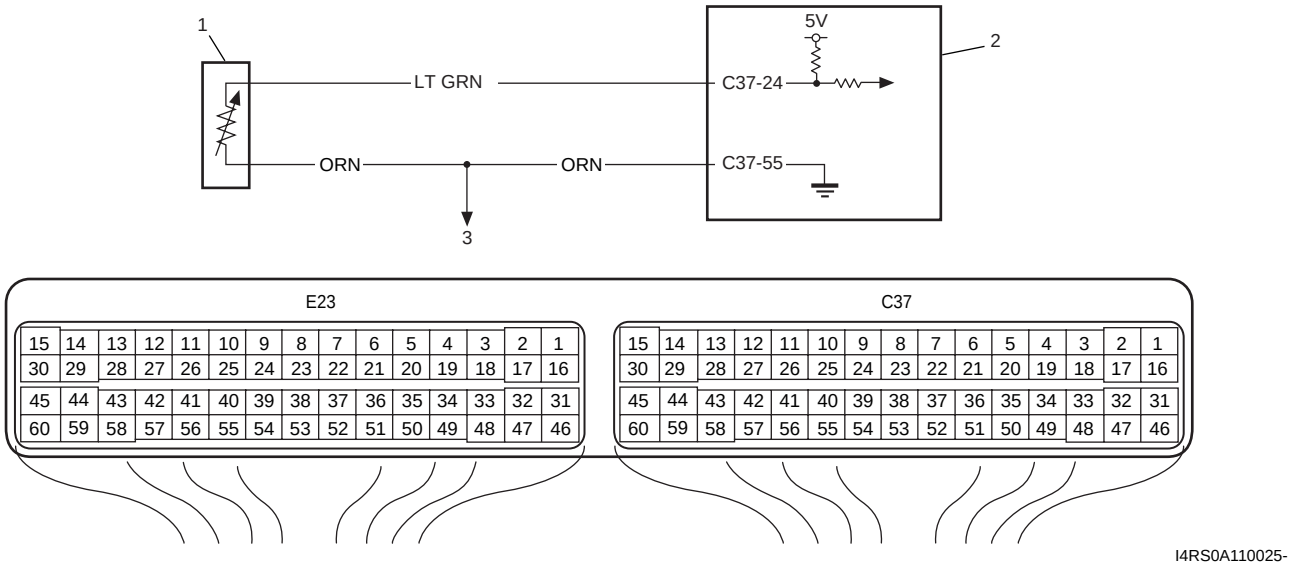
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**DTC check** 1) With ignition switch turned OFF, install scan tool to DLC. 2) Turn ON ignition switch and check DTC with scan tool. *Is DTC P0118 displayed?*	Go to "DTC P0118: Engine Coolant Temperature Circuit High: ".	Go to Step 3.
3	**Engine coolant temp. check** 1) Turn ON ignition switch and check engine coolant temp. displayed on scan tool. 2) Warm up engine to normal operating temp. and check engine coolant temp. displayed on scan tool. *Does engine coolant temp. vary more than 1 °C (1 °F) and rise higher than 70 °C (158 °F)?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 4.
4	**Thermostat check** *Is there a symptom due to thermostat remaining open (it takes a long time before vehicle heater becomes effective or before engine is warmed to normal operating temp., etc.)?*	Check thermostat referring to "Thermostat Inspection: in Section 1F".	Go to Step 5.
5	**Wire harness check** 1) Disconnect ECT sensor connector with ignition switch turned OFF. 2) Check for proper connection to ECT sensor connector at "ORN" and "LT GRN" wire terminals. 3) If OK, then with ignition switch ON, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I2RH01110067- *Is measured voltage applied to "LT GRN" wire terminal about 4 – 6 V?*	Go to Step 9.	Go to Step 6.

Step	Action	Yes	No
6	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-24" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-24" terminal of ECM connector and body ground. *Is voltage about 4 – 6 V?*	"LT GRN" wire is open circuit. If wire and connection are OK, go to Step 7.	Go to Step 7.
7	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and body ground. *Is voltage about 0 V?*	Go to Step 8.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
8	**Wire circuit check** 1) Measure resistance between "C37-24" terminal of ECM connector and "LT GRN" wire terminal of ECT sensor connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 9.	"LT GRN" wire is high resistance circuit.
9	**Ground circuit check** 1) Connect connectors to ECM. 2) Check for proper connection of ECT sensor connector at "ORN" wire terminal. 3) Measure resistance between "ORN" wire terminal of ECT sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 11.	Go to Step 10.
10	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-55" terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	"ORN" wire is open or high resistance circuit. Poor "C37-55" connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
11	**ECT sensor check** 1) Check ECT sensor according to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0117: Engine Coolant Temperature Circuit Low

S4RS0A1104021

Wiring Diagram



I4RS0A110025-

1.	ECT sensor
2.	ECM
3.	To other sensors

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of ECT sensor output is less than specified value (High engine coolant temperature (low voltage / low resistance)) (1 driving cycle detection logic)	• ECT sensor circuit • ECT sensor • ECM

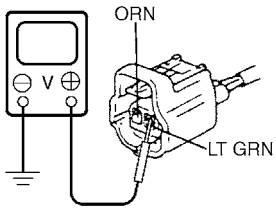
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

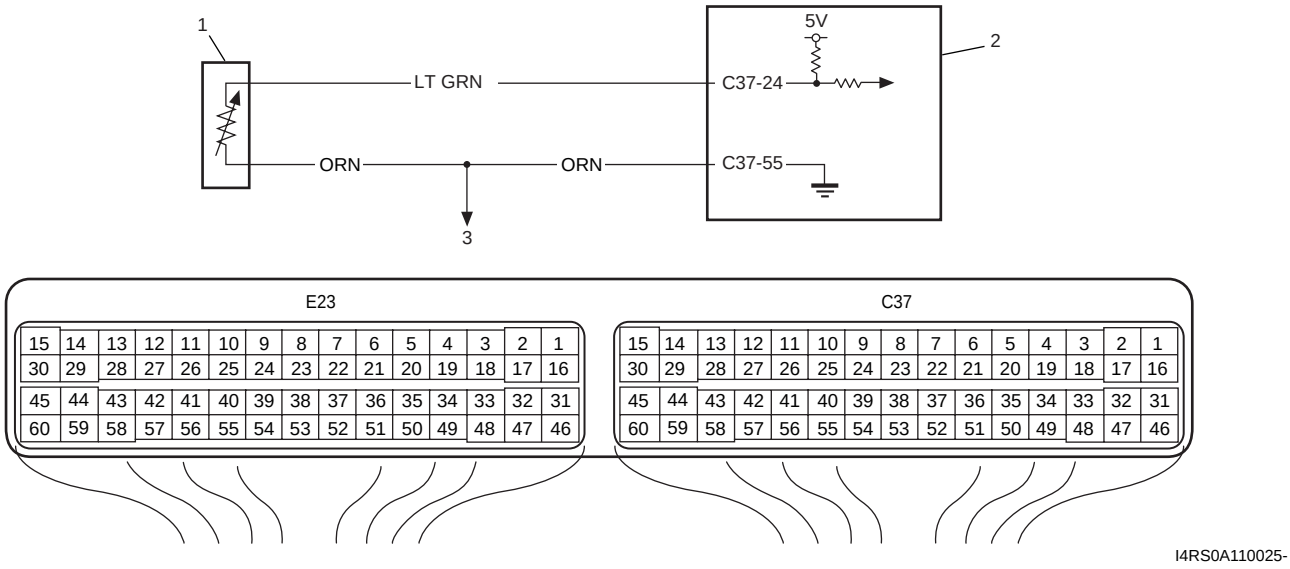
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**ECT sensor and its circuit check** 1) Connect scan tool with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check engine coolant temp. displayed on scan tool. *Is 119 °C (246 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**ECM voltage check** 1) Disconnect connector from ECT sensor with ignition switch turned OFF. 2) Check for proper connection to ECT sensor at "LT GRN" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I4RS0A110026- *Is voltage about 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**ECT sensor short circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"LT GRN" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
5	**ECT sensor short circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**ECT sensor for performance check** 1) Check ECT sensor according to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0118: Engine Coolant Temperature Circuit High

S4RS0A1104022

Wiring Diagram



I4RS0A110025-

1.	ECT sensor
2.	ECM
3.	To other sensors

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of ECT sensor output is more than specified value (Low engine coolant temperature (high voltage / high resistance)) (1 driving cycle detection logic)	• ECT sensor circuit • ECT sensor • ECM

NOTE:

When DTC P0108, P0113 and P0123 are indicated together, it is possible that "ORN" wire circuit open.

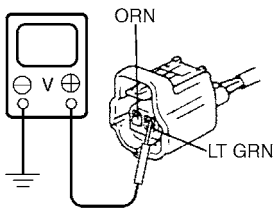
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

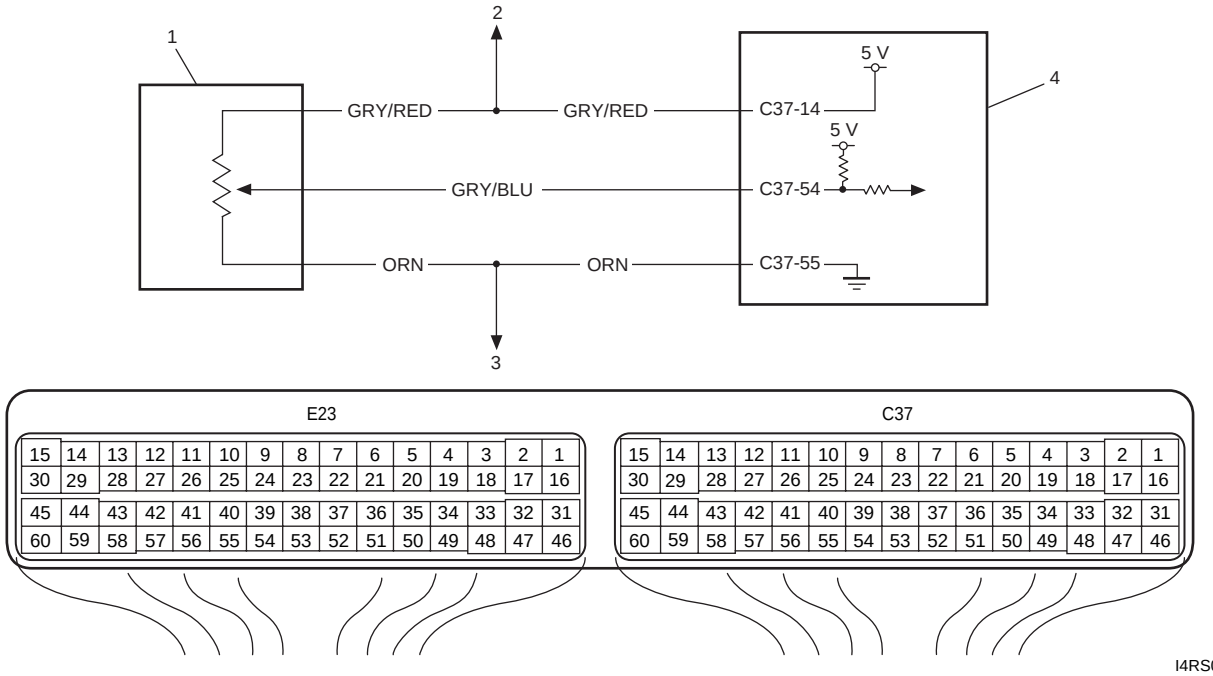
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**ECT sensor and its circuit check** 1) Connect scan tool with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check engine coolant temp. displayed on scan tool. *Is –40 °C (–40 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**ECT voltage check** 1) Disconnect connector from ECT sensor with ignition switch turned OFF. 2) Check for proper connection to ECT sensor at "LT GRN" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I4RS0A110026- *Is voltage about 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-24" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-24" wire terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V?*	"LT GRN" wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.
5	**ECT sensor harness voltage check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**ECT sensor harness resistance check** 1) Measure resistance between "C37-24" terminal of ECM connector and "LT GRN" wire terminal of ECT sensor connector with ignition switch turn OFF. *Is resistance below 5 Ω?*	Go to Step 7.	"LT GRN" wire is high resistance circuit.

Step	Action	Yes	No
7	**ECT sensor ground circuit check** 1) Connect connectors to ECM. 2) Check for proper connection of ECT sensor connector at “ORN” wire terminal. 3) Measure resistance between “ORN” wire terminal of ECT sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 9.	Go to Step 8.
8	**ECT sensor ground circuit check** 1) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open circuit or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
9	**ECT sensor for performance check** 1) Check ECT sensor according to “Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0121: Throttle Position Sensor Circuit Range / Performance

S4RS0A1104023

Wiring Diagram



I4RS0A110027-

1. TP sensor	3. To other sensors
2. To MAP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between actual throttle opening (detected from TP sensor) and opening calculated by ECM (obtained on the basis of engine speed and mass air flow) is out of specified range (–20 degree to 20 degree). (2 driving cycle detection logic)	• Throttle body • TP sensor • TP sensor circuit • ECM • MAF sensor • Idle air control valve • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

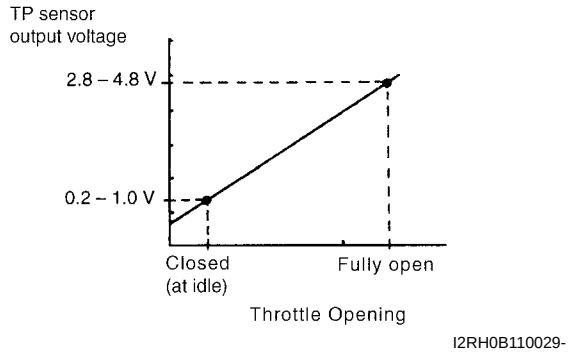
- **Intake air temperature at engine start: –10 °C (14 °C) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °C) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 60 km/h (38 mile/h) at 5th gear or D range.
5) Increase vehicle speed to 65 km/h (40 mile/h) at 5th gear or D range.
6) Release accelerator pedal to decrease vehicle speed to 60 km/h (38 mile/h).
7) Repeat Step 4) to 6) for 3 times.
8) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**TP sensor and its circuit check** 1) Turn OFF ignition switch and connect SUZUKI scan tool to DLC. 2) Turn ON ignition switch and check TP sensor output voltage when throttle valve is at idle position and fully opened.  I2RH0B110029- *Does voltage vary within specified value linearly as shown in the graph?*	Go to Step 14.	Go to Step 3.
3	**TP sensor voltage check** 1) Disconnect connector from TP sensor with ignition switch turned OFF. 2) Check for proper connection to TP sensor connector at "GRY/RED", "GRY/BLU" and "ORN" wire terminals. 3) If OK, then with ignition switch turned ON, check following terminal voltages. • Between "GRY/RED" wire terminal of TP sensor connector and vehicle body ground • Between "GRY/BLU" wire terminal of TP sensor connector and vehicle body ground *Is each terminal voltage about 4 – 6 V?*	Go to Step 11.	Go to Step 4.
4	*Was "GRY/RED" wire terminal voltage in Step 3 within specification?*	Go to Step 7.	Go to Step 5.

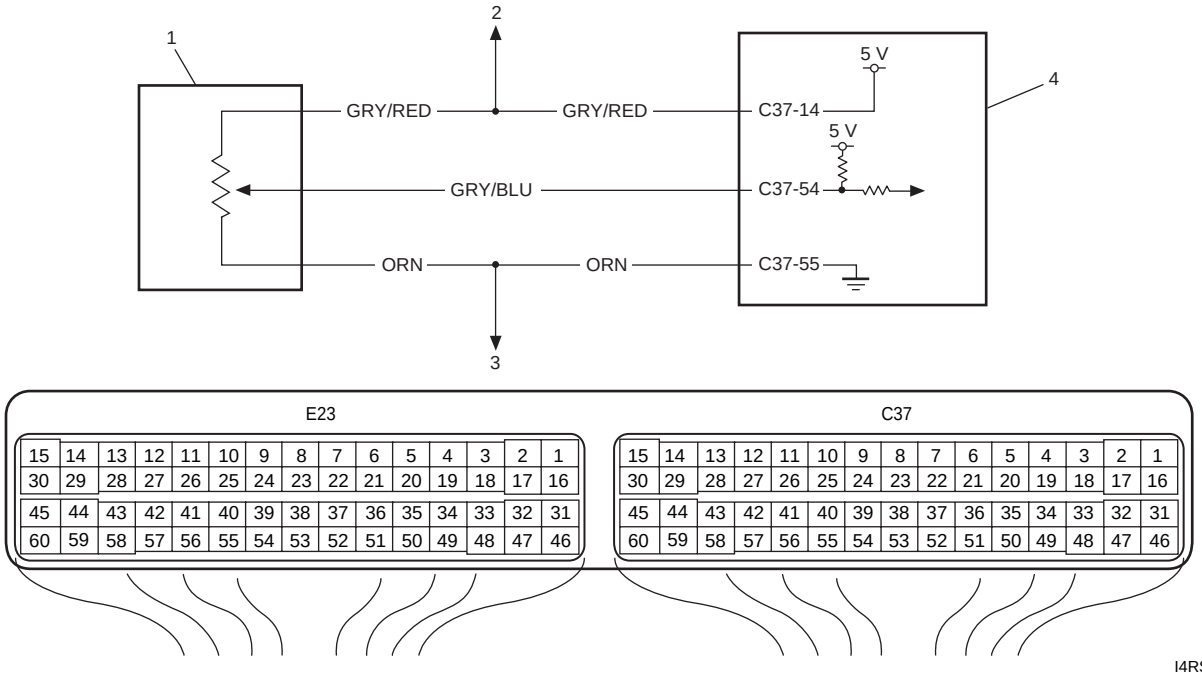
Step	Action	Yes	No
5	**Wire harness check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from MAP sensor and A/C refrigerant pressure sensor. 3) Turn ignition switch to ON position. 4) Measure voltage between “GRY/RED” wire terminal of TP sensor connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	Faulty MAP sensor and/or A/C refrigerant pressure sensor, check MAP sensor and/or A/C refrigerant pressure sensor according to “Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C” or “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: in Section 7B”.	Go to Step 6.
6	**ECM voltage check** 1) Turn ignition switch to OFF position. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at “C37-14” terminal. 4) Turn ignition switch to ON position. 5) Measure voltage between “C37-14” terminal of ECM connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	“GRY/RED” wire is open or high resistance circuit.	Go to Step 8.
7	**ECM voltage check** 1) Turn ignition switch to OFF position. 2) Check for proper connection of ECM connector at “C37-54” terminal. 3) Turn ignition switch to ON position. 4) Measure voltage between “C37-54” terminal of ECM connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	“GRY/BLU” wire is open or high resistance circuit.	Go to Step 8.
8	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “GRY/RED” wire terminal of TP sensor connector and vehicle body ground, between “GRY/BLU” wire terminal of TP sensor connector and body ground and between “GRY/BLU” and “ORN” wire terminals of TP sensor connector. *Is resistance infinity?*	Go to Step 9.	“GRY/RED” and/or “GRY/BLU” wire are shorted to ground circuit and /or “GRY/BLU” wire is shorted to “ORN” wire. If wires are OK, substitute a known-good ECM and recheck.
9	**Wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “GRY/RED” wire terminal of ECM connector and vehicle body ground and between “GRY/BLU” wire terminal of ECM connector and vehicle body ground. *Is voltage about 0 V at each terminal?*	Go to Step 10.	“GRY/RED” and/or “GRY/BLU” wire are shorted to power circuit. If wires are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
10	**Wire circuit check** 1) Measure resistance between “C37-14” terminal of ECM connector and “GRY/RED” wire terminal of TP sensor connector, between “C37-54” terminal of ECM connector and “GRY/BLU” wire terminal of TP sensor connector with ignition switch turned OFF. *Is each resistance below 5 Ω?*	Go to Step 11.	“GRY/RED” and/or “GRY/BLU” wire are high resistance circuit.
11	**Ground circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Measure resistance between “ORN” wire terminal of TP sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 13.	Go to Step 12.
12	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open circuit or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
13	**TP sensor check** 1) Measure resistance between terminals of TP sensor referring to “Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C”. *Are measured values within specifications?*	Go to Step 14.	Replace TP sensor.
14	**MAF sensor for performance check** 1) Check MAF sensor performance referring to Step 3 of “DTC P0101: Mass Air Flow Circuit Range / Performance: ”. *Is it in good condition?*	Go to Step 15.	Repair MAF and IAT sensor circuit or replace MAF and IAT sensor.
15	*Is DTC P0505 detected?*	Go to “DTC P0505: Idle Air Control System: ”.	Go to Step 16.
16	**Idle air control (IAC) valve check** 1) Check idle air control valve referring to “Idle Air Control (IAC) Valve Operation Inspection: in Section 1C”. *Is it in good condition?*	Go to Step 17.	Repair idle air control valve circuit or replace idle air control valve.
17	**Throttle body check** 1) Check throttle body for clog or leak. *Is it OK?*	Substitute a known-good ECM and recheck.	Repair throttle body.

DTC P0122: Throttle Position Sensor Circuit Low

S4RS0A1104024

Wiring Diagram



I4RS0A110027-

1. TP sensor	3. To other sensors
2. To MAP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TP sensor output is less than specified value for 0.5 seconds continuously. (1 driving cycle detection logic)	• TP sensor circuit • TP sensor • MAP sensor • A/C refrigerant pressure sensor • ECM

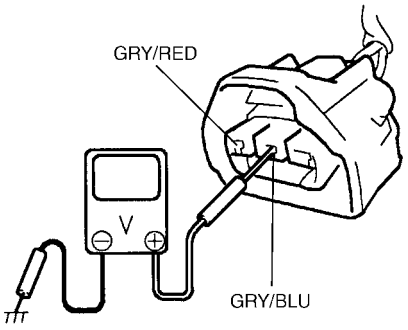
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

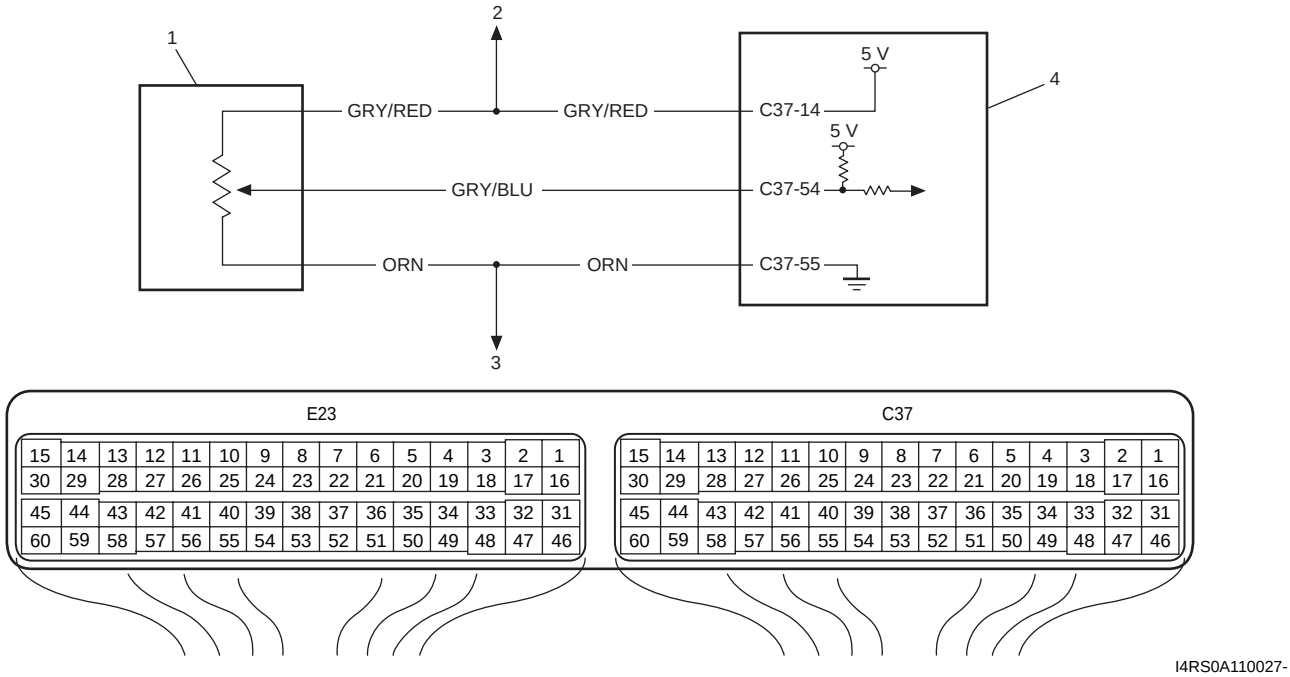
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**TP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF and then turn ON ignition switch. 2) Check throttle valve opening percentage displayed on scan tool. 3) Check throttle valve opening percentage displayed on scan tool while opening throttle valve from idle position to full open position. *Is displayed value 0%?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**Wire harness check** 1) Disconnect connector from TP sensor with ignition switch turned OFF. 2) Check for proper connection to TP sensor at "GRY/RED", "GRY/BLU" and "ORN" wire terminals. 3) If OK, then with ignition switch turned ON, check following terminal voltages. • Between "GRY/RED" wire terminal of TP sensor connector and vehicle body ground • Between "GRY/BLU" wire terminal of TP sensor connector and vehicle body ground  I4RS0A110028- *Is each terminal voltage about 4 – 6 V?*	Go to Step 7.	Go to Step 4.

Step	Action	Yes	No
4	**Wire harness check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from MAP sensor and A/C refrigerant pressure sensor. 3) Turn ignition switch to ON position. 4) Measure voltage between “GRY/RED” wire terminal of TP sensor connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	Faulty MAP sensor and/or A/C refrigerant pressure sensor, check MAP sensor and/or A/C refrigerant pressure sensor according to “Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C” or “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: in Section 7B”.	Go to Step 5.
5	**ECM voltage check** 1) Turn ignition switch to OFF position. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at “C37-14” terminal. 4) Turn ignition switch to ON position. 5) Measure voltage between “C37-14” terminal of ECM connector and vehicle body ground. *Is terminal voltage about 4 – 6 V?*	“GRY/RED” wire is open or high resistance circuit.	Go to Step 6.
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turn OFF. 2) Measure resistance between “GRY/RED” wire terminal of TP sensor connector and vehicle body ground, between “GRY/BLU” wire terminal of TP sensor connector and vehicle body ground and between “GRY/BLU” and “ORN” wire terminals of TP sensor connector. *Is resistance infinity?*	Go to Step 7.	“GRY/RED” and/or “GRY/BLU” wires are shorted to ground circuit and/or “GRY/BLU” wire is shorted to “ORN” wire. If wires are OK, substitute a known-good ECM and recheck.
7	**TP sensor check** 1) Measure resistance between terminals of TP sensor referring to “Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C”. *Are measured values within specifications?*	Substitute a known-good ECM and recheck.	Replace TP sensor.

DTC P0123: Throttle Position Sensor Circuit High

S4RS0A1104025

Wiring Diagram



I4RS0A110027-

1. TP sensor	3. To other sensors
2. To MAP sensor and A/C refrigerant pressure sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TP sensor output is more than specified value for 0.5 seconds continuously. (1 driving cycle detection logic)	• TP sensor circuit • TP sensor • MAP sensor • A/C refrigerant pressure sensor • ECM

DTC Confirmation Procedure

NOTE:

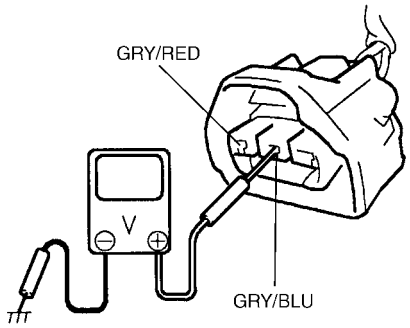
When DTC P0108, P0113 and P0118 are indicated together, it is possible that “ORN” wire circuit open.

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

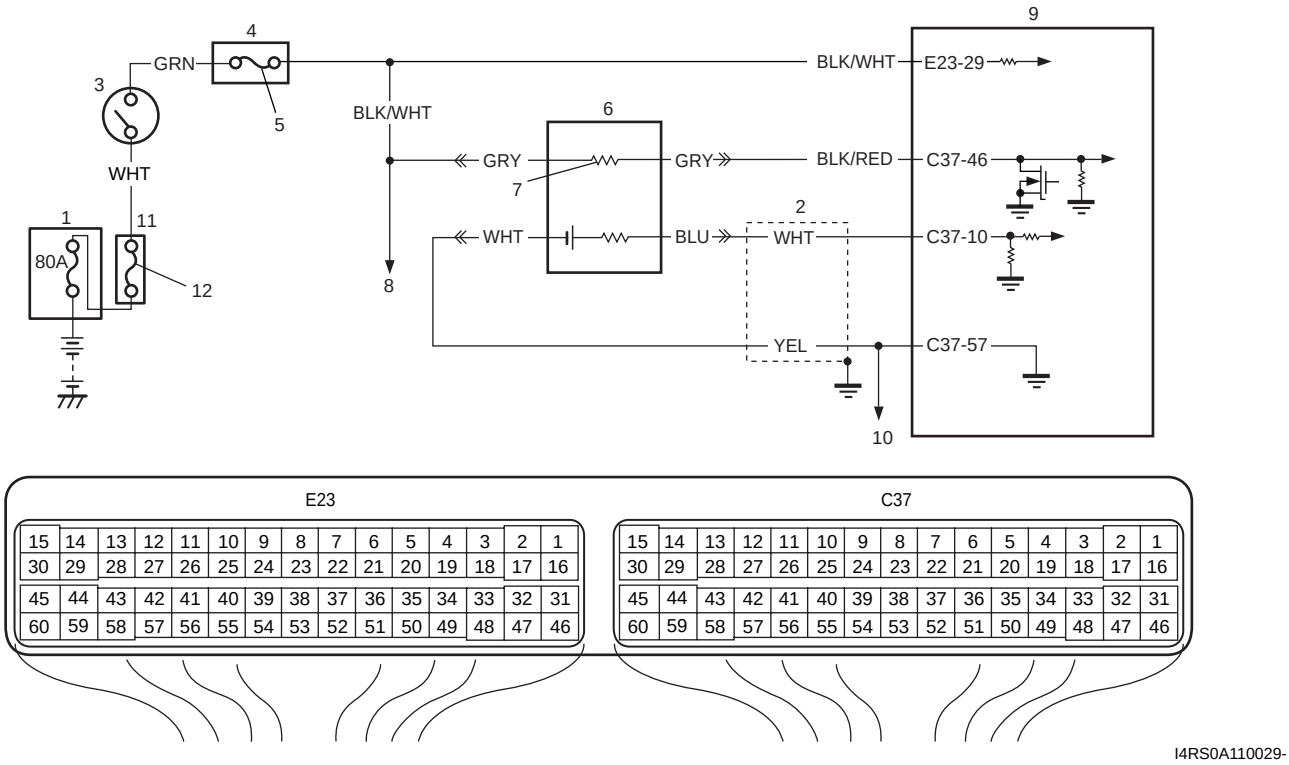
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**TP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF and then turn ON ignition switch. 2) Check throttle valve opening percentage displayed on scan tool. 3) Check throttle valve opening percentage displayed on scan tool while opening throttle valve from idle position to full open position. *Is displayed value 100%?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**Wire harness check** 1) Disconnect connector from TP sensor with ignition switch turned OFF. 2) Check for proper connection to TP sensor at "GRY/RED", "GRY/BLU" and "ORN" wire terminals. 3) If OK, then with ignition switch turned ON, check following terminal voltages. • Between "GRY/RED" wire terminal of TP sensor connector and vehicle body ground • Between "GRY/BLU" wire terminal of TP sensor connector and vehicle body ground  I4RS0A110028- *Is each terminal voltage about 4 – 6 V?*	Go to Step 8.	Go to Step 4.
4	*Was "GRY/RED" wire terminal voltage in Step 3 within specification?*	Go to Step 6.	Go to Step 5.
5	**Wire harness check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Check for proper connection of ECM connector at "C37-14" terminal. 4) Turn ignition switch to ON position. 5) Measure voltage between "GRY/RED" wire terminal of TP sensor connector and vehicle body ground. *Is terminal voltage about 0 V?*	Substitute a known-good ECM and recheck.	"GRY/RED" wire is shorted to power circuit.

Step	Action	Yes	No
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check for proper connection of ECM connector at "C37-54" terminal. 4) Measure voltage between "GRY/BLU" wire terminal of TP sensor connector and vehicle body ground. *Is voltage about 0 V at each terminal?*	Go to Step 7.	"GRY/BLU" wire is shorted to power circuit. If wire is OK, substitute a known-good ECM and recheck.
7	**Wire circuit check** 1) Measure resistance between "C37-54" wire terminal of ECM connector and "GRY/BLU" wire terminal of TP sensor connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 8.	"GRY/BLU" wire is open or high resistance circuit.
8	**Ground circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Measure resistance between "ORN" wire terminal of TP sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 10.	Go to Step 9.
9	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-55" terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	"ORN" wire is open circuit or high resistance circuit. Poor "C37-55" connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
10	**TP sensor check** 1) Measure resistance between terminals of TP sensor referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". *Are measured values within specifications?*	Substitute a known-good ECM and recheck.	Replace TP sensor.

DTC P0131 / P0132: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-1)

S4RS0A1104026

Wiring Diagram



I4RS0A110029-

1. Main fuse box	4. Junction block assembly	7. Heater	10. To other sensors
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-2 heater	11. Relay box
3. Ignition switch	6. HO2S-1	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0131: Maximum HO2S voltage is less than 0.6 V (2 driving cycle detection logic) **DTC P0132:** Minimum HO2S voltage is 0.34 V or more (*2 driving cycle detection logic, monitoring once / 1 driving)	• HO2S-1 circuit • HO2S-1 • Fuel system • ECM • Fuel shortage • Exhaust system • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 72 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 40 mph (60 km/h) or higher. (engine speed: 2500 – 3000 r/min.)
5) Keep above vehicle speed for 6 min. or more. (Throttle valve opening is kept constant in this step.)
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 3 sec. or more) and then stop vehicle.
7) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

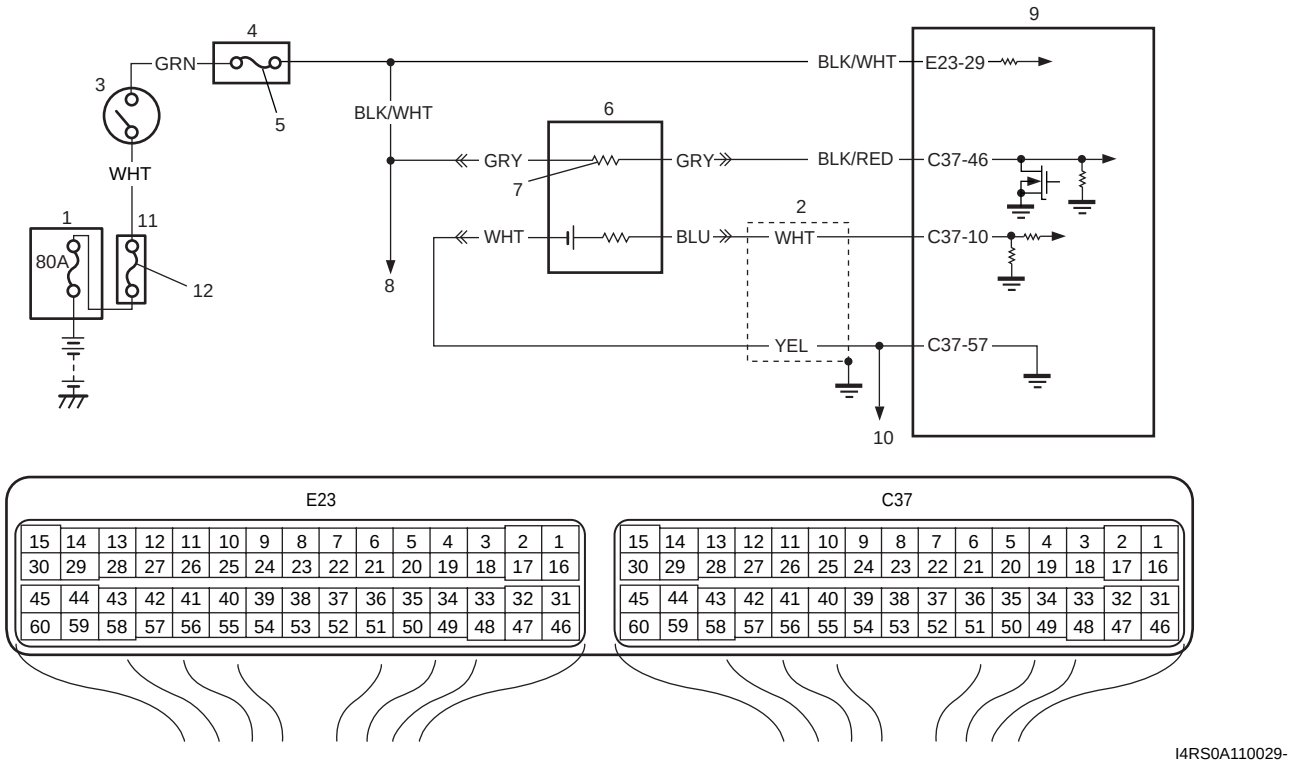
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is there DTC(s) other than HO2S-1?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**HO2S-1 signal check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it). *Does HO2S-1 output voltage deflect between below 0.3 V and over 0.6 V repeatedly?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If check result is OK, go to Step 9.	Go to Step 4.
4	**HO2S-1 ground check** 1) Disconnect connector from HO2S-1 with ignition switch turned OFF. 2) Check for proper connection to HO2S-1 connector at "BLK/RED", "WHT", "BLK/WHT" and "YEL" wire terminals. 3) If connections are OK, measure resistance between "YEL" wire terminal of HO2S-1 connector and engine ground. *Is measured resistance less than 5 Ω?*	Go to Step 5.	"YEL" wire is open circuit or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
5	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between “WHT” wire terminal of HO2S-1 connector and “C37-10” terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 6.	“WHT” wire is high resistance circuit or open circuit. Poor “C37-10” terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turn OFF. 2) Measure resistance between “WHT” wire terminal of HO2S-1 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	“WHT” wire is shorted to ground circuit.
7	**HO2S-1 signal circuit check** 1) Measure voltage between “WHT” wire terminal of HO2S-1 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	“WHT” wire is shorted to other circuits.
8	**HO2S-1 heater circuit check** 1) Check HO2S-1 heater circuit referring to “DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1): ”. *Is circuit in good condition?*	Go to Step 9.	Repair HO2S-1 circuit.
9	**Exhaust system check** 1) Check exhaust system for exhaust gas leakage. *Is it OK?*	Go to Step 4 in “DTC P0171 / P0172: Fuel System Too Lean / Rich: ”. If it is in good condition, go to Step 10.	Repair leakage of exhaust system for leakage.
10	**Air intake system check** 1) Check air intake system for clog or leak. *Is it OK?*	Check HO2S-1 referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C”. If it is in good condition, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0133: O2 Sensor (HO2S) Circuit Slow Response (Sensor-1)

S4RS0A1104027

Wiring Diagram



I4RS0A110029-

1. Battery fuse box	4. Junction block assembly	7. Heater	10. To HO2S-2
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-2 heater	11. Relay box
3. Ignition switch	6. HO2S-1	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Response time (time to change from lean to rich or from rich to lean) of HO2S-1 output voltage is about 1 sec. at minimum or average time of 1 cycle is 5 sec. at minimum. (*2 driving cycle detection logic, monitoring once / 1 driving)	Heated oxygen sensor-1

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this “DTC Confirmation Procedure”.

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 40 mph (60 km/h) or higher. (engine speed: 2500 – 3000 r/min.)

5) Keep above vehicle speed for 6 min. or more. (Throttle valve opening is kept constant in this step.)
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 3 sec. or more) and then stop vehicle.
7) Check if DTC and pending DTC exist by using scan tool. If not, check if oxygen sensor monitoring test has been completed by using scan tool. If not in both of above checks (i.e., no DTC and pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 6).

DTC Troubleshooting

NOTE:

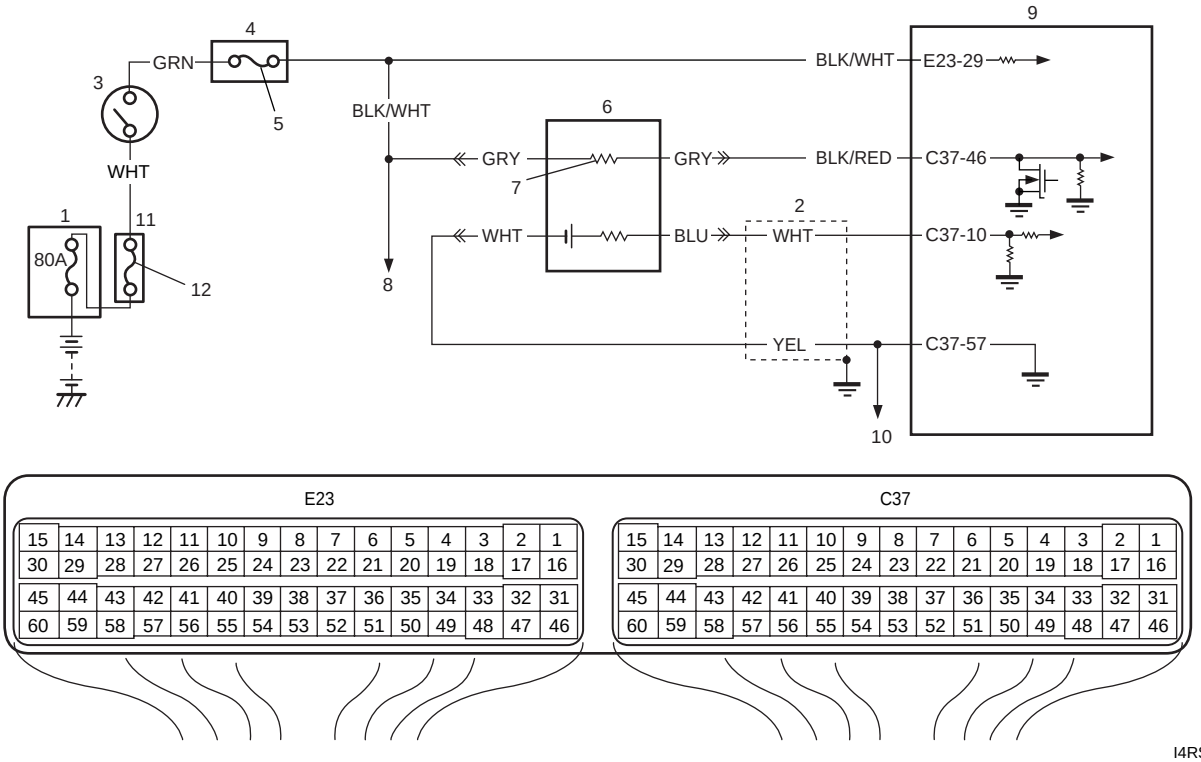
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is there DTC(s) other than HO2S-1 (DTC P0133)?*	Go to applicable DTC diag. flow.	Replace HO2S-1.

DTC P0134: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-1)

S4RS0A1104028

Wiring Diagram



I4RS0A110029-

1. Battery fuse box	4. Junction block assembly	7. Heater	10. To HO2S-2
2. Shield wire	5. "IG COIL" fuse	8. To HO2S-2 heater	11. Relay box
3. Ignition switch	6. HO2S-1	9. ECM	12. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HO2S voltage is higher than 0.6 V for more than 1 min continuously after warming up engine or HO2S voltage is lower than 0.3 V for more than 1 min continuously after warming up engine. (2 driving cycle detection logic)	• HO2S-1 • HO2S-1 circuit • Fuel system • Exhaust gas leakage • ECM • Fuel shortage • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine Coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 40 mph (60 km/h) or higher. (engine speed: 2500 – 3000 r/min.)
5) Keep above vehicle speed for 6 min. or more. (Throttle valve opening is kept constant in this step.)
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 3 sec. or more) and then stop vehicle.
7) Check if DTC and pending DTC exist by using scan tool. If not, check if oxygen sensor monitoring test has been completed by using scan tool. If not in both of above checks (i.e., no DTC and pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 6).

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

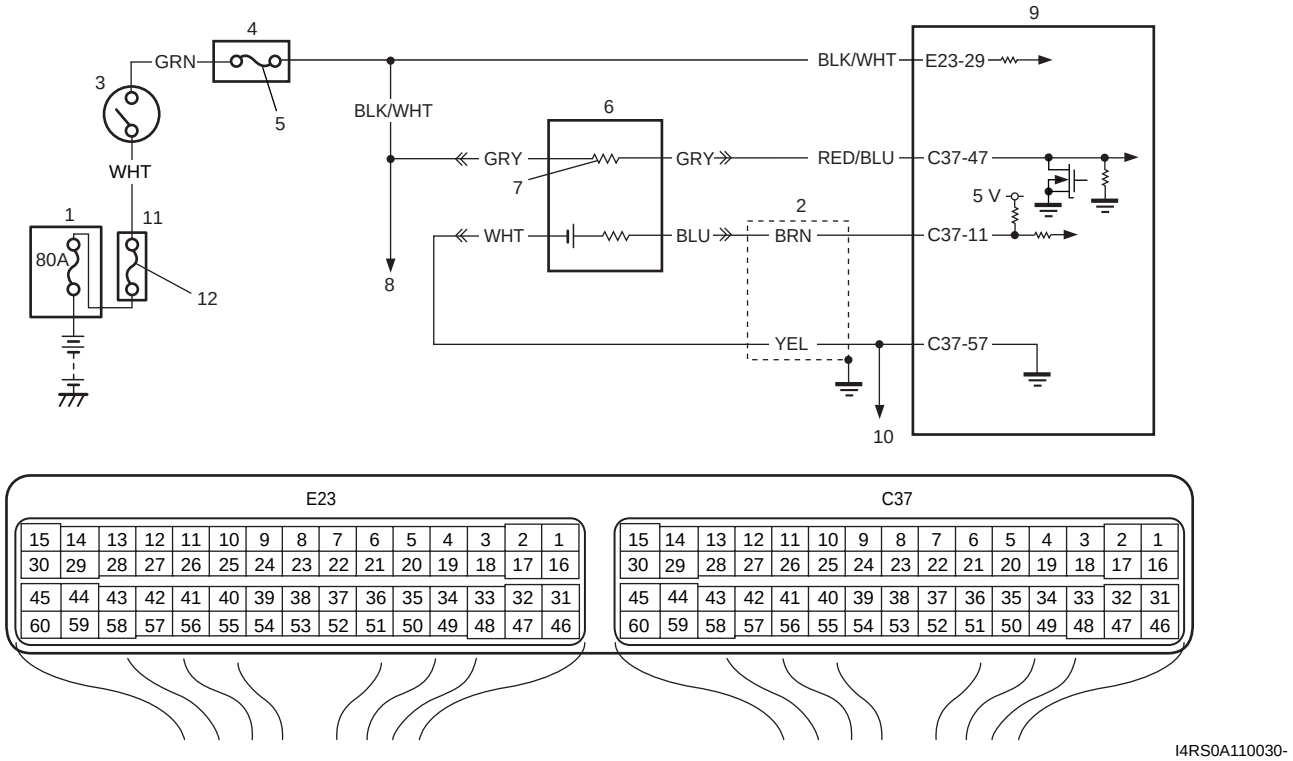
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**HO2S-1 output voltage check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it) and check HO2S output voltages displayed on scan tool. *Is over 0.6 V and below 0.3 V indicated?*	Intermittent trouble, check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If check result is OK, go to Step 3.	Go to Step 3.
3	**HO2S-1 ground check** 1) Disconnect connector from HO2S-1 with ignition switch turned OFF. 2) Check for proper connection to HO2S-1 at "BLK/RED", "WHT", "BLK/WHT" and "YEL" wire terminals. 3) If wire and connection are OK, measure resistance between "YEL" wire terminal of HO2S-1 connector and engine ground. *Is resistance less than 5 Ω?*	Go to Step 4.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
4	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "WHT" wire terminal of HO2S-1 connector and "C37-10" terminal. *Is resistance less than 5 Ω?*	Go to Step 5.	"WHT" wire is high resistance circuit or open circuit. Poor "C37-10" terminal connection of ECM connector. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "WHT" wire terminal of HO2S-1 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"WHT" wire is shorted to ground circuit.
6	**HO2S-1 heater circuit check** 1) Check HO2S-1 heater circuit referring to "DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1): ". *Is it in good condition?*	Go to Step 7.	Repair HO2S-1 circuit.
7	**Exhaust system check** 1) Check exhaust system for exhaust gas leakage. *Is it OK?*	Go to Step 4 in "DTC P0171 / P0172: Fuel System Too Lean / Rich: ". If it is in good condition, go to Step 8.	Repair leakage of exhaust system.

Step	Action	Yes	No
8	**Air intake system check** 1) Check air intake system for clog or leak. *Is it OK?*	Check HO2S-1 referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C”. If it is in good condition, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2)

S4RS0A1104070

Wiring Diagram



I4RS0A110030-

1. Battery fuse box	4. Junction block assembly	7. Heater	10. To other sensors
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-1 heater	11. Relay box
3. Ignition switch	6. HO2S-2	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0137: HO2S-2 voltage is lower than 0.4 V while engine is idling after driving with high engine load (high speed) for specified time. And HO2S-2 max. voltage minus HO2S-2 min. voltage is less than 0.2 V for 40 sec continuously. (2 driving cycle detection logic) **DTC P0138:** HO2S-2 voltage is higher than 0.85 V while engine is idling after driving with high engine load (high speed) for specified time. And HO2S-2 max. voltage minus HO2S-2 min. voltage is less than 0.2 V for 40 sec continuously. (2 driving cycle detection logic)	• HO2S-2 • HO2S-2 circuit • Fuel system • ECM • Fuel shortage • Exhaust system • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine Coolant temperature: 70 °C (158 °F) to 150 °C (302°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Increase vehicle speed to 60 – 80 km/h (37 – 50 mile/h) at 5th gear or D range.
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 4 sec. or more), then stop vehicle and run engine at idle speed for 60 sec. or more.
6) Repeat Step 4).
7) Keep above vehicle speed for 8 min. or more. (Throttle valve opening is kept constant in this step.)
8) Repeat Step 5).
9) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

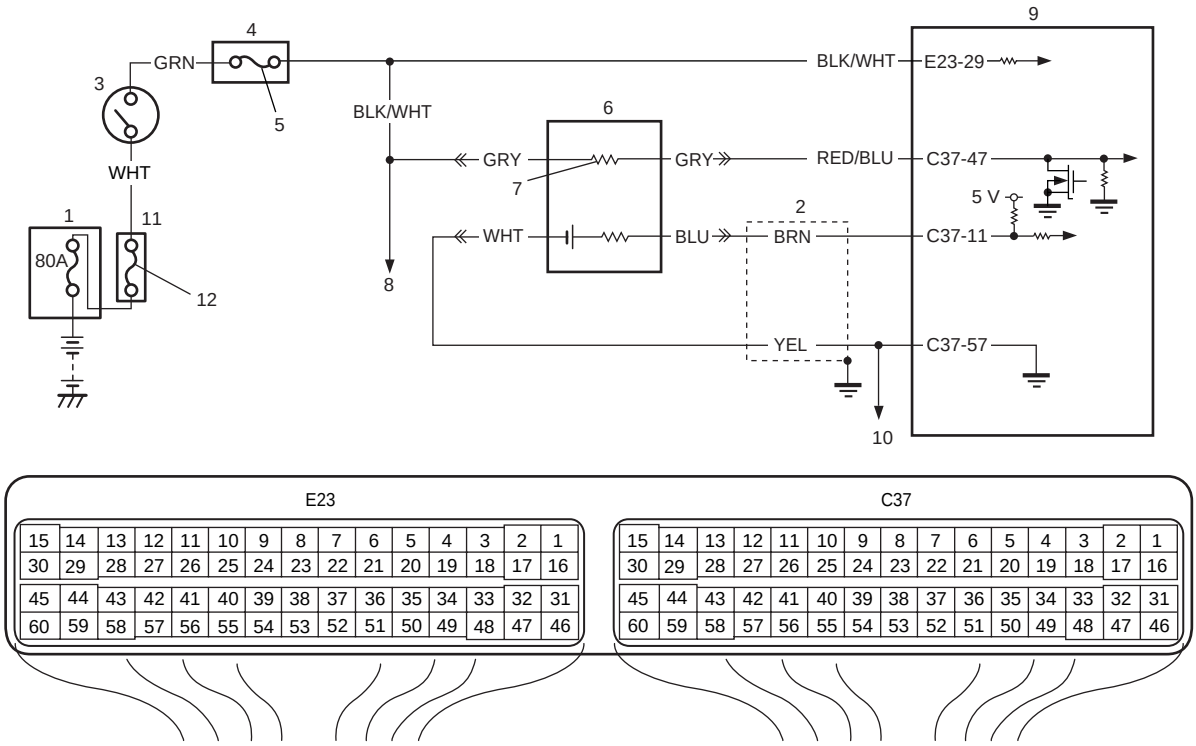
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is there DTC(s) other than fuel system (DTC P0171 / P0172) and HO2S-2 (DTC P0140)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**HO2S-2 and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it). *Does HO2S-2 output voltage indicate deflection between over 0.35 V and below 0.25 V?*	Go to "DTC P0171 / P0172: Fuel System Too Lean / Rich: ".	Go to Step 4.

Step	Action	Yes	No
4	**HO2S-2 ground check** 1) Disconnect connector from HO2S-2 with ignition switch turned OFF. 2) Check for proper connection to HO2S-2 connector at "RED/BLU", "BRN", "YEL" and "BLK/WHT" wire terminals. 3) If connections are OK, measure resistance between "YEL" wire terminal of HO2S-2 connector and engine ground. *Is resistance less than 5 Ω?*	Go to Step 5.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
5	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "BRN" wire terminal of HO2S-2 connector and "C37-11" terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 6.	"BRN" wire is high resistance circuit or open circuit. Poor "C37-11" terminal connection. If they are OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BRN" wire terminal of HO2S-2 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	"BRN" wire is shorted to ground circuit.
7	**HO2S-2 signal circuit check** 1) Measure voltage between "BRN" wire terminal of HO2S-2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	"BRN" wire is shorted to other circuit.
8	**HO2S-2 heater circuit check** 1) Check HO2S-2 heater circuit referring to "DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2): ". *Is circuit in good condition?*	Go to Step 9.	Repair HO2S-2 circuit
9	**Exhaust system check** 1) Check exhaust system for exhaust gas leakage. *Is it OK?*	Go to Step 4 in "DTC P0171 / P0172: Fuel System Too Lean / Rich: ". If it is in good condition, go to Step 10.	Repair leakage of exhaust system.
10	**Air intake system check** 1) Check air intake system for clog or leak. *Is it OK?*	Check HO2S-2 referring to "Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C". If it is in good condition, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0140: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-2)

S4RS0A1104030

Wiring Diagram



I4RS0A110030-

1. Main fuse box	4. Junction block assembly	7. Heater	10. To other sensors
2. Shield wire	5. "IG COIL" fuse	8. To HO2S-1 heater	11. Relay box
3. Ignition switch	6. HO2S-2	9. ECM	12. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HO2S-2 voltage is higher than specified value after warming up engine (circuit open). (2 driving cycle detection logic)	• HO2S-2 • HO2S-2 circuit • ECM • Exhaust gas leakage • Air intake system

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Increase vehicle speed to 60 – 80 km/h (37 – 50 mile/h) at 5th gear or D range.
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 4 sec. or more), then stop vehicle and run engine at idle speed for 60 sec. or more.
6) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**HO2S-2 ground check** 1) Disconnect connector from HO2S-2 with ignition switch turned OFF. 2) Check for proper connection to HO2S-2 connector at "RED/BLU", "BRN", "YEL" and "BLK/WHT" wire terminals. 3) If connections are OK, measure resistance between "YEL" wire terminal of HO2S-2 connector and engine ground. *Is resistance less than 5 Ω?*	Go to Step 3.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
3	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "BRN" wire terminal of HO2S-2 connector and "C37-11" terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 4.	"BRN" wire is high resistance circuit or open circuit. Poor "C37-11" terminal connection. If they are OK, substitute a known-good ECM and recheck.
4	**HO2S-2 signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between "BRN" wire terminal of HO2S-2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 5.	"BRN" wire is shorted to other circuits.
5	**HO2S-2 heater circuit check** 1) Check HO2S-2 heater circuit referring to "DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2): ". *Is circuit in good condition?*	Go to Step 6.	Repair HO2S-2 circuit. If circuit is OK, substitute a known-good ECM and recheck.
6	**HO2S-2 check** 1) Check HO2S-2 referring to "Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace HO2S-2.

DTC P0171 / P0172: Fuel System Too Lean / Rich

S4RS0A1104032

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0171: Total fuel trim is higher than 35% or short term fuel trim is higher than 20% for more than 1 min. continuously. (2 driving cycle detection logic) **DTC P0172:** Total fuel trim is lower than –35% or short term fuel trim is lower than –20% for more than 1 min. continuously. (2 driving cycle detection logic)	• Vacuum leakage • Exhaust gas leakage • Fuel pressure out of specification • Fuel injector malfunction • Heated oxygen sensor-1 malfunction • MAF sensor malfunction • ECT sensor malfunction

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and print freeze frame data or write them down using scan tool.
3) Clear DTC using scan tool.
4) Start engine and warm up to normal operating temperature.
5) Operate vehicle with condition as noted freeze frame data for 5 min.
6) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is there DTC(s) other than fuel system (DTC P0171 / P0172)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Intake system and exhaust system for leakage check** *Are intake system and exhaust system in good condition?*	Go to Step 4.	Repair or replace defective part.
4	**Fuel pressure check** 1) Check fuel pressure referring to "Fuel Pressure Check: ". *Is check result satisfactory?*	Go to Step 5.	Repair or replace defective part.
5	**Fuel injectors and its circuit check** 1) Check fuel injectors referring to "Fuel Injector Inspection: in Section 1G". *Is check result satisfactory?*	Go to Step 6.	Faulty injector(s) or its circuit.
6	**Visual inspection** 1) Check MAF sensor and air intake system. • Objects which block measuring duct and resistor of MAF sensor. • Other air flow which does not pass the MAF sensor. *Are they in good condition?*	Go to Step 7.	Repair or replace detective part.
7	**MAF sensor for performance check** 1) With ignition switch turned OFF, install scan tool. 2) Start engine and warm up to normal operating temperature. 3) Check MAF value using scan tool (Refer to "Scan Tool Data: " for normal value.). *Is each value within specified range?*	Go to Step 8.	Go to "DTC P0101: Mass Air Flow Circuit Range / Performance: ".
8	**ECT sensor for performance check** 1) Check ECT sensor referring to Step 3 and 4 of "DTC P0118: Engine Coolant Temperature Circuit High: ". *Is check result satisfactory?*	Go to Step 9.	Faulty ECT sensor or its circuit.
9	**HO2S-1 for performance check** 1) Check HO2S-1 referring to Step 3 of "DTC P0131 / P0132: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-1): ". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Faulty HO2S-1 or its circuit.

DTC P0300 / P0301 / P0302 / P0303 / P0304: Random Misfire Detected / Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Misfire Detected

S4RS0A1104033

System Description

ECM measures the angle of the crankshaft based on the pulse signal from the CKP sensor and CMP sensor for each cylinder. If it detects a large change in the angle speed of the crankshaft, it concludes occurrence of a misfire. When the number of misfire is counted by ECM beyond the DTC detecting condition, it determines the cylinder where the misfire occurred and output it as DTC.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0300: • Misfire, which causes catalyst to overheat during 200 engine revolutions, is detected at 2 or more cylinders. (MIL flashes as long as this misfire occurs continuously.) or • Misfire, which affects exhaust emission adversely during 1000 engine revolution, is detected at 2 or more cylinders. (2 driving cycle detection logic)	• Ignition system • Fuel injector and its circuit • Fuel pressure • EGR system • Abnormal air drawn in • Engine compression • Valve lash adjuster • Valve timing • Fuel shortage
DTC P0301, P0302, P0303, P0304: • Misfire, which causes catalyst to overheat during 200 engine revolutions, is detected at 1 cylinder. (MIL flashes as long as this misfire occurs continuously.) or • Misfire, which affects exhaust emission adversely during 1000 engine revolution, is detected at 1 cylinder. (2 driving cycle detection logic)	

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temp.: –7 °C, 19.4 °F or higher**
- **Engine coolant temp.: –10 °C, 14 °F or higher**
- **Altitude (barometric pressure): 2500 m, 8200 ft or less (540 mmHg, 72 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and print freeze frame data or write them down using scan tool.
3) Clear DTC using scan tool.
4) Drive vehicle under condition as noted freeze frame data for 1 min. or more.
5) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE:

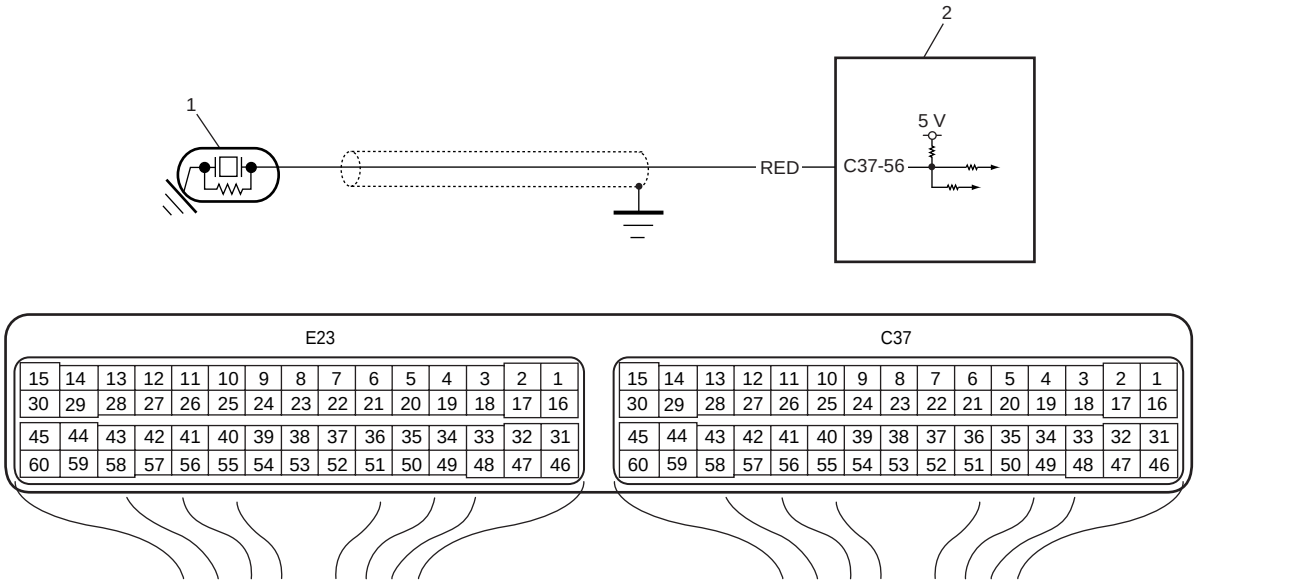
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Does fuel level meter indicate "E" level (empty)?*	Add fuel and recheck.	Go to Step 3.
3	**Ignition system check** 1) Check spark plug and ignition spark of cylinder where misfire occurs, referring to "Spark Plug Inspection: in Section 1H" and "Ignition Spark Test: in Section 1H". *Are they in good condition?*	Go to Step 4.	Faulty ignition coil, wire harness, spark plug or other system parts.
4	**Fuel injector circuit check** 1) Using sound scope, check each injector operating sound at engine cranking or idling. *Do all injectors make operating sound?*	Go to Step 5.	Check coupler connection and wire harness of injector not making operating sound and injector itself. If OK, substitute a known-good ECM and recheck.
5	**Fuel pressure check** 1) Check fuel pressure referring to "Fuel Pressure Check: ". *Is check result satisfactory?*	Go to Step 6.	Repair or replace fuel system.
6	**Fuel injector check** 1) Check fuel injector(s) referring to "Fuel Injector Inspection: in Section 1G". *Is check result satisfactory?*	Go to Step 7.	Replace defective injector.
7	**Ignition timing check** 1) Check ignition timing referring to "Ignition Timing Inspection: in Section 1H". *Is check result satisfactory?*	Go to Step 8.	Check related sensors.
8	**EGR system check** 1) Check EGR system referring to "EGR System Inspection: in Section 1B". *Is check result satisfactory?*	Go to Step 9.	Repair or replace EGR system.
9	**Engine mechanical system check** 1) Check engine mechanical parts or system which can cause engine rough idle or poor performance. • Engine compression (Refer to "Compression Check: in Section 1D".) • Valve lash (Refer to "Valve Lash (Clearance) Inspection: in Section 1D".) • Valve timing (Refer to "Timing Chain and Chain Tensioner Removal and Installation: in Section 1D".) *Are they in good condition?*	Check wire harness and connection of ECM ground, ignition system and fuel injector for intermittent open and short.	Repair or replace defective engine part.

DTC P0327 / P0328: Knock Sensor Circuit Low / High

S4RS0A1104034

Wiring Diagram



I4RS0A110031-

1. Knock sensor
2. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. **DTC P0327:** • Engine is running • Voltage of knock sensor is less than 1.23 V (1 driving cycle detection logic) **DTC P0328:** • Engine is running • Voltage of knock sensor is 3.91 V or more (1 driving cycle detection logic)	• Knock sensor circuit (open or short) • Knock sensor • ECM

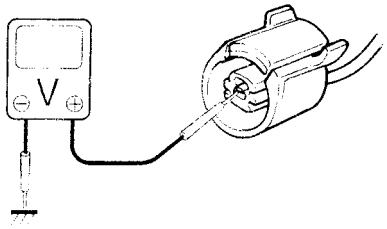
DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC by using scan tool.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

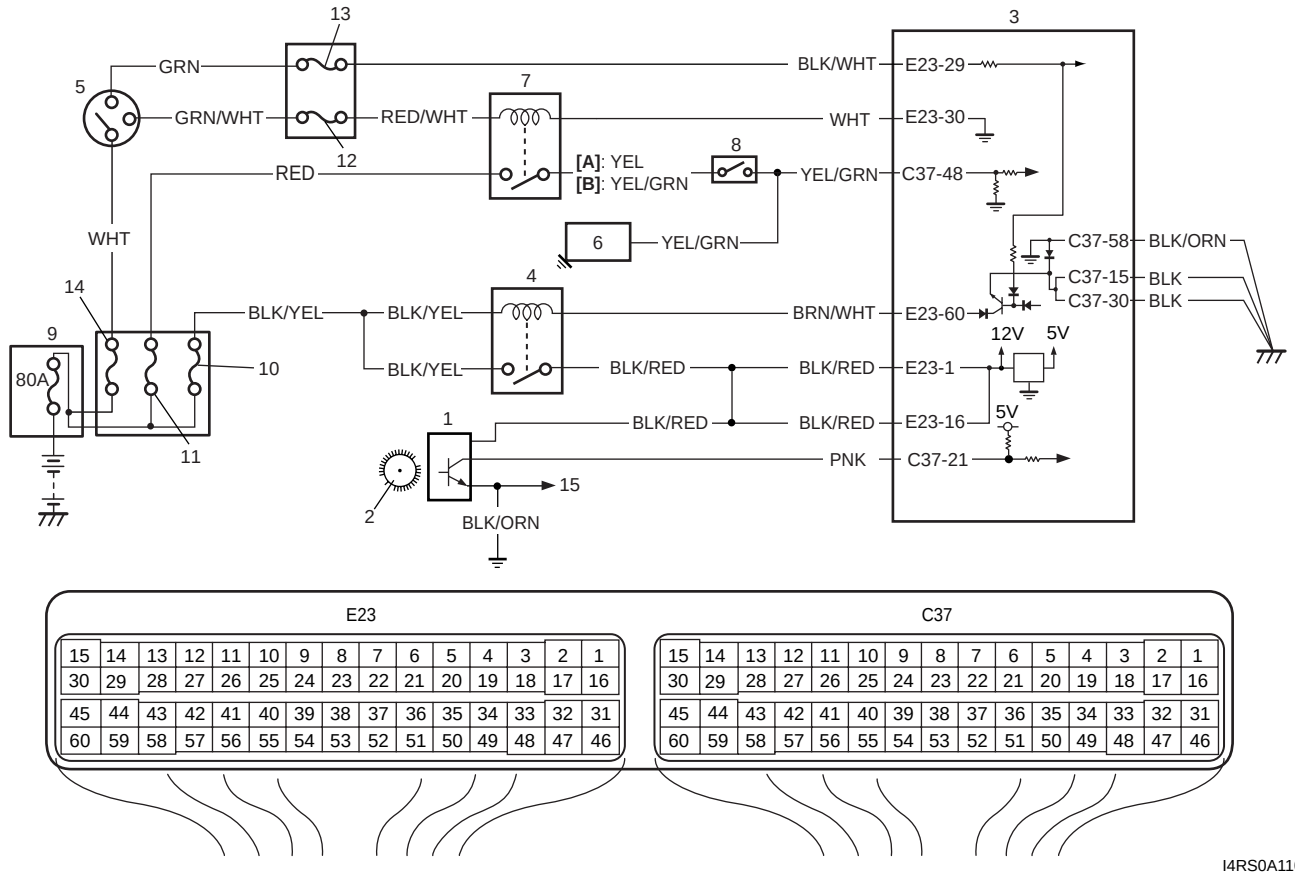
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Knock sensor circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure voltage between "C37-56" terminal of ECM connector and vehicle body ground with engine running. *Is voltage within 1.23 – 3.91 V?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good ECM and recheck.	Go to Step 3.
3	**Knock sensor circuit for open check** 1) Disconnect connector from knock sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "RED" wire of knock sensor connector and engine ground.  I2RH01110089- *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**Knock sensor circuit for open check** 1) Turn ON ignition switch, measure voltage between "C37-56" terminal of ECM connector and engine ground *Is voltage 4 – 6 V?*	"RED" wire is open circuit.	Go to Step 5.
5	**Knock sensor circuit for short check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-56" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"RED" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**Knock sensor circuit for short check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "C37-56" terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 7.	"RED" wire is shorted to other circuit.

Step	Action	Yes	No
7	**Knock sensor circuit for high resistance check** 1) Turn OFF ignition switch, measure resistance between "C37-56" terminal of ECM connector and "RED" wire terminal of knock sensor harness connector. *Is resistance below 5 Ω?*	Faulty knock sensor.	"RED" wire is high resistance circuit.

DTC P0335: Crankshaft Position (CKP) Sensor Circuit

S4RS0A1104035

Wiring Diagram



I4RS0A110032-

[A]: A/T vehicle	5. Ignition switch	11. "ST MOT" fuse
[B]: M/T vehicle	6. Starting motor	12. "ST SIG" fuse
1. CKP sensor	7. Starting motor control relay	13. "IG COIL" fuse
2. Sensor plate on crankshaft	8. Transmission range switch (A/T vehicle)	14. "IG ACC" fuse
3. ECM	9. Battery fuse	15. To CMP sensor
4. Main relay	10. "FI" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No CKP sensor signal for 2 sec. even if starting motor signal is inputted at engine cranking. (1 driving cycle detection logic)	• CKP sensor circuit open or short • Sensor plate teeth damaged • CKP sensor malfunction, foreign material being attached or improper installation • ECM • Engine start signal circuit malfunction

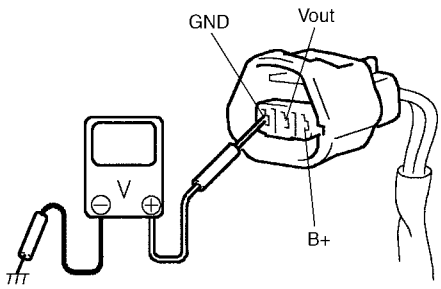
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Crank engine for 3 – 5 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

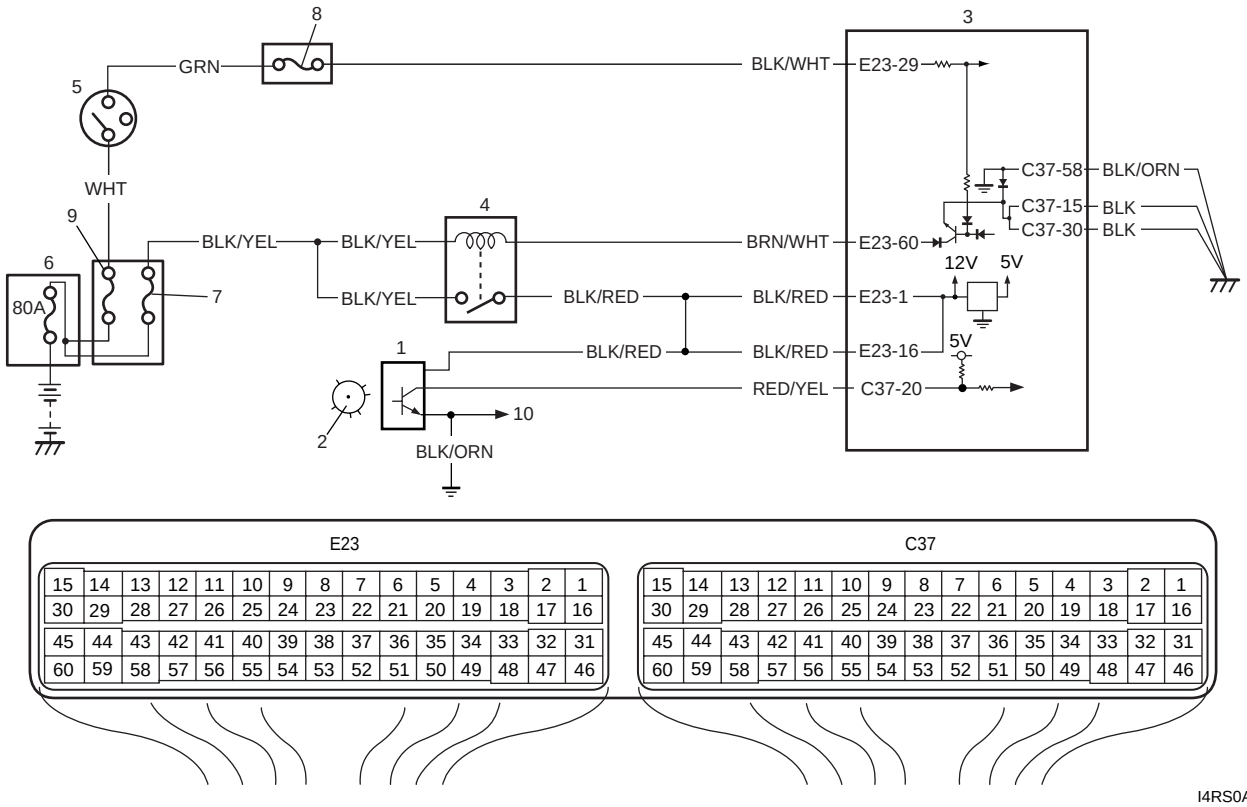
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**CKP sensor and connector for proper installation check** *Is CKP sensor installed properly and connector connected securely?*	Go to Step 3.	Correct.
3	**Wire harness and connection check** 1) Disconnect connector from CKP sensor with ignition switch turned OFF. 2) Check for proper connection to CKP sensor at "BLK/RED", "PNK" and "BLK/ORN" wire terminals. 3) If OK, turn ON ignition switch and check voltage at "BLK/RED", "PNK" and "BLK/ORN" wire terminals of disconnected CKP sensor connector. **CKP sensor voltage** **Terminal "B+": 10 – 14 V** **Terminal "Vout": 4 – 5 V** **Terminal "GND": 0 V**  I2RH0B110048- *Is check result satisfactory?*	Go to Step 6.	Go to Step 4.
4	*Was terminal "Vout" voltage in Step 3 within specification?*	Go to Step 5.	"PNK" wire is open or shorted to ground / power supply circuit. If wire and connection are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
5	**Ground circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between “BLK/ORN” wire terminal of CKP sensor connector and engine ground. *Is measured resistance value less than 3 Ω?*	Go to Step 6.	“BLK/ORN” wire is open or high resistance.
6	*Was terminal “B+” voltage in Step 3 within specification?*	Go to Step 7.	“BLK/RED” wire is open circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
7	**Engine start signal check** 1) Check starting motor circuit for opening and short referring to Step 2 of “DTC P0616: Starter Relay Circuit Low: ” and Step 3 and 4 of “DTC P0617: Starter Relay Circuit High: ”. *Is check result satisfactory?*	Go to Step 8.	Repair or replace.
8	**CKP sensor check** 1) Check CKP sensor and sensor plate tooth referring to “Crankshaft Position (CKP) Sensor Inspection: in Section 1C”. *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace CKP sensor and/or sensor plate.

DTC P0340: Camshaft Position (CMP) Sensor Circuit

S4RS0A1104036

Wiring Diagram



I4RS0A110034-

1. CMP sensor	4. Main relay	7. “FI” fuse	10. To CKP sensor
2. Signal rotor	5. Ignition switch	8. “IG COIL” fuse	
3. ECM	6. Battery fuse	9. “IG ACC” fuse	

System Description
The CMP sensor located on the transmission side of cylinder head consists of the signal generator (magnetic sensor) and signal rotor (intake camshaft portion).
The signal generator generates Reference signal through slits in the slit plate which turns together with the camshaft.

Reference signal
The CMP sensor generates 6 pulses of signals each of which has a different waveform length while the camshaft makes one full rotation. Refer to “Inspection of ECM and Its Circuits: ”.
Based on these signals, ECM judges which cylinder piston is in the compression stroke and the engine speed.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• CMP sensor pulse is less than 20 pulses per crankshaft 8 revolutions • CMP sensor pulse is more than 28 pulses per crankshaft 8 revolutions • CMP sensor pulse is less than 20 pulses between BTDC 155° CA and BTDC 5° CA with crankshaft 8 revolutions from engine start. (1 driving cycle detection logic)	• CMP sensor circuit open or short • Signal rotor teeth damaged • CMP sensor malfunction, foreign material being attached or improper installation • ECM

DTC Confirmation Procedure

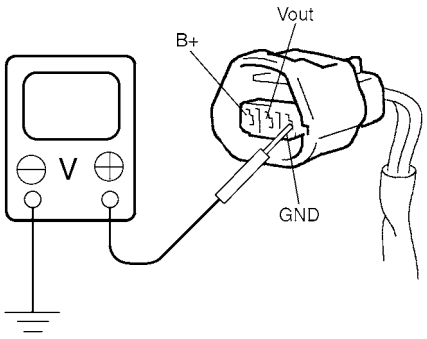
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Crank engine for 5 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

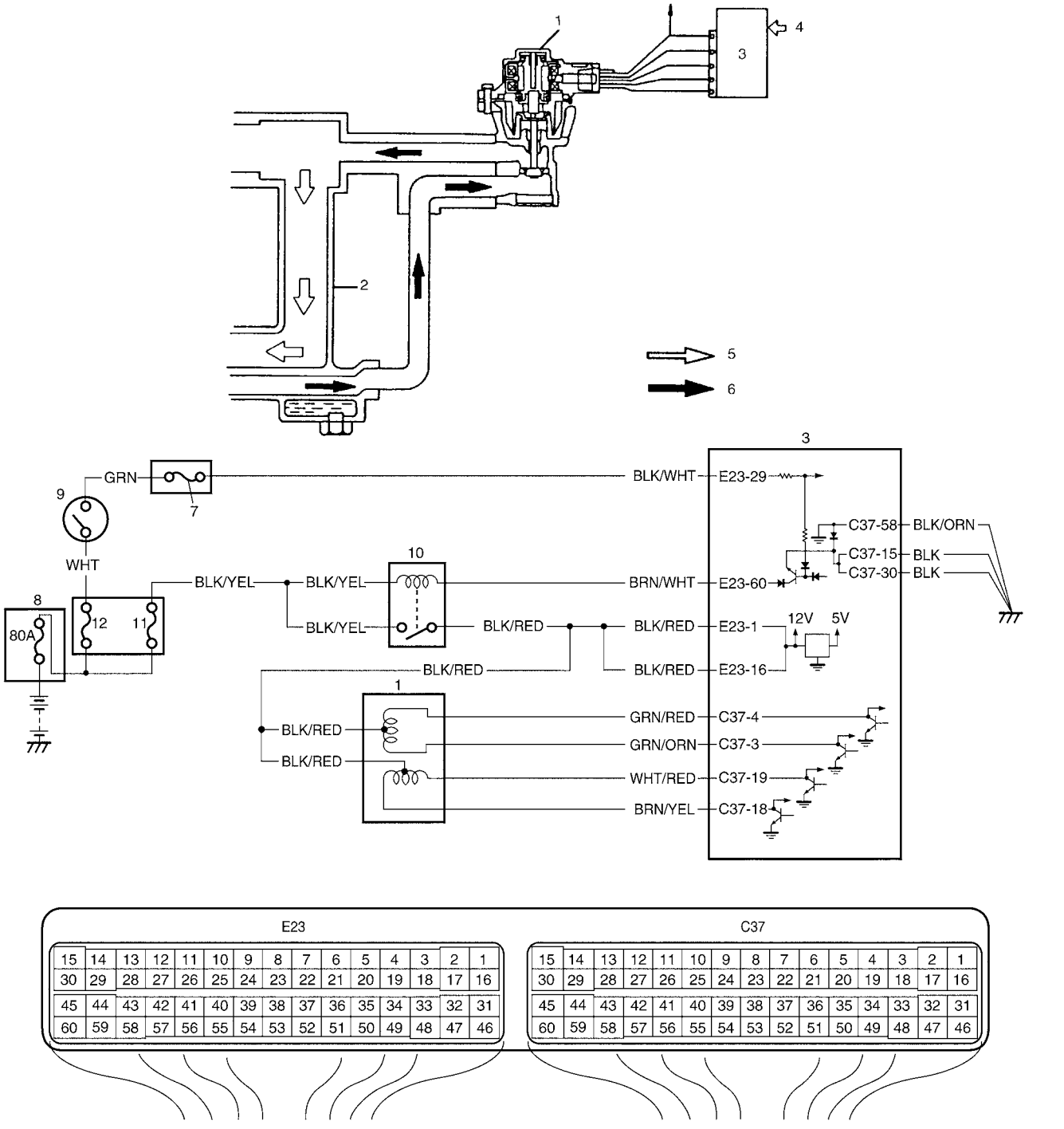
Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.
2	**CMP sensor and connector for proper installation check** *Is CMP sensor installed properly and connector connected securely?*	Go to Step 3.	Correct.

Step	Action	Yes	No
3	**Wire harness and connection check** 1) Disconnect connector from CMP sensor. 2) Check for proper connection to CMP sensor at "BLK/RED", "RED/YEL" and "BLK/ORN" wire terminals. 3) If OK, turn ON ignition switch and check voltage at "BLK/RED", "RED/YEL" and "BLK/ORN" wire terminals of disconnected CMP sensor connector. **CMP sensor voltage** **Terminal "B+": 10 – 14 V** **Terminal "Vout": 4 – 5 V** **Terminal "GND": 0 V**  I3RH0B110006- *Is check result satisfactory?*	Go to Step 7.	Go to Step 4.
4	*Was terminal "Vout" voltage in Step 3 within specification?*	Go to Step 5.	"RED/YEL" wire is open or shorted to ground / power supply circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
5	**Ground circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "BLK/ORN" wire terminal of CMP sensor connector and engine ground. *Is measured resistance value less than 3 Ω?*	Go to Step 6.	"BLK/ORN" wire is open or high resistance circuit.
6	*Was terminal "B+" voltage in Step 3 within specification?*	Go to Step 7.	"BLK/RED" wire is open circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
7	**CMP sensor check** 1) Check CMP sensor and signal rotor tooth referring to "Camshaft Position (CMP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace CMP sensor and/or intake camshaft.

DTC P0401 / P0402: Exhaust Gas Recirculation Flow Insufficient Detected / Excessive Detected

S4RS0A1104037

System and Wiring Diagram



I4RS0A110035-

1. EGR valve	4. Sensed information	7. "IG COIL" fuse	10. Main relay
2. Intake manifold	5. Fresh air	8. Battery fuse box	11. "FI" fuse
3. ECM	6. Exhaust gas	9. Ignition switch	12. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0401: Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is smaller than specified value. (*2 driving cycle detection logic, monitoring once / 1 driving) **DTC P0402:** Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is larger than specified value. (*2 driving cycle detection logic, monitoring once / 1 driving)	• EGR valve • EGR passage • MAP sensor • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC confirmation procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle for 10 min.
5) Drive vehicle and increase engine speed 3000 rpm in 3rd gear.
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 5 sec. or more. (Keep fuel cut condition for 5 sec. or more) If fuel cut condition is not kept for 5 sec. or more, coast down a slope in engine speed 1000 – 3000 rpm for 5 sec. or more.
7) Stop vehicle and run engine at idle.
8) Check DTC and pending DTC by using scan tool.

DTC Troubleshooting

NOTE:

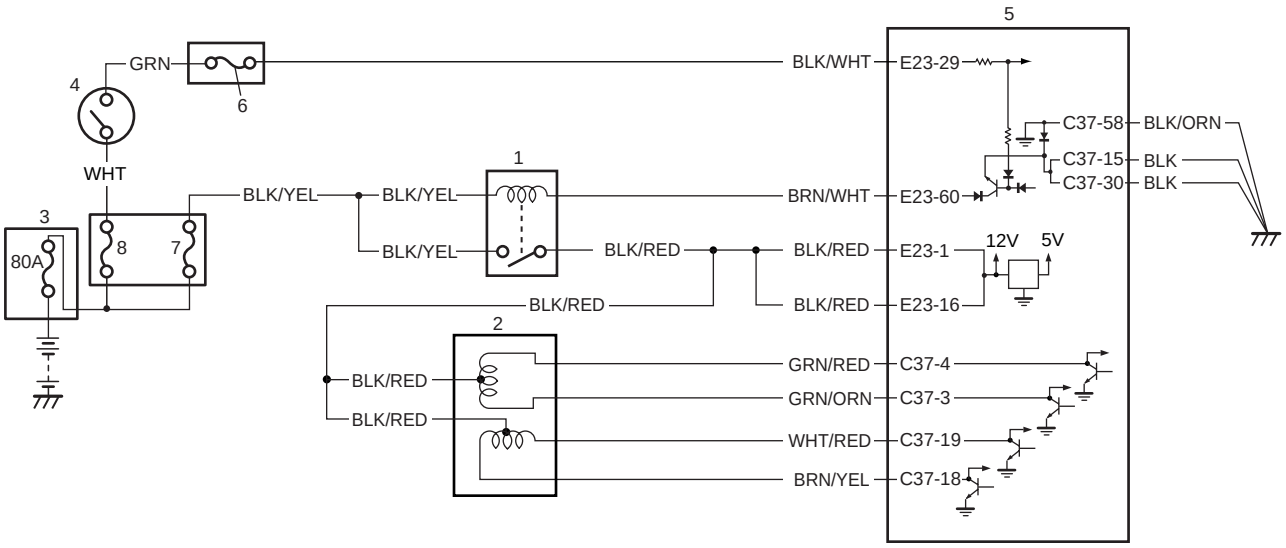
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

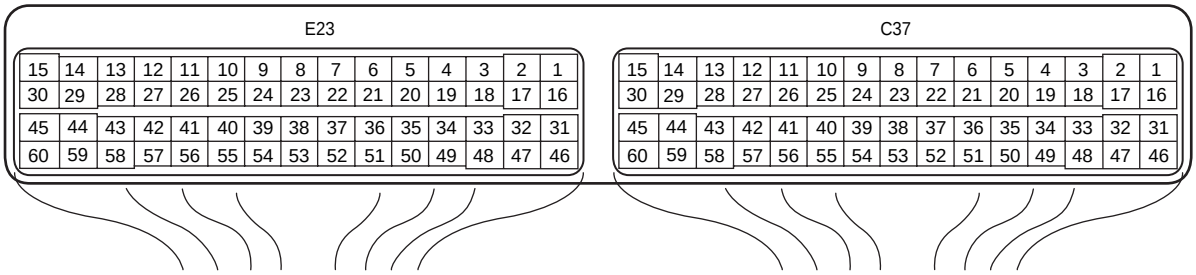
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 5.
3	**EGR valve operation check** 1) With ignition switch turned OFF, install SUZUKI scan tool to DTC. 2) Check EGR system referring to "EGR System Inspection: in Section 1B". *Is it in good condition?*	Go to Step 4.	Go to Step 5.
4	**MAP sensor check** 1) Check MAP sensor for performance referring to "Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Replace MAP sensor.
5	**EGR valve control circuit check** 1) Check that EGR valve control circuits are in good condition referring to Step 2 to 5 of "DTC P0403: Exhaust Gas Recirculation Control Circuit: " *Are circuits in good condition?*	Go to Step 6.	Repair or replace EGR valve control circuit(s).
6	**EGR valve check** 1) Check EGR valve referring to "EGR Valve Inspection: in Section 1B". *Is check result satisfactory?*	Go to Step 7.	Faulty EGR valve.
7	**MAP sensor check** 1) Check MAP sensor for performance referring to "Manifold Absolute Pressure (MAP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	EGR passage clogged. If OK, substitute a known-good ECM and recheck.	Replace MAP sensor.

DTC P0403: Exhaust Gas Recirculation Control Circuit

S4RS0A1104071

Wiring Diagram





I4RS0A110036-

1. Main relay	3. Battery fuse box	5. ECM	7. "FI" fuse
2. EGR valve	4. Ignition switch	6. "IG COIL" fuse	8. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
EGR valve output voltage is different from output command with more than one pole out of 4 poles. (1 driving cycle detection logic)	• EGR valve circuit open • EGR valve • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) With ignition switch turned OFF, connect scan tool to DLC.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm it up to normal operating temperature.
4) Drive vehicle in 2000 – 3500 rpm of engine speed.
5) Keep above vehicle speed for 1 min. (Throttle valve opening is kept constant in this step.)
6) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE:

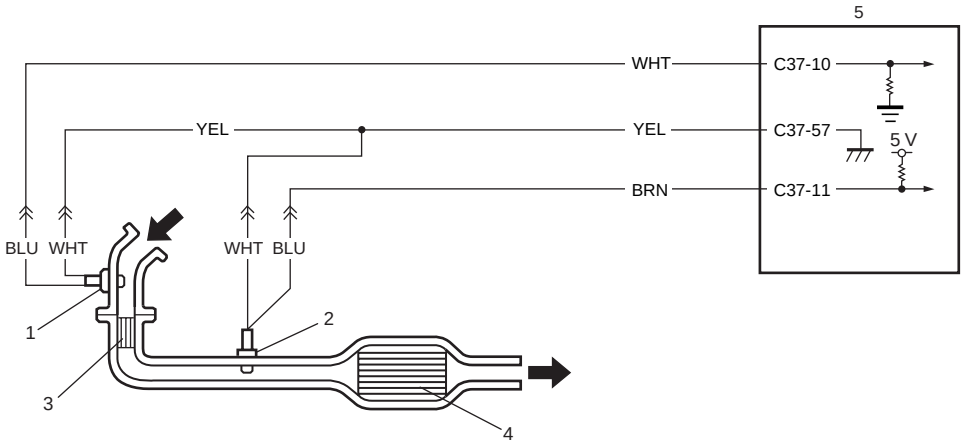
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Description: ".
2	**EGR valve power supply circuit check** 1) Remove air intake pipe. 2) With ignition switch turned OFF, disconnect EGR valve connector. 3) With ignition switch turned ON, measure voltage between "BLK/RED" wire terminal of EGR valve connector and vehicle body ground. *Is check voltage 10 – 14 V?*	Go to Step 3.	"BLK/RED" wire is open circuit.
3	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between engine ground and each "GRN/RED", "GRN/ORN", "WHT/RED", "BRN/YEL" wire terminals of EGR valve connector. *Is each voltage 0 V?*	Go to Step 4.	Faulty wire(s) are shorted to other circuit. If wires are OK, substitute a known-good ECM and recheck.
4	**Wire circuit check** 1) With ignition switch turned OFF, measure resistance between engine ground and each "GRN/RED", "GRN/ORN", "WHT/RED", "BRN/YEL" wire terminals of EGR valve connector. *Is resistance infinity?*	Go to Step 5.	Faulty wire(s) are shorted to ground circuit. If wires are OK, substitute a known-good ECM and recheck.
5	**Short circuit check for EGR valve control circuit** 1) With ignition turned OFF, measure resistance between each EGR valve control circuit wire ("GRN/RED", "GRN/ORN", "WHT/RED" and "BRN/YEL" wire) and each EGR valve control circuit wire. *Is each resistance infinity?*	Go to Step 6.	Faulty wire(s) are short circuit.
6	**EGR valve stepper motor coil circuit check** 1) With ignition switch turned OFF, connect EGR valve connector. 2) Measure resistance between "E23-1/16" and each "C37-4", "C37-3", "C37-19", "C37-18" terminals of ECM connector. *Is each resistance 20 – 31 Ω at 20 °C, 68 °F?*	Faulty ECM. Substitute a known-good ECM and recheck.	Go to Step 7.
7	**EGR valve check** 1) Check EGR valve resistance referring to "EGR Valve Inspection: in Section 1B". *Is resistance within specified value?*	Faulty wire(s) are open or high resistance circuit. If wires are OK, substitute a known-good ECM and recheck.	Faulty EGR valve.

DTC P0420: Catalyst System Efficiency below Threshold

S4RS0A1104039

System and Wiring Diagram



I4RS0A110037-

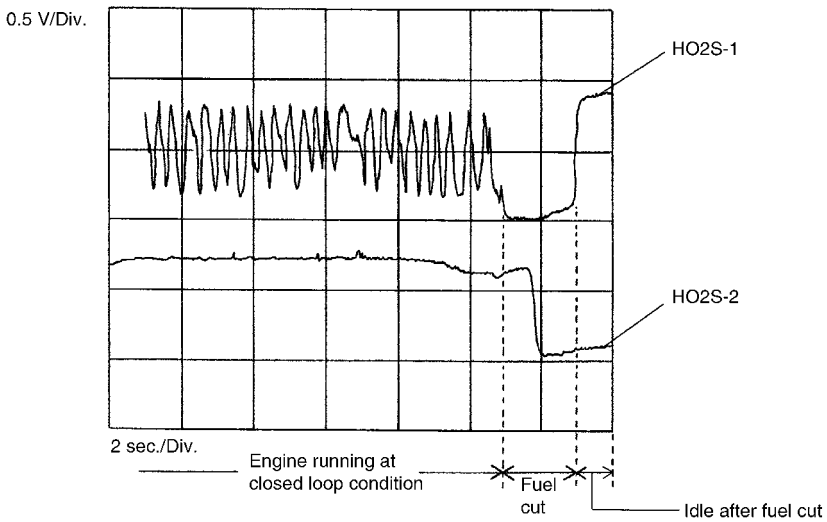
1. HO2S-1	3. Warm up three way catalytic converter	5. ECM
2. HO2S-2	4. Three way catalytic converter	

Circuit Description

ECM monitors oxygen concentration in the exhaust gas which has passed the warm up three way catalytic converter by HO2S-2. When the catalyst is functioning properly, the variation cycle of HO2S-2 output voltage (oxygen concentration) is slower than that of HO2S-1 output voltage because of the amount of oxygen in the exhaust gas which has been stored in warm up three way catalytic converter.

Reference

Oscilloscope waveforms



I2RH01110102-

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• While vehicle running at constant speed under other than high load. • Time from rich or lean switching command is output till HO2S-2 output voltage crosses 0.45 V is less than specified value. (*2 driving cycle detection logic, monitoring once / 1 driving)	• Exhaust gas leak • Warm up three way catalytic converter malfunction • HO2S-2 malfunction • HO2S-1 malfunction

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE:

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temp.: –7 °C, 19.4 °F or higher**
- **Engine coolant temp.: 70 °C, 158 °F or higher**
- **Altitude (barometric pressure): 2500 m, 8200 ft or less (540 mmHg, 72 kPa or more)**

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Increase vehicle speed to 50 – 60 mph, 80 – 100 km/h. (engine speed: 2500 – 3000 r/min.)
4) Keep above vehicle speed for 10 min. or more (Throttle valve opening is kept constant in this step).
5) Stop vehicle and check if DTC / pending DTC exists using scan tool. If not, check if catalyst monitoring test has been completed using scan tool. If not in both of above checks (i.e., no DTC / pending DTC and catalyst monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 5).

DTC Troubleshooting

NOTE:

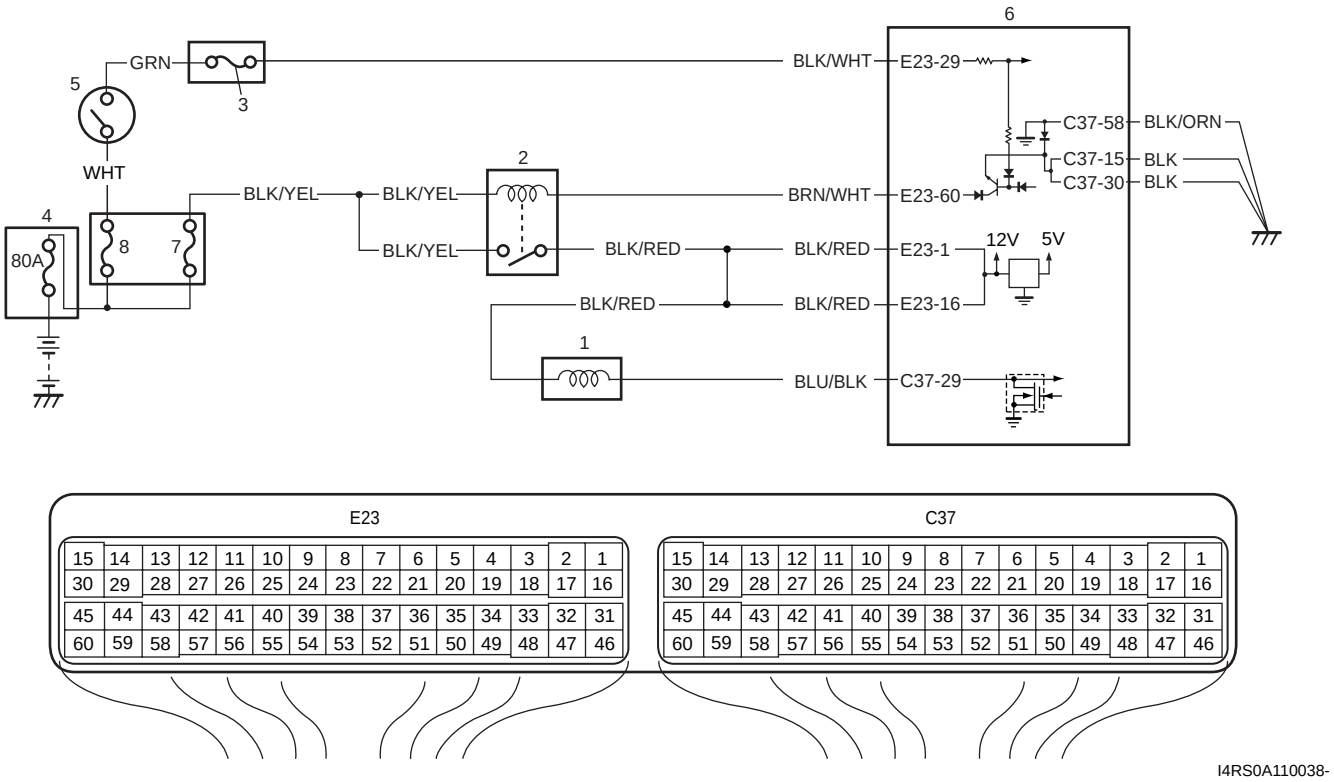
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Exhaust system visual check** 1) Check exhaust system for leaks, damage and loose connection. *Is it in good condition?*	Go to Step 3.	Repair or replace defective part.
3	**HO2S-2 output voltage check** 1) Check output voltage of HO2S-2 referring to "DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2): " and "DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2): ". *Is check result satisfactory?*	Replace exhaust manifold (built in warm up three way catalytic converter) and exhaust center pipe (built in three way catalytic converter).	Check "BRN" and / or "YEL" wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S-2.

DTC P0443: Evaporative Emission System Purge Control Valve Circuit

S4RS0A1104040

Wiring Diagram



I4RS0A110038-

1. EVAP canister purge valve	3. "IG COIL" fuse	5. Ignition switch	7. "FI" fuse
2. Main relay	4. Battery fuse box	6. ECM	6. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of EVAP canister purge valve is different from command signal. (Circuit open or short) (2 driving cycle detection logic)	• EVAP canister purge valve • EVAP canister purge valve circuit • ECM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) With ignition switch OFF, connect scan tool to DLC.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up normal operating temperature.
4) Drive vehicle at more than 40 km/h, 25 mph for 5 min. or more.
5) Check DTC and pending DTC.

DTC Troubleshooting

WARNING:

In order to reduce risk of fire and personal injury, this work must be performed in a well ventilated area and away from any open flames such as gas water heater.

NOTE:

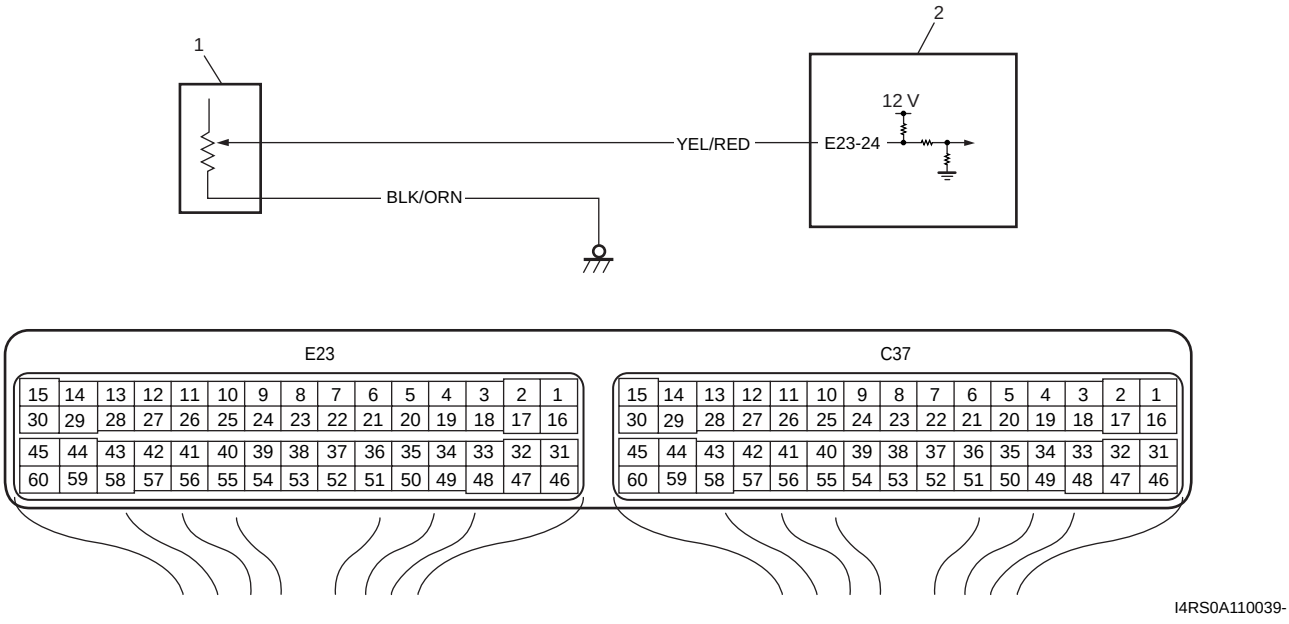
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**EVAP canister purge power supply circuit check** 1) Turn OFF ignition switch and disconnect connector from EVAP canister purge valve. 2) Measure voltage between engine ground and "BLK/RED" wire terminal of EVAP canister purge valve connector with ignition switch turned ON. *Is it voltage 10 – 14 V?*	Go to Step 3.	"BLK/RED" wire is open circuit.
3	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-29" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 4.	"BLU/BLK" wire is shorted to ground circuit.
4	**Wire circuit check** 1) Measure voltage between "C37-29" terminal of ECM connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 5.	"BLU/BLK" wire is shorted to other circuit.
5	**Wire circuit check** 1) Connect connector to purge control valve with ignition switch turned OFF. 2) Turn ON ignition switch and measure voltage between "C37-29" terminal of ECM connector and vehicle body ground. *Is it voltage 10 – 14 V?*	Go to Step 6.	"BLU/BLK" wire is open circuit.
6	**EVAP canister purge control valve check** 1) Check EVAP canister purge control valve referring to "EVAP Canister Purge Valve Inspection: in Section 1B". *Is it in good condition?*	Go to Step 7.	Faulty EVAP canister purge control valve.
7	**EVAP canister purge control circuit check** 1) With ignition switch turn OFF, measure resistance between "E23-1/16" terminal and "C37-29" terminal of ECM connector. *Is resistance below 40 Ω at 20 ℃, 68 ℉?*	Faulty ECM. Substitute a known-good ECM and recheck.	"BLK/RED" and/or "BLU/BLK" wire are high resistance circuit.

DTC P0462: Fuel Level Sensor Circuit Low

S4RS0A1104072

Wiring Diagram



I4RS0A110039-

1.	Fuel level sensor (gauge)
2.	ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Fuel level sensor voltage is lower than 0.45 V for 3 seconds continuously. (1 driving cycle detection logic but MIL does not light up)	• "YEL/RED" circuit short • Fuel level sensor malfunction • ECM and/or its power and ground circuit malfunction • Combination meter malfunction

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 30 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

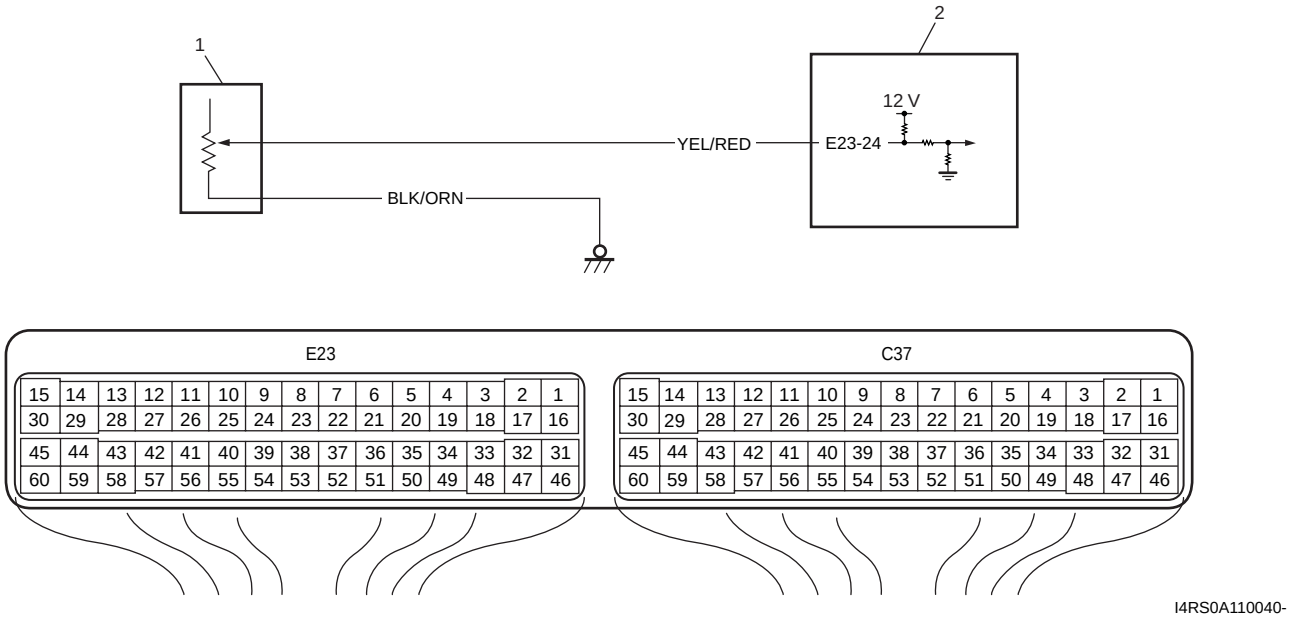
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Do you have SUZUKI scan tool?*	Go to step 3.	Go to step 4.
3	**Fuel level sensor output signal check with SUZUKI scan tool** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check fuel level displayed on SUZUKI scan tool. *Is 100% displayed?*	Go to Step 5.	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
4	**Fuel level sensor output signal check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connector connected. 3) Turn ON ignition switch and measure voltage between "E23-24" terminal of ECM connector and vehicle body ground. *Is voltage about 3.5 V or less?*	Go to Step 5.	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**Fuel level sensor output signal circuit check** 1) Disconnect fuel pump connector referring to "Fuel Tank Removal and Installation: in Section 1G". 2) Disconnect connectors from ECM with ignition switch turned OFF. 3) Measure resistance between "E23-24" terminal of ECM connector and vehicle body ground. *Is it infinity?*	Go to Step 6.	"YEL/RED" wire is shorted to ground circuit.
6	**Fuel level sensor output signal circuit check** 1) Connect connectors to ECM. 2) Measure voltage between "E23-24" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 10 – 14 V?*	Go to Step 7.	Substitute a known-good ECM and recheck.
7	**Fuel level sensor check** 1) Check fuel level sensor referring to "Fuel Level Sensor Inspection: in Section 9C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty fuel level sensor.

DTC P0463: Fuel Level Sensor Circuit High

S4RS0A1104073

Wiring Diagram



I4RS0A110040-

1.	Fuel level sensor (gauge)
2.	ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Fuel level sensor voltage is higher than 4.95 V for 3 seconds continuously. (1 driving cycle detection logic but MIL does not light up)	• "YEL/RED" or "BLK/ORN" circuit open • Fuel level sensor malfunction • ECM and/or its power and ground circuit malfunction • Combination meter faulty

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 30 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Does fuel level meter in combination meter indicate "E" (empty)?*	Replenish fuel tank with fuel and go to Step 3.	Go to Step 3.
3	*Do you have SUZUKI scan tool?*	Go to Step 4.	Go to Step 5.

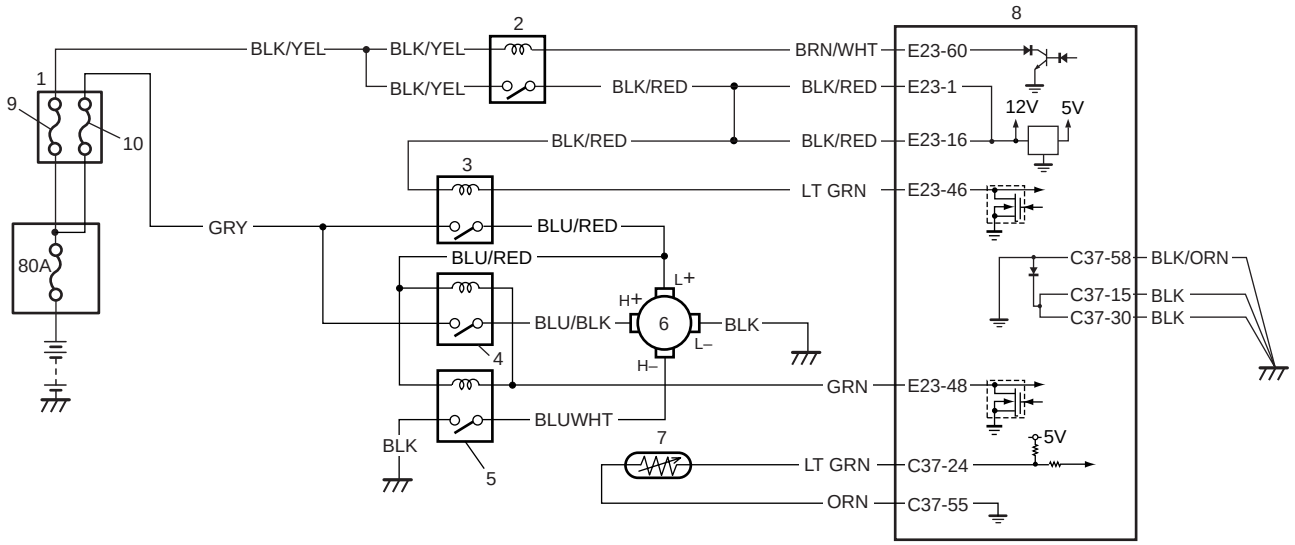
Step	Action	Yes	No
4	**Fuel level sensor output signal check with SUZUKI scan tool** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check fuel level displayed on SUZUKI scan tool. *Is it 3% or less?*	Go to Step 6.	Intermittent trouble or faulty ECM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.
5	**Fuel level sensor output signal check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Turn ON ignition switch and measure voltage between “E23-24” terminal of ECM connector and vehicle body ground. *Is voltage about 3.5 V or more?*	Go to Step 6.	Intermittent trouble or faulty ECM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.
6	**Fuel level sensor circuit resistance check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection to “E23-24” terminal of ECM connector. 3) If OK, measure resistance between “E23-24” terminal of ECM connector and vehicle body ground. *Is resistance below 280 Ω?*	Go to Step 7.	Go to Step 8.
7	**Short circuit check for fuel level sensor output signal circuit** 1) Turn ON ignition switch and measure voltage between “E23-24” terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	“YEL/RED” wire is shorted to power supply circuit.
8	**Open circuit check for fuel level sensor output signal circuit** 1) Disconnect fuel pump connector referring to “Fuel Tank Removal and Installation: in Section 1G”. 2) Check for proper connection to “YEL/RED” and “BLK/ORN” wire terminals of fuel pump connector. 3) Connect connectors to ECM. 4) Turn ON ignition switch, measure voltage between “YEL/RED” wire terminal of disconnected fuel pump connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 10.	Go to Step 9.
9	**Open circuit check for fuel level sensor output signal circuit** 1) Measure voltage between “E23-24” terminal of ECM connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 10.	“YEL/RED” wire is open circuit.
10	**Fuel level sensor ground circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between “BLK/ORN” wire terminal of fuel pump connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 11.	“BLK/ORN” wire is open or high resistance circuit.

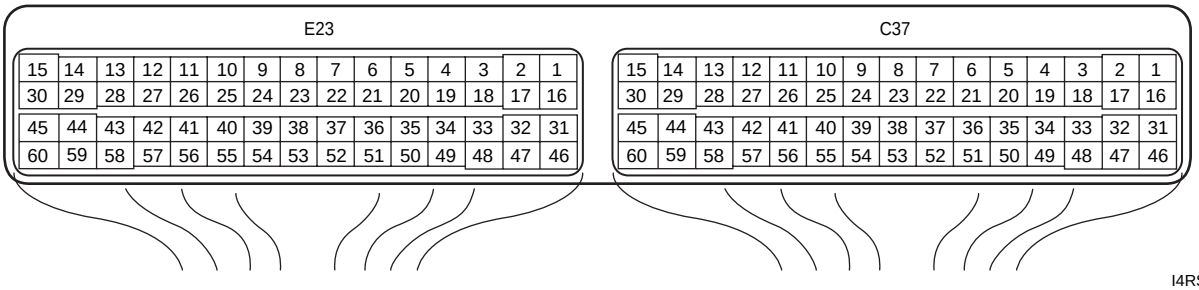
Step	Action	Yes	No
11	**High resistance circuit check for fuel level sensor circuit** 1) Disconnect connectors from ECM. 2) Measure resistance between “YEL/RED” wire terminal of fuel pump connector and “E23-24” wire terminal of ECM connector. *Is resistance below 5 Ω?*	Go to Step 12.	“YEL/RED” wire is high resistance circuit.
12	**Fuel level sensor check** 1) Check fuel level sensor referring to “Fuel Level Sensor Inspection: in Section 9C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty fuel level sensor.

DTC P0480: Fan 1 (Radiator Cooling Fan) Control Circuit

S4RS0A1104074

Wiring Diagram





I4RS0A110041-

1. Relay box	5. Radiator cooling fan relay No. 3	9. “FI” fuse
2. Main relay	6. Radiator cooling fan motor	10. “RDTR FAN” fuse
3. Radiator cooling fan relay No. 1	7. ECT sensor	
4. Radiator cooling fan relay No. 2	8. ECM	

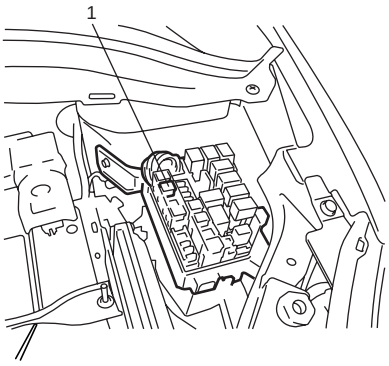
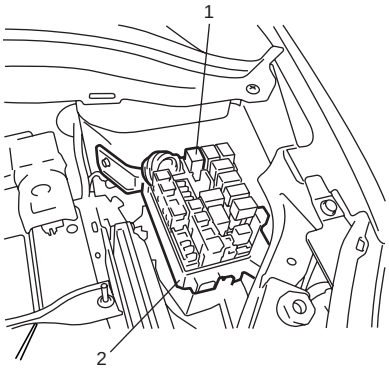
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of radiator cooling fan relay is different from command signal. (1 driving cycle detection logic)	• Radiator cooling fan relay circuit malfunction • Radiator cooling fan relay malfunction • ECM malfunction

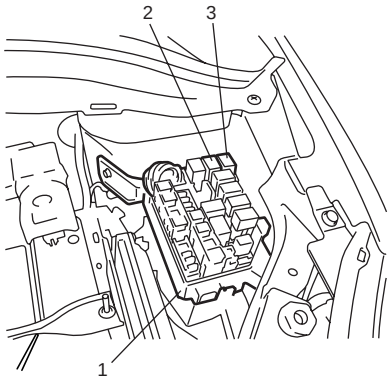
DTC Confirmation Procedure

1) Turn OFF ignition switch turned.
2) Clear DTC with ignition switch turned ON.
3) Run engine at idle speed.
4) Check pending DTC in “ON BOARD TEST” or “PENDING DTC” mode and DTC in “DTC” mode.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.
2	**Circuit fuse check** 1) Check “RDTR FAN” fuse (1) in relay box with ignition switch turned OFF.  I4RS0A110022- *Is “RDTR FAN” fuse in good condition?*	Go to Step 3.	Check for short in circuits connected to this fuse.
3	**Wire circuit check** 1) Disconnect radiator cooling fan relay No. 1 (1) from relay box (2) with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between each engine ground to “BLK/RED” and “GRY” wire terminal.  I4RS0A110042- *Is voltage 10 – 14 V?*	Go to Step 4.	“BLK/RED” and/or “GRY” wire are open circuit.

Step	Action	Yes	No
4	**Wire circuit check** 1) Connect radiator cooling fan relay No. 1 to relay box with ignition switch turned OFF. 2) Remove ECM from its bracket with ECM connectors connected. 3) Turn ON ignition switch, measure voltage between vehicle body ground and “E23-46” terminal of ECM connector when engine coolant temp. is below 97.5 °C, 207.5 °F. *Is voltage 10 – 14 V?*	Go to Step 8.	Go to Step 5.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Disconnect radiator cooling fan relay No. 1 from relay box. 3) Measure resistance between “E23-46” terminal of ECM connector and vehicle ground. *Is resistance infinity?*	Go to Step 6.	“LT GRN” wire is shorted to ground circuit.
6	**Wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “E23-46” terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 7.	“LT GRN” wire is shorted to other circuit.
7	**Radiator cooling fan relay No. 1 check** 1) Check radiator cooling fan relay No. 1 referring to “Radiator Cooling Fan Relay Inspection: in Section 1F”. *Is check result satisfactory?*	“LT GRN” wire is open circuit.	Replace relay.
8	**Radiator cooling fan control No. 1 check** 1) Run engine until ECT is over 97.5 °C, 207.5 °F. 2) Measure voltage between vehicle body ground and “E23-46” terminal of ECM connector. *Is voltage lower than 1.5 V?*	Go to Step 9.	Faulty ECM. Substitute a known-good ECM and recheck.

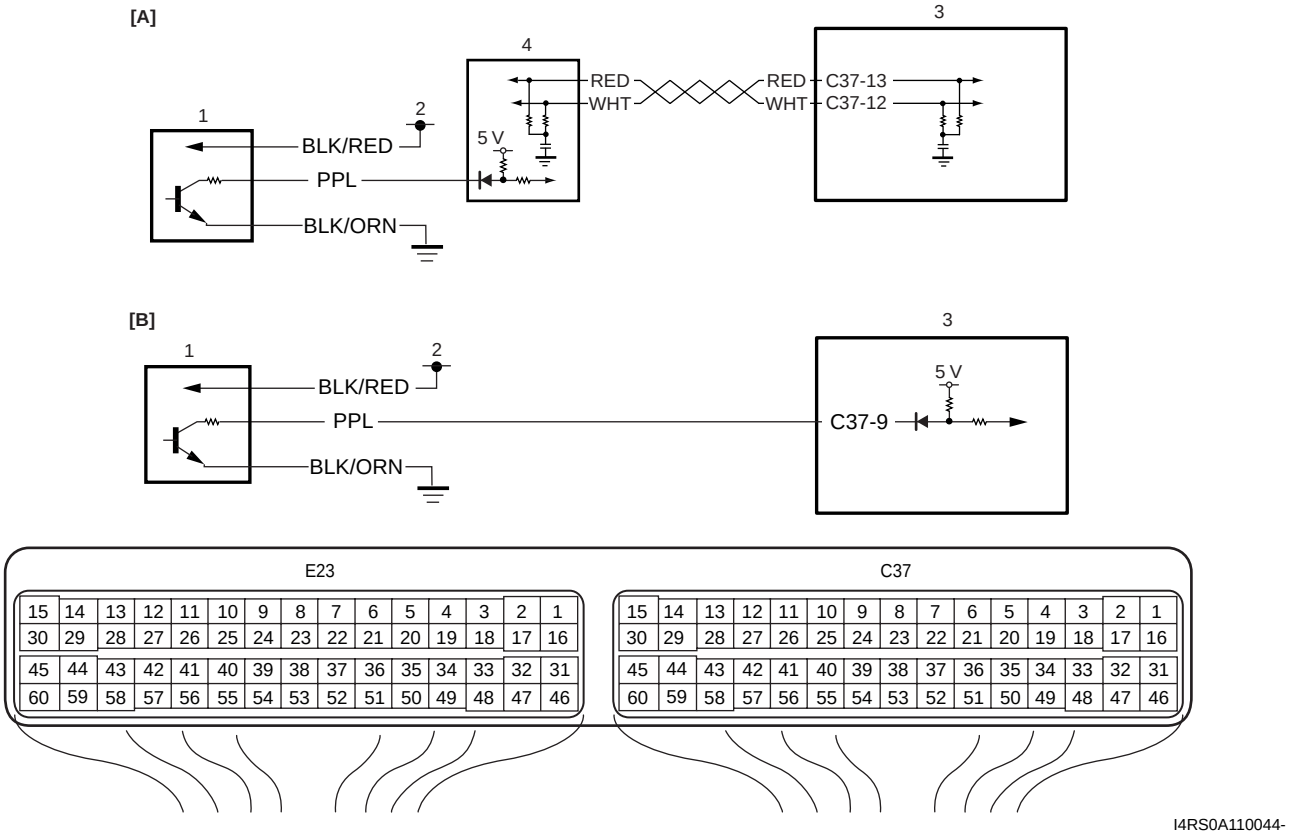
Step	Action	Yes	No
9	**Radiator cooling fan control check** 1) Disconnect radiator cooling fan relay No. 2 (2) and No. 3 (3) from relay box (1) with ignition switch turned OFF. 2) Run engine until ECT is over 97.5 °C, 207.5 °F. 3) Measure voltage between vehicle body ground and each “BLU/RED” wire terminal of radiator cooling fan control relay No. 2 and No. 3 connectors.  I4RS0A110043- *Is voltage 10 – 14 V?*	Go to Step 10.	“BLU/RED” wire is open circuit.
10	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Connect radiator cooling fan relay No. 2 to relay box. 3) Using service wire, ground “E23-46” and “E23-60” terminals of ECM connector. 4) Turn ON ignition switch, measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage 10 – 14 V?*	Go to Step 11.	Go to Step 12.
11	**Wire circuit check** 1) Disconnect radiator cooling fan relay No. 2 and then connect radiator cooling fan relay No. 3 to relay box with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage 10 – 14 V?*	Go to Step 15.	Go to Step 12.
12	**Wire circuit check** 1) Disconnect radiator cooling fan control relay No. 2 and No. 3 from relay box with ignition switch turned OFF. 2) Measure resistance between “E23-48” terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 13.	“GRN” wire is shorted to ground circuit.
13	**Wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “E23-48” terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 14.	“GRN” wire is shorted to power supply circuit.

Step	Action	Yes	No
14	**Radiator cooling fan relay No. 2 and No. 3 check** 1) Check radiator cooling fan relay No. 2 and No. 3 referring to “Radiator Cooling Fan Relay Inspection: in Section 1F”. *Are relays in good condition?*	“GRN” wire is open circuit.	Replace relay.
15	**Radiator cooling fan control No. 2 and No. 3 check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Connect radiator cooling fan relay No. 2 to relay box. 3) Run engine until ECT is over 102.5 °C, 216.5 °F. 4) Measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage lower than 1.5 V?*	Intermittent trouble. Check for intermittent refer to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good ECM and recheck.	Faulty ECM.

DTC P0500: Vehicle Speed Sensor (VSS) Malfunction

S4RS0A1104045

Wiring Diagram



I4RS0A110044-

[A]: A/T vehicle	1. VSS	3. ECM
[B]: M/T vehicle	2. To main relay	4. TCM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• Vehicle speed signal is not input while fuel is cut at deceleration for 4 seconds continuously at 3600 rpm or less. • Vehicle speed signal is not input even if engine is running with more than 3000 rpm at D-Range for 4 sec (for A/T model). (2 driving cycle detection logic)	• "BLK/ORN" circuit open • "PPL" or "BLK/RED" circuit open or short • VSS malfunction • TCM malfunction • ECM malfunction

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester.**

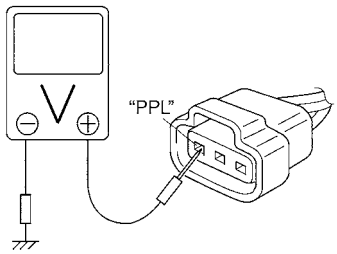
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Warm up engine to normal operating temperature.
4) Drive vehicle at 4000 rpm (engine speed) with 3rd gear (for M/T vehicle) or "3" range (for A/T vehicle) or more.
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 6 sec. or more (fuel cut condition for 5 sec. or more) and stop vehicle.
6) For A/T vehicle, drive vehicle at more than 3600 rpm for 10 sec.
7) Check pending DTC and DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Vehicle speed signal check** *Is vehicle speed displayed on scan tool in Step 4) and 5) of "DTC Confirmation Procedure"?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 3.
3	**Vehicle spec check** *Is vehicle equipped with A/T?*	Go to Step 4.	Go to Step 5.
4	**DTC check in TCM** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check TCM for DTC. *Is there DTC P0722 in TCM?*	Go to applicable DTC diag. flow.	Substitute a known-good ECM and recheck.

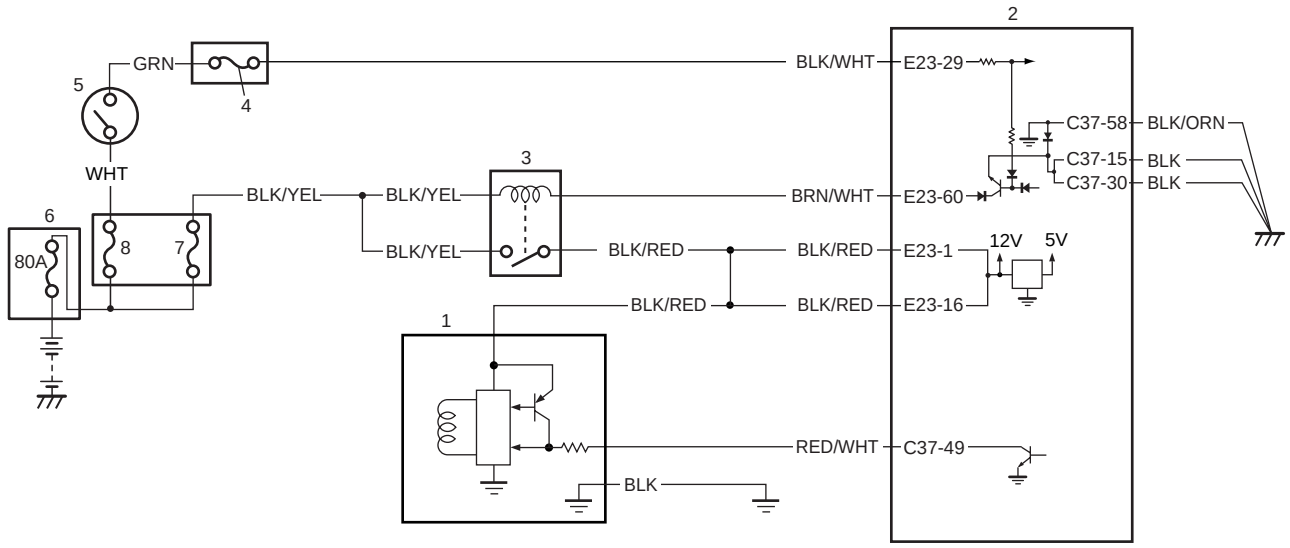
Step	Action	Yes	No
5	**Power supply circuit check** 1) With ignition switch turned OFF, disconnect connector from VSS. 2) Check for proper connection to “BLK/RED”, “PPL” and “BLK/ORN” wire terminals of VSS connector. 3) If wires are OK, turn ON ignition switch, measure voltage between engine ground and “BLK/RED” wire terminal of VSS connector. *Is voltage 10 – 14 V?*	Go to Step 6.	“BLK/RED” wire is open circuit.
6	**Ground circuit check** 1) Measure resistance between engine ground and “BLK/ORN” wire terminal of VSS connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 7.	“BLK/ORN” wire is open or high resistance circuit.
7	**Wire circuit check** 1) Turn ON ignition switch, measure voltage between engine ground and “PPL” wire terminal of VSS connector.  I4RS0A110087- *Is measured voltage 4 – 5 V?*	Go to Step 11.	Go to Step 8.
8	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM form its bracket with ECM connectors connected. 3) Turn ON ignition switch, measure voltage between vehicle body ground and “C37-9” terminal of ECM connector. *Is measured voltage 4 – 5 V?*	“PPL” wire is open circuit.	Go to Step 9.
9	**Short circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and “C37-9” terminal of ECM connector. *Is it voltage 0 V?*	Go to Step 10.	“PPL” wire is shorted to power supply circuit.
10	**Short circuit check** 1) Measure resistance between engine ground and “C37-9” terminal of ECM connector with ignition switch turned OFF. *Is resistance infinity?*	Go to Step 11.	“PPL” wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.

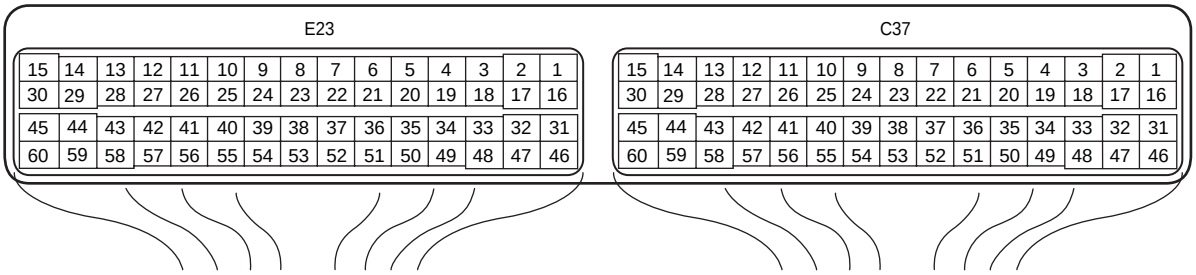
Step	Action	Yes	No
11	**VSS check** 1) Check VSS and signal rotor tooth referring to “Vehicle Speed Sensor (VSS) Inspection (M/T model): in Section 1C”. *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace VSS or signal rotor.

DTC P0505: Idle Air Control System

S4RS0A1104046

Wiring Diagram





I4RS0A110045-

1. IAC valve	4. “IG COIL” fuse	7. “FI” fuse
2. ECM	5. Ignition switch	8. “IG ACC” fuse
3. Main relay	6. Battery fuse box	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
IAC control duty pulse is not detected in its monitor signal. (2 driving cycle detection logic)	• Idle air control valve and / or its circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Run engine at idle speed (more than 600 rpm) for 1 min. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

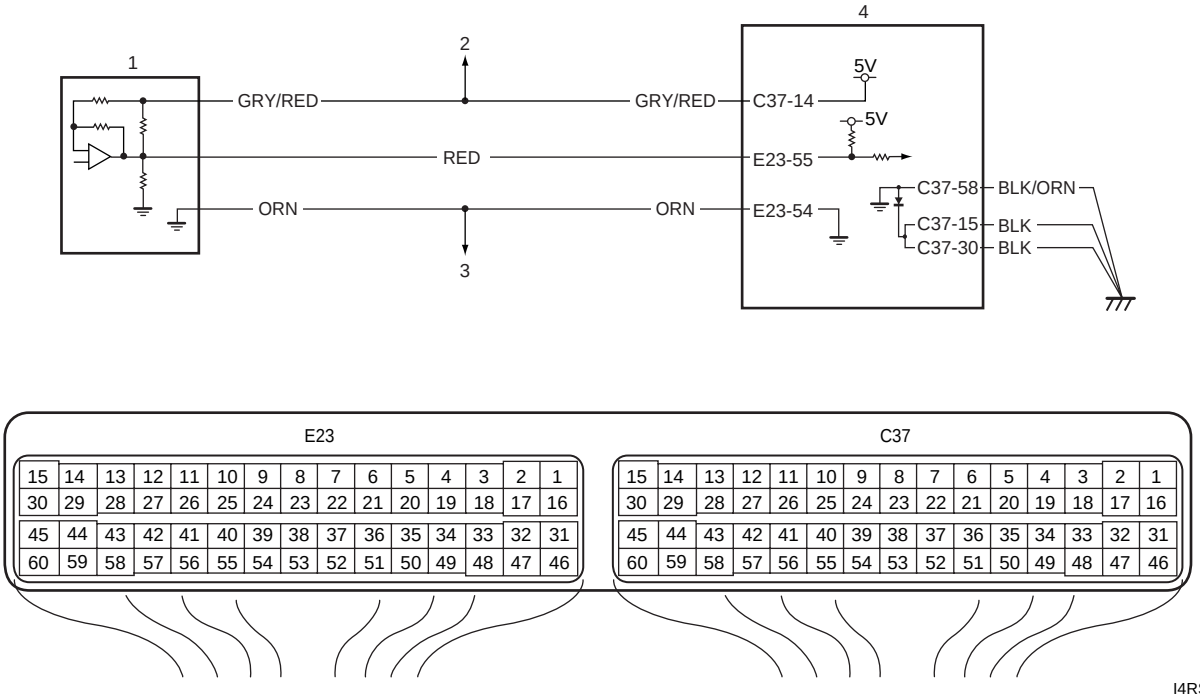
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Idle speed check** 1) Check idle speed / idle air control duty referring to "Idle Speed / Idle Air Control (IAC) Duty Inspection: ". *Is check result as specified?*	Go to Step 3.	Go to Step 4.
3	**Idle air control valve operation check** 1) Check idle air control valve for operation referring to "Idle Air Control (IAC) Valve Operation Inspection: in Section 1C". *Is check result as specified?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good ECM and recheck.	Go to Step 4.
4	**Idle air control valve circuit check** 1) Disconnect connector from idle air control valve with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "BLK/RED" wire terminal of idle air control valve connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 5.	"BLK/RED" wire is open or high resistance circuit.
5	**Idle air control valve circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "RED/WHT" wire terminal of idle air control valve connector and "C37-49" terminal of ECM connector. *Is resistance 2 Ω or less?*	Go to Step 6.	"RED/WHT" wire is open or high resistance circuit.
6	**Idle air control valve circuit check** 1) Measure resistance between each "C37-49" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	"RED/WHT" wire is shorted to ground circuit.
7	**Idle air control valve circuit check** 1) Connect connectors to ECM. 2) Turn ON ignition switch, measure voltage between "C37-49" terminal of ECM connector and vehicle body ground. *Is each voltage 0 V?*	Go to Step 8.	"RED/WHT" wire is shorted to power circuit.

Step	Action	Yes	No
8	**Idle air control valve circuit check** 1) Measure resistance between “BLK” wire terminal of idle air control valve connector and vehicle body ground with ignition switch turned OFF. *Is resistance continuity?*	Go to Step 9.	“BLK” wire is open circuit.
9	**Idle air control valve signal check** 1) Connect connector to idle air control valve. 2) Using oscilloscope, check that idle air control valve duty pulse is outputted referring to “Reference waveform No.19” and “Reference waveform No.20” of “Inspection of ECM and Its Circuits: ”. *Is duty pulse outputted at “C37-49” terminal of ECM connector?*	Replace idle air control valve.	Go to Step 10.
10	**Idle air control valve circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Using service wire, ground “E23-60” terminal of ECM connector because of main relay turned ON. 3) Measure voltage between “C37-49” terminal of ECM connector and vehicle body ground with ignition switch turned ON. *Is voltage 10 – 14 V?*	Substitute a known-good ECM and recheck.	Replace idle air control valve.

DTC P0532: A/C Refrigerant Pressure Sensor Circuit Low

S4RS0A1104075

Wiring Diagram



I4RS0A110046-

1. A/C refrigerant pressure sensor	3. To other sensors
2. To TP sensor and MAP sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is less than 0.15 V for 0.5 sec. continuously. (1 driving detection logic but MIL does not light up)	• A/C refrigerant pressure sensor circuit • A/C refrigerant pressure sensor • TP sensor • MAP sensor • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

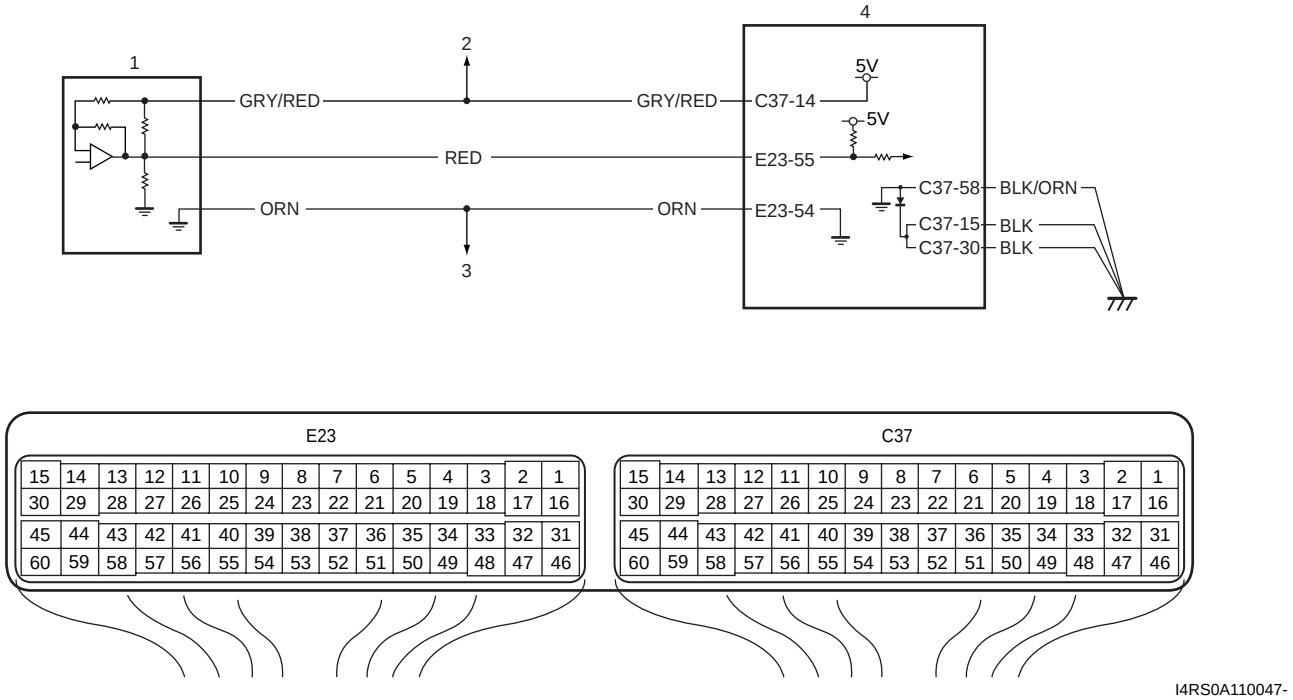
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connector from A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Check for proper connection of A/C refrigerant pressure sensor at "GRY/RED", "RED" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 3.
3	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connectors from TP sensor and MAP sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or MAP sensor.	Go to Step 4.
4	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and "C37-14" terminal of ECM connector. *Is resistance infinity?*	Go to Step 6.	"GRY/RED" wire is shorted to ground circuit.

Step	Action	Yes	No
5	**A/C refrigerant pressure sensor signal circuit check** 1) Connect connectors to ECM. 2) Turn ON ignition switch, measure voltage between engine ground and “RED” wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 7.	Go to Step 6.
6	**A/C refrigerant pressure sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and “E23-55” terminal of ECM connector. *Is resistance infinity?*	Go to Step 7.	“RED” wire is shorted to ground circuit.
7	**A/C refrigerant pressure sensor check** 1) Check A/C refrigerant pressure sensor referring to “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: in Section 7B” *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty A/C refrigerant pressure sensor.

DTC P0533: A/C Refrigerant Pressure Sensor Circuit High

S4RS0A1104076

Wiring Diagram



I4RS0A110047-

1. A/C refrigerant pressure sensor	3. To other sensors
2. To TP sensor and MAP sensor	4. ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is higher than 4.93 V for 0.5 sec. continuously. (1 driving detection logic but MIL does not light up)	• A/C refrigerant pressure sensor circuit • A/C refrigerant pressure sensor • TP sensor • MAP sensor • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: "
2	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connector from A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Check for proper connection of A/C refrigerant pressure sensor at "GRY/RED", "RED" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 4.	Go to Step 3.
3	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connectors from TP sensor and MAP sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or MAP sensor.	"GRY/RED" wire is open or shorted to power circuit.
4	**A/C refrigerant pressure sensor signal circuit check** 1) Turn ON ignition switch, measure voltage between engine ground and "RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 5.
5	**A/C refrigerant pressure sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "RED" wire terminal of A/C refrigerant pressure sensor connector and "E23-55" terminal of ECM connector. *Is resistance below 2 Ω?*	"RED" wire is shorted to power supply circuit.	"RED" wire is open or high resistance circuit.
6	**A/C refrigerant pressure sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between engine ground and "ORN" wire terminal of A/C refrigerant pressure sensor connector. *Is resistance below 5 Ω?*	Go to Step 8.	Go to Step 7.

Step	Action	Yes	No
7	**ECM ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between engine ground and "E23-54" terminal of ECM connector. *Is resistance below 5 Ω?*	"ORN" wire is open or high resistance circuit.	ECM grounds "C37-58", "C37-15" and/or "C37-30" is open or high resistance circuit.
8	**A/C refrigerant pressure sensor check** 1) Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection: in Section 7B" *Is it good condition?*	Substitute a known-good ECM and recheck.	Faulty A/C refrigerant pressure sensor.

DTC P0601 / P0602: Internal Control Module Memory Check Sum Error / Control Module Programming Error

S4RS0A1104052

System Description

Internal control module is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0601: Data write error or check sum error (1 driving cycle detection logic) **DTC P0602:** Data programming error (1 driving cycle detection logic)	ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it at idle if possible.
4) Check DTC and pending DTC by using scan tool.

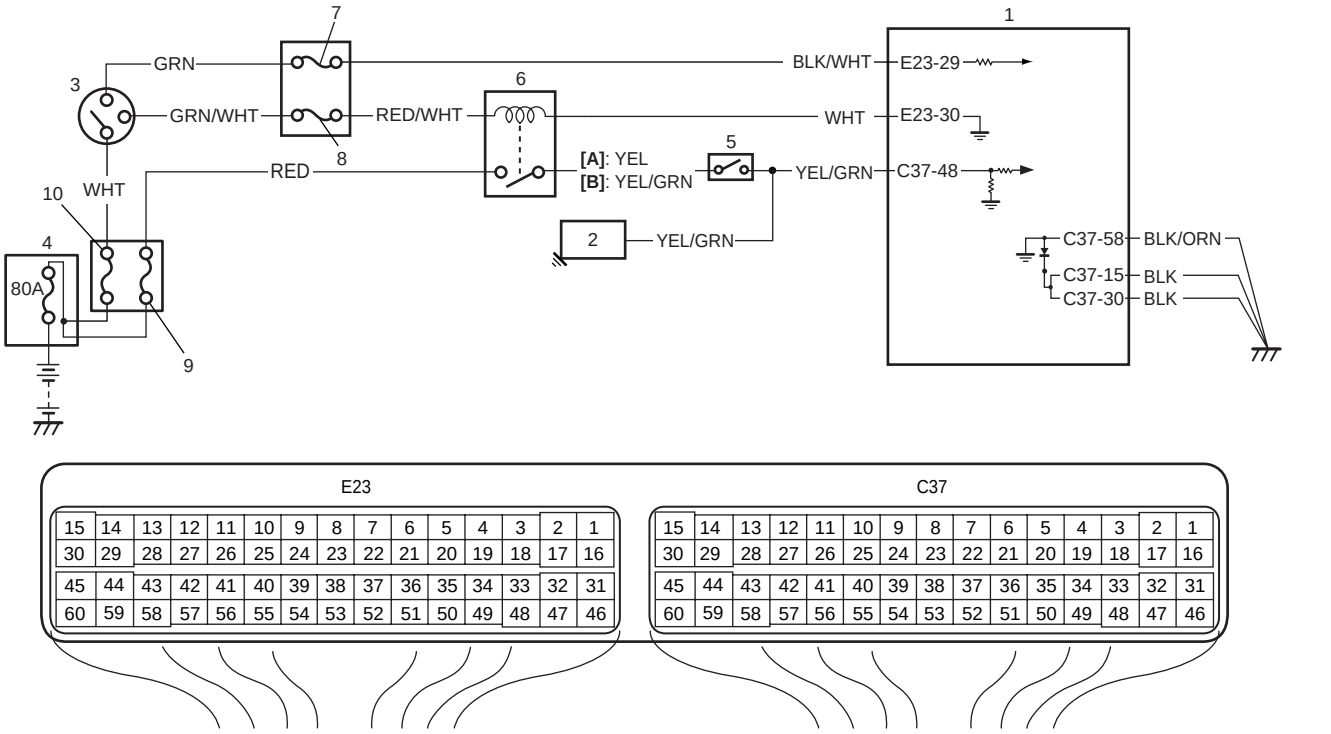
DTC Troubleshooting

Step	Action	Yes	No
1	**DTC recheck** 1) Clear DTC referring to "DTC Clearance: ". 2) Turn OFF ignition switch. 3) Turn ON ignition switch and check DTC. *Is DTC P0601 or P0602 still indicated?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00"
2	**ECM power and ground circuit check** 1) Check that ECM power supply and ground circuit is in good condition referring to "ECM Power and Ground Circuit Check: ". 2) Check that ECM ground is in good condition. *Are check results OK?*	Substitute a known-good ECM and recheck.	Repair ECM power or ground circuit.

DTC P0616: Starter Relay Circuit Low

S4RS0A1104077

Wiring Diagram



I4RS0A110048-

[A]: A/T vehicle	3. Ignition switch	7. "IG COIL" fuse
[B]: M/T vehicle	4. Battery fuse box	8. "ST SIG" fuse
1. ECM	5. Transmission range switch (A/T vehicle)	9. "ST MOT" fuse
2. Starter motor	6. Starting motor control relay	10. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Engine starts even though vehicle is at stop and engine starter signal is low voltage. (2 driving cycle detection logic)	• Engine starter signal circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

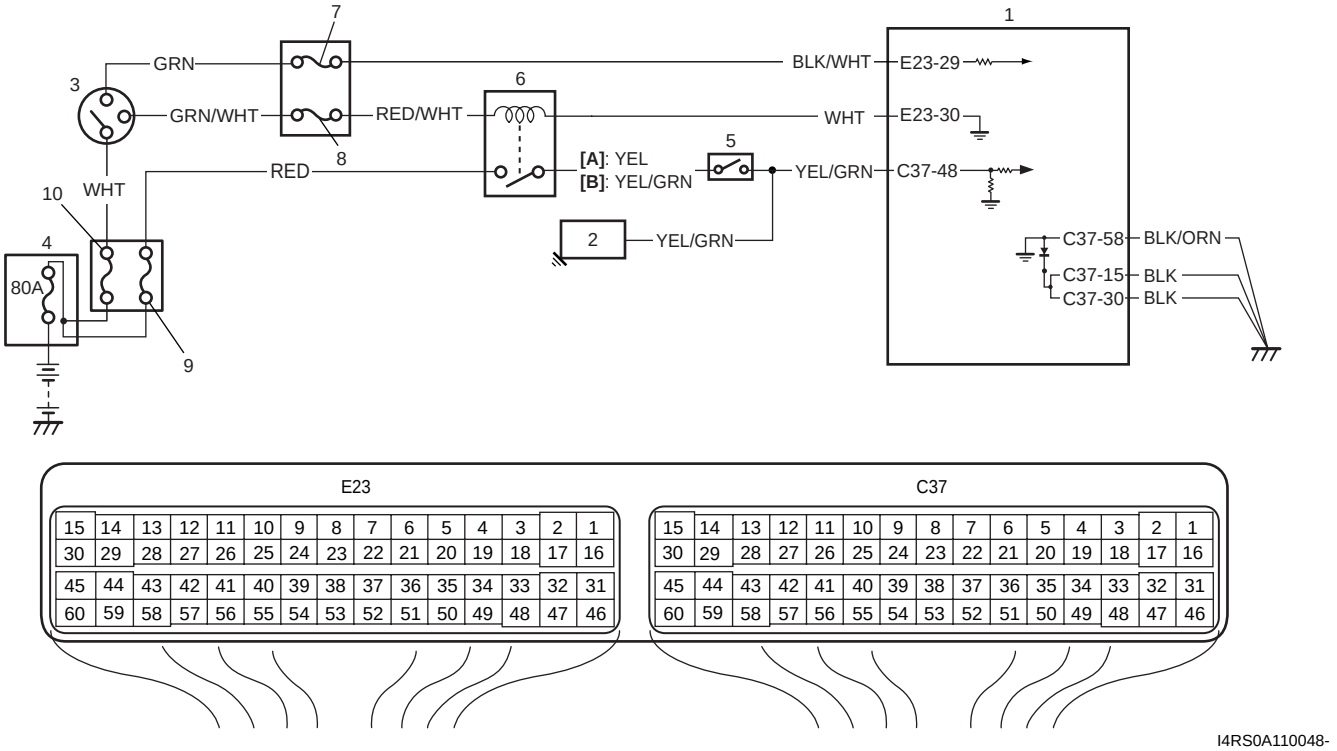
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".

Step	Action	Yes	No
2	**Signal circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure voltage at terminal "C37-48" of ECM connector, under following condition. **Voltage at terminal "C37-48" of ECM connector** **While engine cranking: 6 – 14 V** **After starting engine: 0 – 1 V** *Is each voltage within specified range?*	Poor "C37-48" connection or intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If wire and connections are OK, substitute a known-good ECM and recheck.	"YEL/GRN" wire is open or high resistance circuit.

DTC P0617: Starter Relay Circuit High

S4RS0A1104078

Wiring Diagram



I4RS0A110048-

[A]: A/T vehicle	3. Ignition switch	7. "IG COIL" fuse
[B]: M/T vehicle	4. Battery fuse box	8. "ST SIG" fuse
1. ECM	5. Transmission range switch (A/T vehicle)	9. "ST MOT" fuse
2. Starter motor	6. Starting motor control relay	10. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Engine starter signal is high voltage for 180 seconds continuously while engine is running. (2 driving cycle detection logic)	• Engine starter signal circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it at idle for 3 min. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

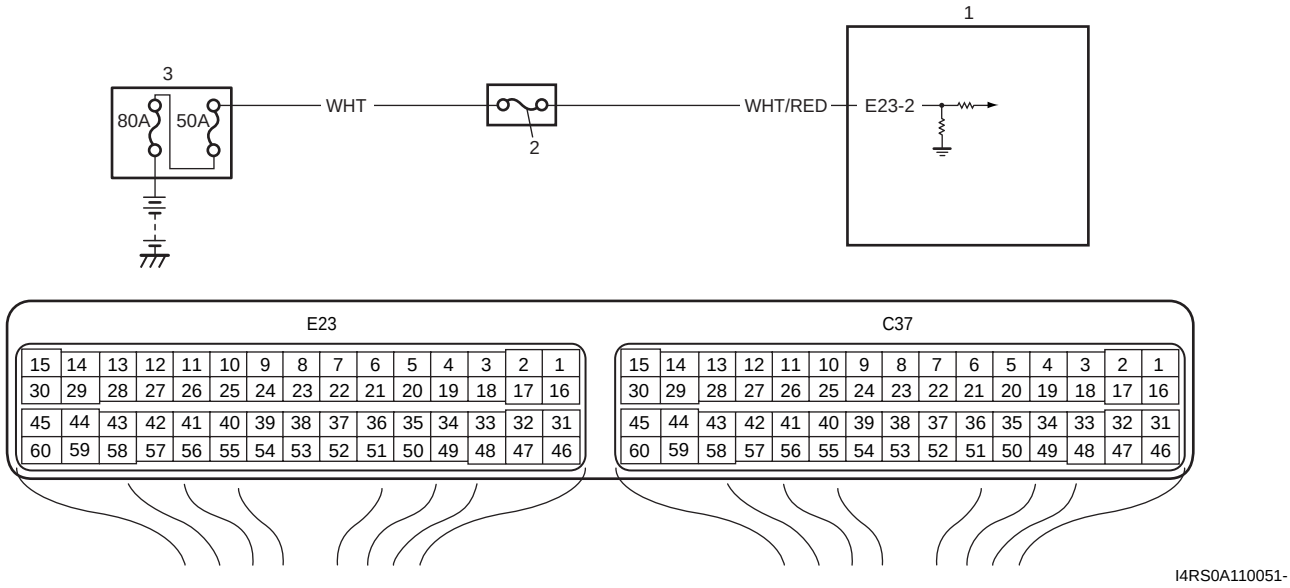
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**Starter signal check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Start engine, measure voltage between "C37-48" terminal of ECM connector and vehicle body ground. *Is voltage 0 – 1 V?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good ECM and recheck.	Go to Step 3.
3	**Wire circuit check** 1) Disconnect starting motor control relay in relay box with ignition switch turned OFF. 2) Check for proper connection to starting motor control relay at "RED/WHT", "RED", "WHT", "YEL" (A/T vehicle) and "YEL/GRN" (M/T vehicle) wire terminals. 3) Disconnect connectors from starting motor. 4) Check for proper connection to ECM at "C37-48" terminal. 5) Measure voltage between "C37-48" terminal of ECM connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 – 1 V?*	Go to Step 4.	For A/T vehicle, "YEL" or "YEL/GRN" wire is shorted to power circuit. For M/T vehicle, "YEL/GRN" wire is shorted to power circuit. If wires are OK, substitute a known-good ECM and recheck.
4	**Wire circuit check** 1) Measure voltage between "RED/WHT" wire terminal of starting motor control relay connector and vehicle body ground wire ignition switch turned ON. *Is voltage 0 – 1 V?*	Go to Step 5.	Faulty ignition switch, check ignition switch referring to "Ignition Switch Inspection: in Section 9C". If ignition switch is OK, check for short circuit between ignition switch and starting motor control relay to power circuit.
5	**Starting motor control relay check** 1) Check starting motor control relay referring to "Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace starting motor control relay.

DTC P1510: ECM Back-Up Power Supply Malfunction

S4RS0A1104053

Wiring Diagram



I4RS0A110051-

1.	ECM
2.	“RADIO” fuse
3.	Battery fuse box

Circuit Description

Battery voltage is supplied so that DTC memory, values for engine control learned by ECM, etc. are kept in ECM even when the ignition switch is turned OFF.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Back-up power circuit voltage is less than 70% battery voltage for 5 seconds continuously while engine is running. (1 driving cycle detection logic)	Battery voltage supply circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool and run engine at idle speed for 1 min.
3) Check DTC and pending DTC.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

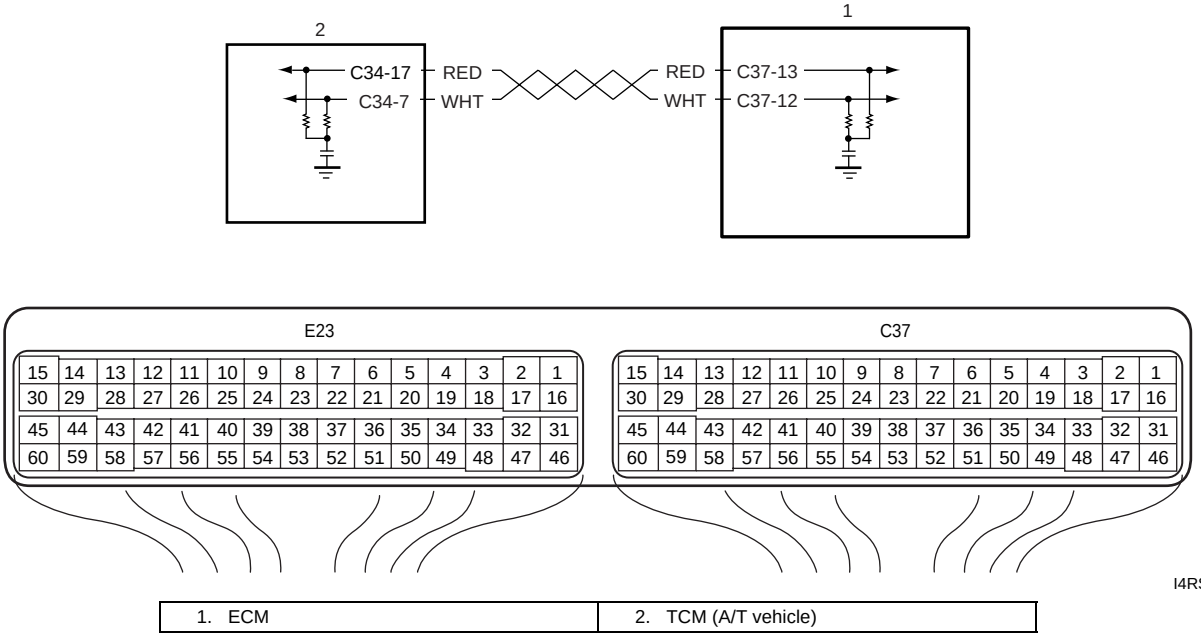
Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.

Step	Action	Yes	No
2	**Battery voltage supply circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) With engine running, measure voltage between “E23-2” terminal of ECM connector and engine ground. *Is voltage 10 – 14 V?*	Poor “E23-2” connection or intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If wire and connections are OK, substitute a known-good ECM and recheck.	“RADIO” fuse blown, “WHT” or “WHT/RED” wire is open or short circuit.

DTC P1603: TCM Trouble Code Detected

S4RS0A1104065

Wiring Diagram



I4RS0A110053-

1. ECM	2. TCM (A/T vehicle)

DTC Detecting Condition

When ECM receives a trouble code from TCM, which indicates that some problem occurred in sensor circuits and its calculated values used for operations such as idle speed control, engine power control, and so on by TCM, ECM sets DTC P1603. (TCM outputs the trouble code to ECM when TCM can not compute the engine control signal due to malfunctions of sensor circuits used for gear shift control.)

DTC Troubleshooting

NOTE:

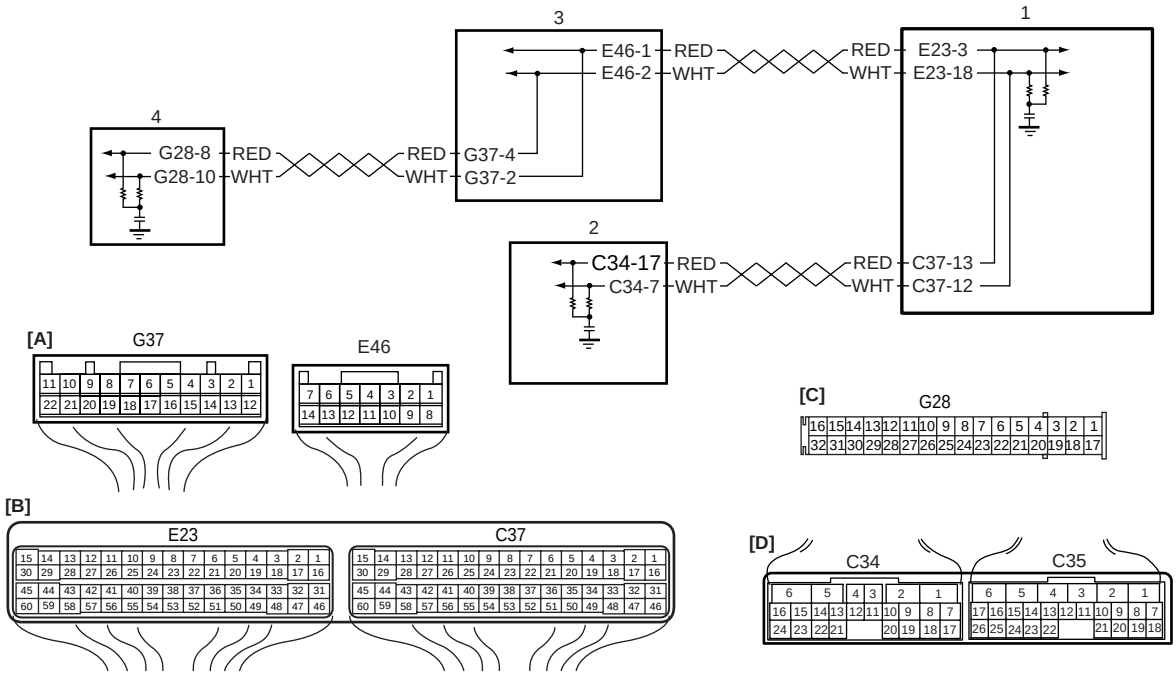
- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**DTC check** 1) Check DTC of TCM referring to "DTC Check: in Section 5A". *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good ECM and recheck.

DTC P1674: CAN Communication (Bus Off Error)

S4RS0A1104080

Wiring Diagram



I4RS0A110052-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. BCM
[B]: ECM connector (viewed from harness side)	1. ECM	4. Combination meter
[C]: Combination meter connector (viewed from harness side)	2. TCM (equipped with A/T)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously. (1 driving detection logic)	• ECM • BCM • TCM (equipped with A/T) • Combination meter • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (equipped with A/T) and BCM for DTC. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (equipped with A/T) and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**ECM, TCM (equipped with A/T), BCM and combination meter connectors check** 1) Check for proper connection at each ECM, TCM (equipped with A/T), BCM and combination meter connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1674?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00"
4	**ECM power and ground circuit check** 1) Check ECM power and ground circuit referring to "ECM Power and Ground Circuit Check: ". *Are they in good condition?*	Go to Step 5.	Repair ECM power and/or ground circuits.
5	**DTC check in BCM and TCM (equipped with A/T) (bus off)** 1) Check DTC(s) in TCM (equipped with A/T) and BCM. *Is there DTC(s) P1774 in TCM (equipped with A/T) and/or U1073 in BCM?*	Go to Step 6.	Go to Step 7.
6	**DTC check in ECM (bus off)** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check TCM (equipped with A/T) and BCM for DTC(s). *Is there DTC(s) P1774 in TCM (equipped with A/T) and/or U1073 in BCM?*	Go to Step 7.	Substitute a known-good ECM and recheck.
7	**DTC check in ECM** 1) Connect connectors to ECM and disconnect connectors from TCM (equipped with A/T) with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 8.	Substitute a known-good TCM (equipped with A/T) and recheck.

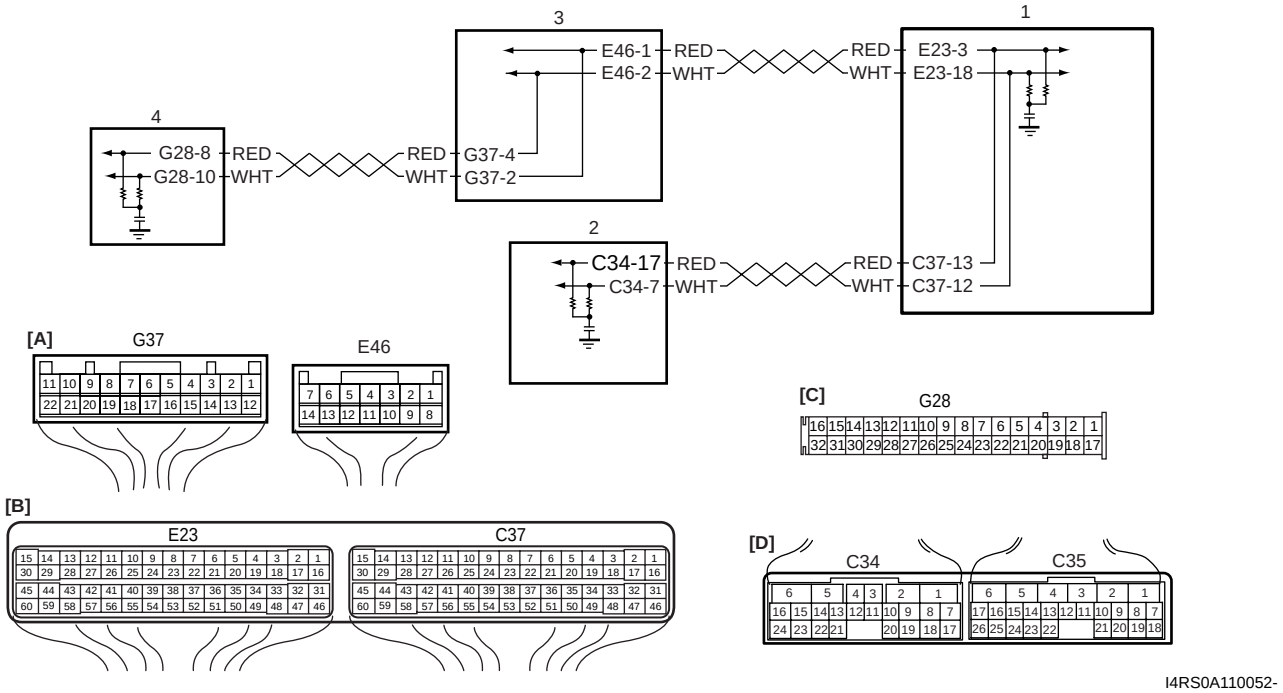
Step	Action	Yes	No
8	**DTC check in ECM** 1) Disconnect connector from combination meter with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 9.	Substitute a known-good combination meter and recheck.
9	**CAN communication line circuit insulation check** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance between “G37-2” and “G37-4” terminals of BCM connector. *Is resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”
10	**CAN communication line circuit insulation check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “E23-3” and “E23-18” terminals of ECM connector. *Is resistance infinity?*	Go to Step 11.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**CAN communication line circuit insulation check (equipped with A/T)** 1) Measure resistance between “C37-13” and “C37-12” terminals of ECM connector. *Is resistance infinity?*	Go to Step 12.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
12	**CAN communication line circuit continuity check** 1) Measure resistance at following connector terminals. • Between “E23-3” terminal of ECM connector and “E46-1” terminal of BCM connector • Between “E23-18” terminal of ECM connector and “E46-2” terminal of BCM connector • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector (equipped with A/T) • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector (equipped with A/T) • Between “G37-4” terminal of BCM connector and “G28-8” terminal of combination meter connector • Between “G37-2” terminal of BCM connector and “G28-10” terminal of combination meter connector *Is each resistance below 1 Ω?*	Go to Step 13.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”

Step	Action	Yes	No
13	**CAN communication line circuit ground short check** 1) Measure resistance at following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 14.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”
14	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Substitute a known-good BCM (included in junction block assembly) and recheck. If DTC is still detected, substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”

DTC P1675: CAN Communication (Transmission Error)

S4RS0A1104081

Wiring Diagram



I4RS0A110052-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. BCM
[B]: ECM connector (viewed from harness side)	1. ECM	4. Combination meter
[C]: Combination meter connector (viewed from harness side)	2. TCM (equipped with A/T)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for ECM is detected for longer than specified time continuously. (1 driving detection logic)	• ECM • BCM • TCM (equipped with A/T) • Combination meter • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: "
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (equipped with A/T) and BCM for DTC. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (equipped with A/T) and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**CAN communication error check for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): "	Go to Step 4.
4	**CAN communication error check for BCM and TCM (equipped with A/T)** 1) Check BCM and TCM (equipped with A/T) for DTC(s). *Are there DTC U1073 in BCM and DTC P1774 in TCM (equipped with A/T)?*	Go to applicable DTC diag. flow.	Go to Step 5.
5	**ECM, TCM (equipped with A/T), BCM and combination meter connectors check** 1) Check for proper connection at each ECM, TCM (equipped with A/T), BCM and combination meter connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1675?*	Go to Step 6.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00"
6	**ECM power and ground circuit check** 1) Check ECM power and ground circuits referring to "ECM Power and Ground Circuit Check: ". *Are they in good condition?*	Go to Step 7.	Repair ECM power and/or ground circuits.
7	**DTC check in ECM** 1) Check ECM for DTC(s). *Are there DTCs P1676 and P1678?*	Go to Step 8.	Go to Step 10.
8	**DTC check in TCM (equipped with A/T) and BCM** 1) Check TCM (equipped with A/T) and BCM for DTC(s). *Are there DTCs P1777, P1778 in TCM (equipped with A/T) and DTCs U1100, U1101 in BCM?*	Go to Step 10.	Go to Step 9.

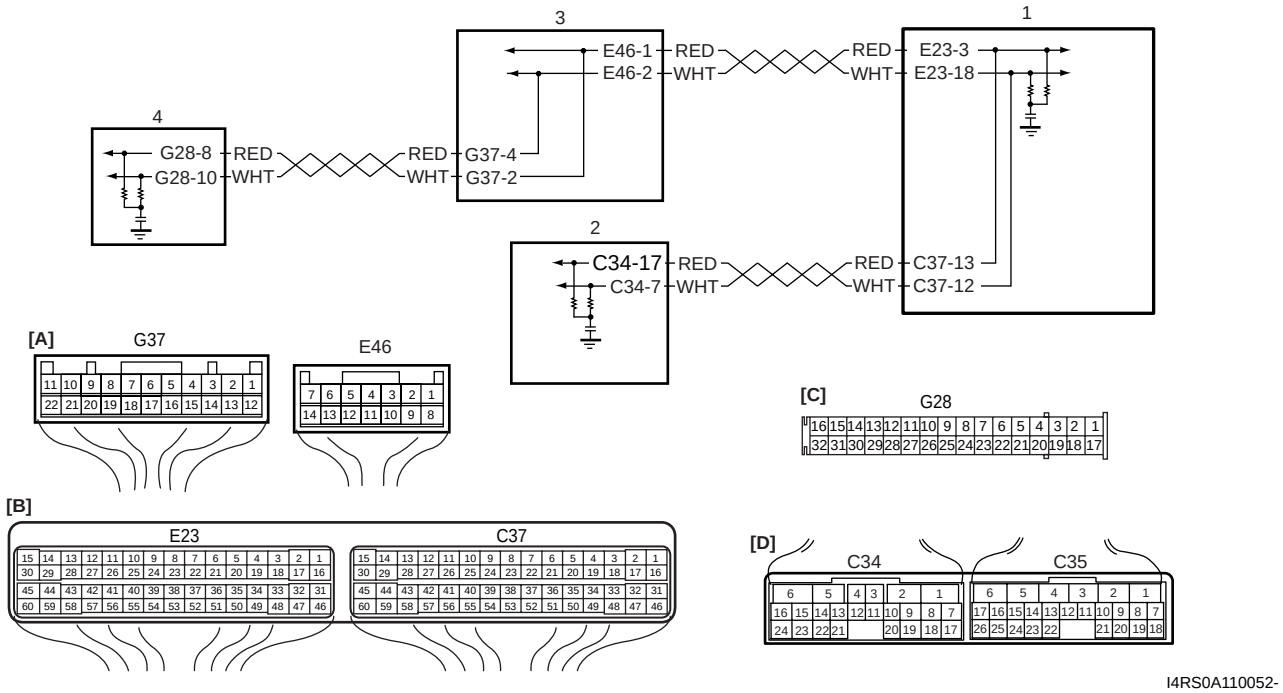
Step	Action	Yes	No
9	**Combination meter operation check** 1) Check combination meter operation for seat belt warning lamp (fastening and unfastening driver side seat belt) and shift position indicator lamp (equipped with A/T) with ignition switch turned ON. *Are they OK?*	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly), TCM (equipped with A/T) and recheck.
10	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM, BCM, TCM (equipped with A/T) and combination meter with ignition switch turned OFF. 2) Measure resistance at following connector terminals. • Between “E23-3” terminal of ECM connector and “E46-1” terminal of BCM connector • Between “E23-18” terminal of ECM connector and “E46-2” terminal of BCM connector • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector (equipped with A/T) • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector (equipped with A/T) • Between “G37-4” terminal of BCM connector and “G28-8” terminal of combination meter connector • Between “G37-2” terminal of BCM connector and “G28-10” terminal of combination meter connector *Is each resistance below 1 Ω?*	Go to Step 11.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”
11	**CAN communication line circuit insulation check** 1) Measure resistance at following connector terminals. • Between “E23-3” and “E23-18” terminals of ECM connector • Between “C37-13” and “C37-12” terminals of ECM connector (equipped with A/T) • Between “G37-4” and “G37-2” terminals of BCM connector *Is each resistance infinity?*	Go to Step 12.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”
12	**CAN communication line circuit ground short check** 1) Measure resistance at following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 13.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”

Step	Action	Yes	No
13	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”

DTC P1676: CAN Communication (Reception Error for TCM)

S4RS0A1104082

Wiring Diagram



I4RS0A110052-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (viewed from harness side)	3. BCM
[B]: ECM connector (viewed from harness side)	1. ECM	4. Combination meter
[C]: Combination meter connector (viewed from harness side)	2. TCM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for TCM is detected for longer than specified time continuously (1 driving detection logic)	• ECM • TCM • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

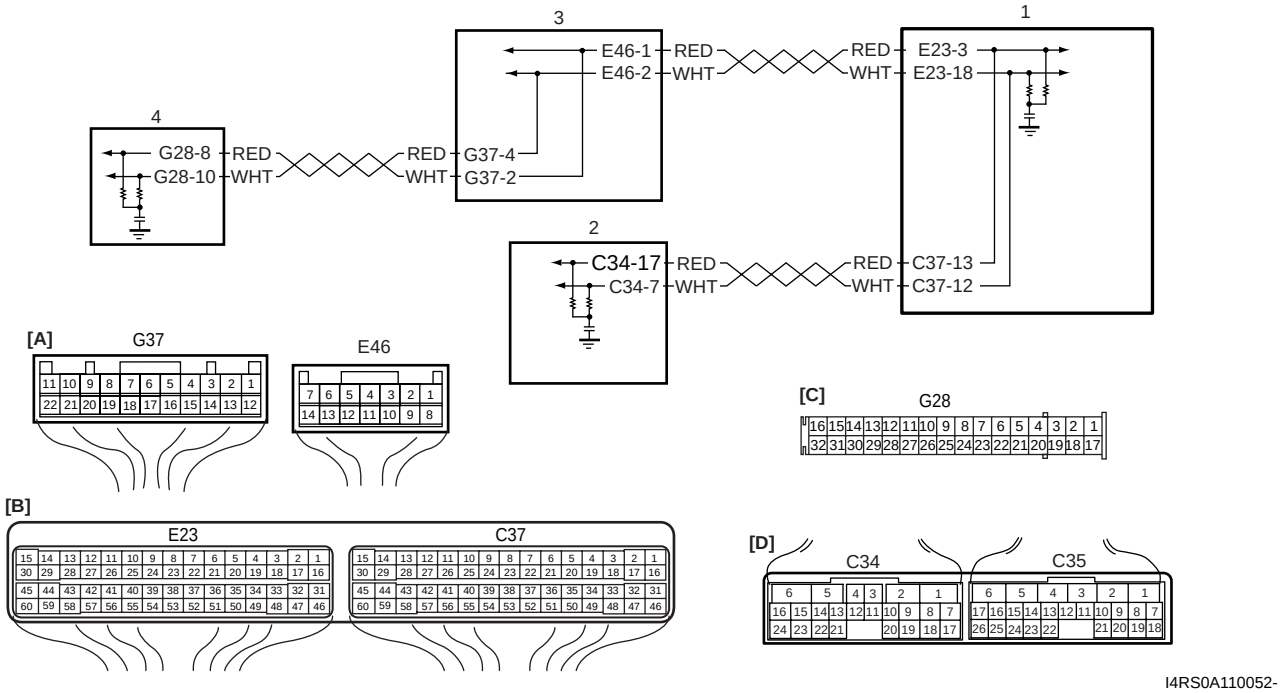
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM and BCM for DTC. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check CAN communication error for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): ".	Go to Step 4.
4	**ECM and TCM connector check** 1) Check for proper connection at each ECM and TCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1676?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**ECM power and ground circuit check** 1) Check ECM power and ground circuits referring to "ECM Power and Ground Circuit Check: ". *Are they in good condition?*	Go to Step 6.	Repair ECM power and/or ground circuits.
6	**DTC check in TCM** 1) Check DTC P1774 in TCM. *Is it indicated?*	Go to"DTC P1774: Control Module Communication Bus Off: in Section 5A"	Go to Step 7.
7	**DTC check in BCM** 1) Check DTC U1101 in BCM. *Is it indicated?*	Go to "DTC U1101 (No.1101): Lost communication with TCM: in Section 10B".	Go to Step 8

Step	Action	Yes	No
8	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM and TCM with ignition switch turned OFF. 2) Measure resistance at following connector terminals. • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector *Is each resistance below 1 Ω?*	Go to Step 9.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
9	**CAN communication line circuit insulation check** 1) Measure resistance between “C37-13” and “C37-12” terminals of ECM connector. *Is resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
10	**CAN communication line circuit ground short check** 1) Measure resistance at following connector terminals. • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 11.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at following connector terminals with ignition switch turned ON. • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 12.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
12	**ECM circuit check** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Connect connectors to ECM. 3) Measure resistance at following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connectors • Between “E23-18” and “C37-12” terminals of ECM connectors *Is resistance below 1 Ω?*	Substitute a known-good TCM and recheck.	Substitute a known-good ECM and recheck.

DTC P1678: CAN Communication (Reception Error for BCM)

S4RS0A1104083

Wiring Diagram



I4RS0A110052-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. BCM
[B]: ECM connector (viewed from harness side)	1. ECM	4. Combination meter
[C]: Combination meter connector (viewed from harness side)	2. TCM (equipped with A/T)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for BCM is detected for longer than specified time continuously (1 driving detection logic but MIL does not light up)	• ECM • BCM • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: ”.

Step	Action	Yes	No
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (equipped with A/T) and BCM for DTC. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (equipped with A/T) and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**CAN communication error check for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): ".	Go to Step 4.
4	**ECM, TCM (equipped with A/T) and BCM connector check** 1) Check for proper connection at each ECM, TCM (equipped with A/T) and BCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1678?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**ECM power and ground circuit check** 1) Check ECM power and ground circuits referring to "ECM Power and Ground Circuit Check: ". *Are they in good condition?*	Go to Step 6.	Repair ECM power and/or ground circuits.
6	**DTC check in BCM** 1) Check DTC U1073 in BCM. *Is it indicated?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: in Section 10B".	Go to Step 7.
7	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM and BCM with ignition switch turned OFF. 2) Measure resistance at following connector terminals. • Between "E23-3" terminal of ECM connector and "E46-1" terminal of BCM connector • Between "E23-18" terminal of ECM connector and "E46-2" terminal of BCM connector *Is each resistance below 1 Ω?*	Go to Step 8.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".
8	**CAN communication line circuit insulation check** 1) Measure resistance between "E23-3" and "E23-18" terminals of ECM connector. *Is resistance infinity?*	Go to Step 9.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".
9	**CAN communication line circuit ground short check** 1) Measure resistance at following connector terminals. • Between "E23-3" terminal of ECM connector and vehicle body ground • Between "E23-18" terminal of ECM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 10.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".

Step	Action	Yes	No
10	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 11.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Vehicle spec check** *Is vehicle equipped with A/T?*	Go to Step 12.	Go to Step 14.
12	**DTC check in TCM (equipped with A/T)** 1) Connect connectors to ECM and BCM with ignition switch turned OFF. 2) Check DTC P1778 in TCM (equipped with A/T). *Is it indicated?*	Go to Step 13.	Substitute a known-good ECM and recheck.
13	**ECM circuit check** 1) Disconnect connectors from BCM and TCM (equipped with A/T) with ignition switch turned OFF. 2) Measure resistance at following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connector • Between “E23-18” and “C37-12” terminals of ECM connector *Is resistance below 1 Ω?*	Substitute a known-good BCM (included in junction block assembly) and recheck.	Substitute a known-good ECM and recheck.
14	**Combination meter operation check** 1) Check combination meter operation for seat belt warning lamp by fastening and unfastening driver side seat belt with ignition switch turned ON. *Is check result satisfactory?*	Go to Step 15.	Substitute a known-good BCM (included in junction block assembly) and recheck.
15	**BCM circuit check** 1) Disconnect connectors from combination meter with ignition switch turned OFF. 2) Connect connectors to BCM. 3) Measure resistance at following connector terminals. • Between “E46-1” and “G37-2” terminals of BCM connector • Between “E46-2” and “G37-2” terminals of BCM connector *Is resistance below 1 Ω?*	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly) and recheck.

DTC P2227 / P2228 / P2229: Barometric Pressure Circuit Malfunction

S4RS0A1104054

DTC P2227: Barometric Pressure Circuit Range / Performance
DTC P2228: Barometric Pressure Circuit Low
DTC P2229: Barometric Pressure Circuit High

System Description
Barometric pressure sensor is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P2227: Difference of barometric pressure value and intake manifold pressure value is higher than specified value while engine is cranking. (2 driving cycle detection logic)	• Manifold absolute pressure sensor performance problem • Barometric pressure sensor in ECM
DTC P2228: Barometric pressure signal less than specified value is detected. (1 driving cycle detection logic)	• Barometric pressure sensor in ECM
DTC P2229: Barometric pressure signal more than specified value is detected. (1 driving cycle detection logic)	

DTC Confirmation Procedure

DTC P2227:

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine to normal operating temperature.
3) Check DTC and pending DTC by using scan tool.

DTC P2228 / P2229:

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch, clear DTC by using scan tool and run engine for 1 min.
3) Check DTC and pending DTC by using scan tool.

DTC Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: ".
2	*Is DTC P2227 set?*	Go to Step 3.	Substitute a known-good ECM and recheck.
3	**MAP sensor check** 1) Check MAP sensor and its circuit referring to "DTC P0107: Manifold Absolute Pressure Circuit Low Input: "and/or "DTC P0108: Manifold Absolute Pressure Circuit High Input: ". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	MAP sensor or its circuit malfunction.

Inspection of ECM and Its Circuits

S4RS0A1104055

ECM and its circuits can be checked by measuring voltage, pulse signal and resistance with special tool connected.

CAUTION:

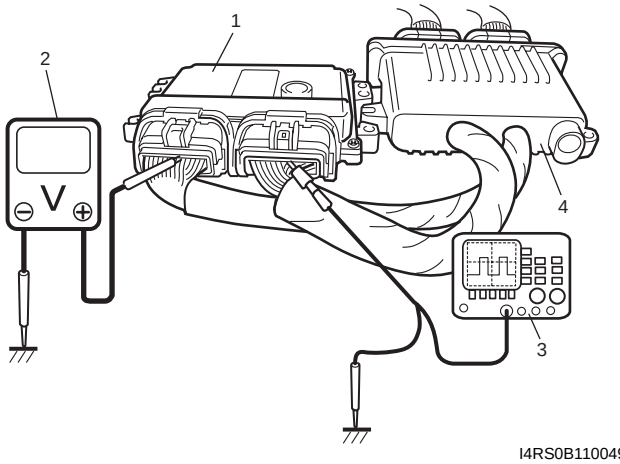
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with ECM connectors disconnected from it.

Voltage Check

1) Remove ECM (1) from its bracket referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.
2) Connect special tool (4) between ECM and ECM connectors securely.
3) Check voltage and/or pulse signal using voltmeter (2) and oscilloscope (3).

NOTE:

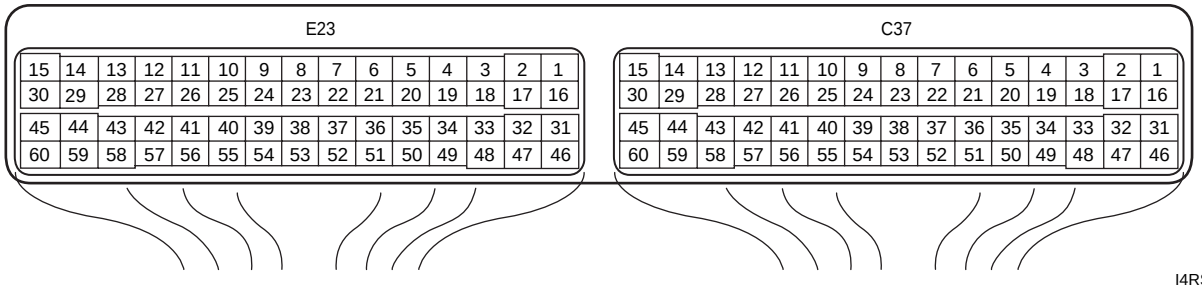
- **As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is turned ON.**
- **Voltage with asterisk (*) cannot be measured with voltmeter because it is pulse signal. Use oscilloscope for its check if necessary.**



I4RS0B110049-

- **Before performed this inspection, be sure to read the “Precautions of ECM Circuit Inspection: ”.**

Viewed from harness side



I4RS0A110055-

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-1	BLU/YEL	Fuel injector No.1 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: ”, “Reference waveform No.2: ” and “Reference waveform No.30: ”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-2	BLU/WHT	Fuel injector No.2 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: ” and “Reference waveform No.3: ”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-3	GRN/ORN	EGR valve (stepper motor coil 2) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: ”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-4	GRN/RED	EGR valve (stepper motor coil 1) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: ”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-5	GRN/WHT	Ignition coil No.2 and No.3 output	0 – 0.6 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 3 – 5 V (“Reference waveform No.5: ” and “Reference waveform No.6: ”)	Engine running at idle after warmed up engine.	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C37-6	GRN/YEL	Ignition coil No.1 and No.4 output	0 – 0.6 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 3 – 5 V (“Reference waveform No.6: ”, “Reference waveform No.7: ” and “Reference waveform No.30: ”)	Engine running at idle after warmed up engine.	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C37-7	—	—	—	—	—
C37-8	—	—	—	—	—
C37-9	PPL	Vehicle speed sensor signal (for M/T)	*0 – 1 V ↑↓ 4 – 5 V (“Reference waveform No.8: ” (M/T))	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (69 pulses (M/T) are generated per sec. at 30 km/h, 19 mph.) (8232 pulses/km (M/T))

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-10	WHT	Oxygen signal of heated oxygen sensor-1	0 – 1 V	Ignition switch turned ON.	—
			*Deflects between over 0.5 V and under 0.45 V (“Reference waveform No.9: ” and “Reference waveform No.10: ”)	While engine running at 2,000 r/min. for 1 min. or longer after warmed up.	
C37-11	BRN	Oxygen signal of heated oxygen sensor-2	4 – 5 V	Ignition switch turned ON.	—
			*Deflects between over 0.5 V and under 0.45 V (“Reference waveform No.11: ”)	While engine running at 2,000 r/min. or more after vehicle running over 30 km/h, 19 mph for 5 min.	
C37-12	WHT	CAN (low) (communication line (active low signal) to TCM (for A/T)	*0.5 – 2.5 V (“Reference waveform No.12: ”)	Ignition switch turned ON with engine stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
C37-13	RED	CAN (high) communication line (active high signal) to TCM (for A/T)	*2.5 – 4.5 V (“Reference waveform No.12: ”)		
C37-14	GRY/ RED	Output of 5 V power source for TP sensor, MAP sensor, A/C refrigerant pressure sensor	4.5 – 5.5 V	Ignition switch turned ON.	—
C37-15	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-16	BLU/ RED	Fuel injector No.3 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: ” and “Reference waveform No.13: ”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-17	BLU/ ORN	Fuel injector No.4 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: ” and “Reference waveform No.14: ”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-18	BRN/ YEL	EGR valve (stepper motor coil 4) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: ”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-19	WHT/ RED	EGR valve (stepper motor coil 3) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: ”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-20	RED/ YEL	CMP sensor signal	0 – 1 V or 4 – 5 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 4 – 5 V (“Reference waveform No.15: ” and “Reference waveform No.16: ”)	Engine running at idle after warmed up engine.	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (6 pulses are generated per 1 camshaft revolution.)
C37-21	PNK	CKP sensor signal	0 – 1 V or 4 – 5 V	Ignition switch turned ON.	—
			*4 – 5 V ↑↓ 0 – 0.6 V (“Reference waveform No.15: ” and “Reference waveform No.16: ”)	Engine running at idle after warming up engine.	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (30 (36 – 6) pulses are generated per 1 crankshaft revolution.)
C37-22	—	—	—	—	—
C37-23	—	—	—	—	—
C37-24	LT GRN	Engine coolant temp. (ECT) sensor signal	3.3 – 3.8 V	Ignition switch turned ON, ECT at 0 °C, 32 °F.	—
			1.38 – 1.72 V	Ignition switch turned ON, ECT at 50 °C, 122 °F.	
			0.40 – 0.53 V	Ignition switch turned ON, ECT at 100 °C, 212 °F.	
C37-25	BLK/ YEL	Intake air temp. (IAT) sensor signal	3.18 – 3.67 V	Ignition switch turned ON, IAT at 0 °C, 32 °F.	—
			1.32 – 1.65 V	Ignition switch turned ON, IAT at 40 °C, 104 °F.	
			0.46 – 0.60 V	Ignition switch turned ON, IAT at 80 °C, 176 °F.	
C37-26	GRN/ BLK	Mass air flow (MAF) sensor signal	0.5 – 1.5 V	Ignition switch turned ON with engine at stop.	—
			1.5 – 2.0 V (“Reference waveform No.17: ”)	When engine running at specified idle speed after warmed up.	
C37-27	GRY	Ground for MAF sensor	Below 0.3 V	Ignition switch turned ON.	—
C37-28	—	—	—	—	—
C37-29	BLU/ BLK	EVAP canister purge valve output	10 – 14 V	Ignition switch turned ON with engine at stop.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.18: ”)	Set EVAP canister purge valve at 52% by using “Misc Test” of scan tool.	Output signal is active low duty pulse. Duty ratio varies depending on vehicle condition.
C37-30	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-31	—	—	—	—	—
C37-32	—	—	—	—	—
C37-33	—	—	—	—	—
C37-34	—	—	—	—	—
C37-35	—	—	—	—	—
C37-36	—	—	—	—	—
C37-37	—	—	—	—	—
C37-38	—	—	—	—	—
C37-39	—	—	—	—	—
C37-40	—	—	—	—	—
C37-41	—	—	—	—	—
C37-42	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-43	—	—	—	—	—
C37-44	—	—	—	—	—
C37-45	—	—	—	—	—
C37-46	BLK/RED	Heater output of heated oxygen sensor-1	10 – 14 V	Ignition switch turned ON.	—
			*0 – 2 V ↑↓ 10 – 14 V (“Reference waveform No.9: ” and “Reference waveform No.10: ”)	Engine running at idle after warmed up engine.	Output signal is active low duty pulse. Duty ratio varies depending on engine condition.
C37-47	RED/BLU	Heater output of heated oxygen sensor-2	10 – 14 V	Ignition switch turned ON.	—
			0 – 1 V (“Reference waveform No.11: ”)	Engine running at idle after vehicle running over 30 km/h, 19 mph for 5 min.	
C37-48	YEL/GRN	Starting motor signal	0 – 1 V	Ignition switch turned ON.	—
			6 – 14 V	While engine cranking.	
C37-49	RED/WHT	IAC valve output	*0 – 2 V ↑↓ 8 – 14 V (“Reference waveform No.19: ”)	Ignition switch turned ON.	Ignition switch turned ON.
			*0 – 2 V ↑↓ 8 – 14 V (“Reference waveform No.20: ”)	Engine running at idle after warmed up engine.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-50	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-51	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-52	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-53	RED/BLK	Manifold absolute pressure (MAP) sensor signal	Approx. 4 V (“Reference waveform No.21: ”)	Ignition switch turned ON with barometric pressure at 100 kPa, 760 mmHg.	—
			0.4 – 2.0 V (“Reference waveform No.22: ”)	While engine running at specified idle speed after warmed up with barometric pressure at 100 kPa, 760 mmHg.	
C37-54	GRY/BLU	Throttle position (TP) sensor signal	0.5 – 1.0 V	Ignition switch turned ON and throttle valve at idle position after warmed up engine.	—
			3.4 – 4.7 V	Ignition switch turned ON and throttle valve at full open position after warmed up engine.	
C37-55	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—
C37-56	RED	Knock sensor signal	2 – 3 V (“Reference waveform No.23: ” and “Reference waveform No.24: ”)	Ignition switch turned ON.	—
				Engine running at 4000 r/min. after warmed up.	
C37-57	YEL	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—
C37-58	BLK/ORN	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-59	YEL/ GRN	Oil control valve ground	Below 1.3 V	Ignition switch turned ON.	—
C37-60	YEL/ RED	Oil control valve output	*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.25: ” and “Reference waveform No.26: ”)	At the moment of ignition switch turned ON.	Output signal is active high pulse. Duty ratio varies depending on vehicle condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-1	BLK/ RED	Main power supply	10 – 14 V	Ignition switch turned ON.	—
E23-2	WHT/ RED	Power source for ECM internal memory	10 – 14 V	Ignition switch turned ON.	—
E23-3	RED	CAN (high) communication line (active high signal) for BCM, combination meter	*2.5 – 4.5 V (“Reference waveform No.27: ”)	Ignition switch turned ON with engine at stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency with varies depending on engine condition.
E23-4	BRN	Engine revolution signal output for EPS control module	0 – 0.8 V	Ignition switch turned ON with engine at stop.	—
			*0 – 1 V ↑↓ 8 – 14 V (“Reference waveform No.28: ” and “Reference waveform No.29: ”)	While engine running.	Output signal is pulse. Pulse frequency varies depending on engine speed. (2 pulses are generated per 1 crankshaft revolution.) (3000 r/min. = 100 Hz)
E23-5	PPL/ WHT	Serial communication line of data link connector 12 V	8 – 14 V	Ignition switch turned ON.	—
E23-6	—	—	—	—	—
E23-7	—	—	—	—	—
E23-8	—	—	—	—	—
E23-9	—	—	—	—	—
E23-10	—	—	—	—	—
E23-11	—	—	—	—	—
E23-12	—	—	—	—	—
E23-13	YEL/ RED	Clock signal for immobilizer coil antenna	10 – 14 V	Ignition switch turned ON.	—
E23-14	—	—	—	—	—
E23-15	GRN/ WHT	Fuel pump relay output	0 – 2.5 V	For 3 sec. from the time ignition switch is turned ON or while engine is running.	—
			10 – 14 V	On and after 3 sec. from the time ignition switch is turned ON or while engine is at stop.	
E23-16	BLK/ RED	Main power supply	10 – 14 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-17	—	—	—	—	—
E23-18	WHT	CAN (low) communication line (active low signal) for BCM, combination meter	*0.5 – 2.5 V (“Reference waveform No.27: ”)	Ignition switch turned ON with engine at stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
E23-19	BLU/ WHT	Electric load signal for heater blower motor	10 – 14 V	Ignition switch turned ON, blower fan selector at OFF position.	—
			0 – 1 V	Ignition switch turned ON, blower fan selector at 2nd speed position or more.	
E23-20	GRN/ WHT	Stop lamp switch signal	0 – 1 V	Ignition switch turned ON, stop lamp not lit up.	—
			10 – 14 V	Ignition switch turned ON, stop lamp lit up.	
E23-21	—	—	—	—	—
E23-22	—	—	—	—	—
E23-23	—	—	—	—	—
E23-24	YEL/ RED	Fuel level sensor signal	0 – 6 V	Ignition switch turned ON. Voltage varies depends on fuel level.	—
E23-25	PPL	Vehicle speed signal output for EPS control module	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.8: ”)	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (21 pulses are generated per sec. at 30 km/h (2561 pulses/km), 19 mph.)
E23-26	RED/ BLU	EPS signal	10 – 14 V	Ignition switch turned ON.	—
			0 – 1 V	With engine running at idle speed, and steering wheel turned to the right or left as far as it stops.	
E23-27	—	—	—	—	—
E23-28	YEL/ BLK	Serial communication line for immobilizer coil antenna	10 – 14 V	Ignition switch turned ON.	—
E23-29	BLK/ WHT	Ignition switch signal	0 – 1 V	Ignition switch turned OFF.	—
			10 – 14 V	Ignition switch turned ON.	
E23-30	WHT	Starting motor control relay output	0 – 1 V	Ignition switch turned ON.	—
			0 – 1 V	Ignition switch is turned to ST (engine cranking) position.	
E23-31	—	—	—	—	—
E23-32	—	—	—	—	—
E23-33	—	—	—	—	—
E23-34	—	—	—	—	—
E23-35	—	—	—	—	—
E23-36	—	—	—	—	—
E23-37	—	—	—	—	—
E23-38	—	—	—	—	—
E23-39	—	—	—	—	—
E23-40	—	—	—	—	—
E23-41	—	—	—	—	—
E23-42	—	—	—	—	—

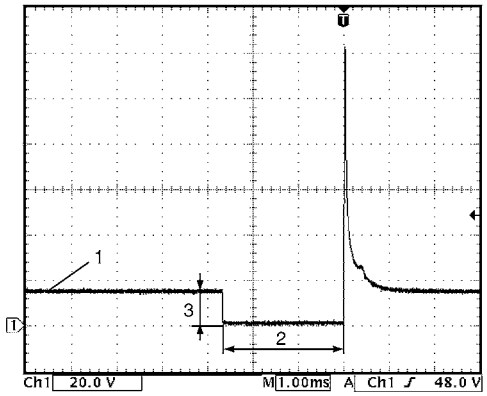
Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-43	—	—	—	—	—
E23-44	—	—	—	—	—
E23-45	—	—	—	—	—
E23-46	LT GRN	Radiator cooling fan relay No.1 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 95 °C (203 °F), or A/C refrigerant pressure: below 600 kPa (87 psi) with A/C switch turned ON while engine is running.	—
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 97.5 °C (207.5 °F) or higher, or A/C refrigerant pressure: 1100 kPa (159.5 psi) or higher with A/C switch turned ON while engine is running.	
E23-47	GRY	A/C compressor relay output	10 – 14 V	Engine running, A/C switch OFF and blower selector at OFF position.	—
			0 – 1 V	Engine running, A/C switch ON and blower selector at 1st position or more.	
E23-48	GRN	Radiator cooling fan relay No.2 and No.3 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 100 °C (212 °F), or A/C refrigerant pressure: below 1200 kPa (174 psi) with A/C switch turned ON while engine is running.	—
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 102.5 °C (216.5 °F) or higher, or A/C refrigerant pressure: 1500 kPa (217.5 psi) or higher with A/C switch turned ON while engine is running.	
E23-49	—	—	—	—	—
E23-50	—	—	—	—	—
E23-51	—	—	—	—	—
E23-52	—	—	—	—	—
E23-53	—	—	—	—	—
E23-54	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-55	RED	A/C refrigerant pressure sensor signal	1.38 – 1.52 V	Engine running, A/C switch OFF and blower selector at OFF position, A/C refrigerant pressure: 800 kPa (116 psi)	—
			2.15 – 2.38 V	Engine running, A/C switch ON and blower selector at 1st position or more, A/C refrigerant pressure: 1400 kPa (203 psi)	
			2.67 – 2.95 V	Engine running, A/C switch ON and blower selector at 1st position or more, A/C refrigerant pressure: 1800 kPa (261 psi)	
E23-56	—	—	—	—	—
E23-57	WHT/ BLK	A/C evaporator outlet air temp. sensor signal	3.4 – 3.7 V	Ignition switch turned ON at A/C evaporator outlet temperature 0 °C (32 °F).	—
			2.5 – 2.8 V	Ignition switch turned ON at A/C evaporator outlet temperature 15 °C (59 °F).	
			1.7 – 2.0 V	Ignition switch turned ON at A/C evaporator outlet temperature 30 °C (86 °F).	
E23-58	—	—	—	—	—
E23-59	—	—	—	—	—
E23-60	BRN/ WHT	Main power supply relay output	10 – 14 V	Ignition switch turned OFF.	—
			0 – 2 V	Ignition switch turned ON.	

Reference waveform No.1

Fuel injector signal (1) with engine idling

Measurement terminal	CH1: “C37-2” to “C37-58”
Oscilloscope setting	CH1: 20 V/DIV TIME: 1 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



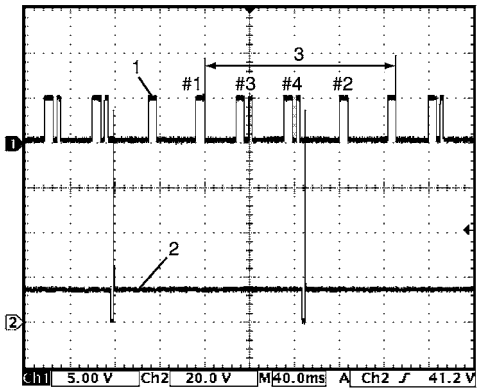
I4RS0B110050-

2. Fuel injection pulse width: 2-4 msec.
3. 10 – 14 V

Reference waveform No.2

No.1 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-1” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



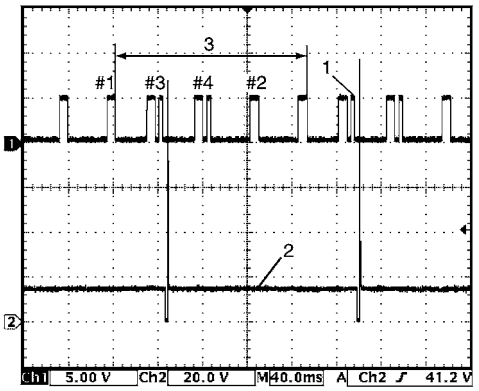
I4RS0A110088-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.3

No.2 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-2” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



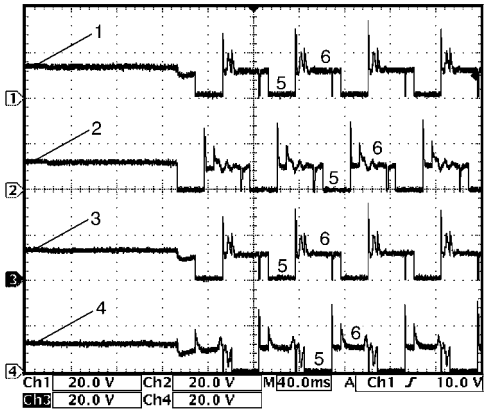
I4RS0A110089-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.4

EGR valve signal

Measurement terminal	CH1: “C37-4” to “C37-58” CH2: “C37-3” to “C37-58” CH3: “C37-19” to “C37-58” CH4: “C37-18” to “C37-58”
Oscilloscope setting	CH1: 20 V/DIV, CH2: 20 V/DIV CH3: 20 V/DIV, CH4: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	Engine at cranking



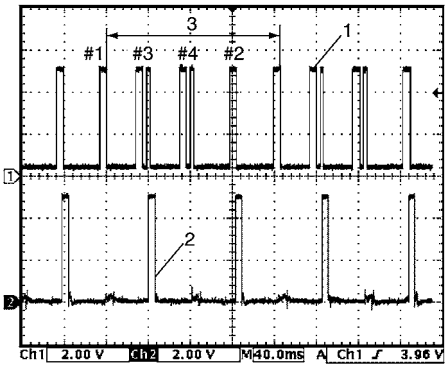
I4RS0B110053-

1. EGR valve stepper motor coil 1 signal
2. EGR valve stepper motor coil 2 signal
3. EGR valve stepper motor coil 3 signal
4. EGR valve stepper motor coil 4 signal
5. ON signal
6. OFF signal

Reference waveform No.5

Ignition coil No.2 and No.3 signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-5” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



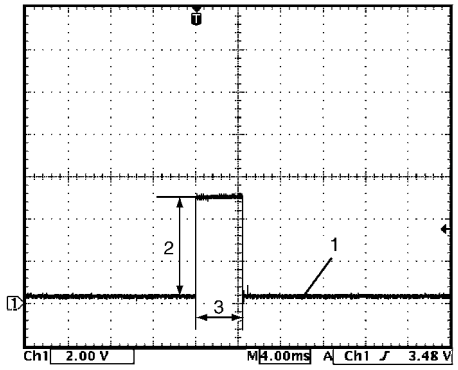
I4RS0A110090-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.6

Ignition coil signal (1) with engine idling

Measurement terminal	CH1: “C37-6” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV TIME: 4 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



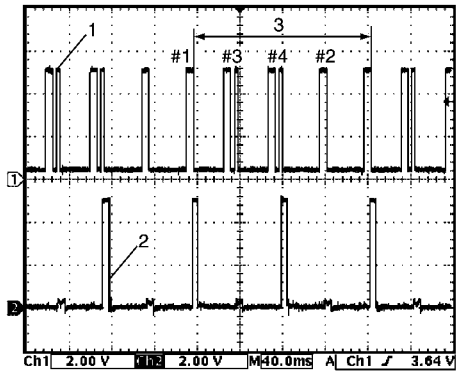
I4RS0B110055-

2. 4 – 6 V
3. Ignition coil pulse width: 4 – 5 msec.

Reference waveform No.7

Ignition coil No.1 and No.4 signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



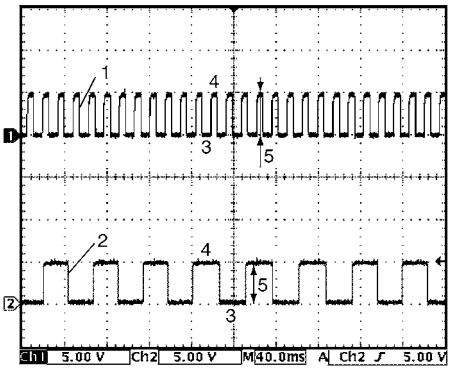
I4RS0A110091-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.8

VSS signal at 30 km/h (19 mph) (for M/T model)

Measurement terminal	CH1: “C37-9” to “C37-58” CH2: “E23-25” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 30 km/h (19 mph)



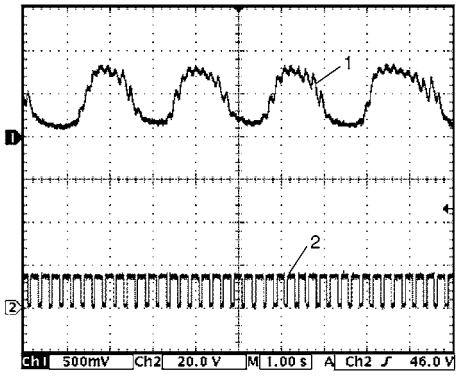
I4RS0B110057-

1. VSS signal (M/T)
2. VSS signal for EPS control module
3. ON
4. OFF
5. 4 – 5 V

Reference waveform No.9

Heated oxygen sensor-1 signal (1) with engine idling

Measurement terminal	CH1: “C37-10” to “C37-57” CH2: “C37-46” to “C37-58”
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 20 V/DIV TIME: 1 s/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



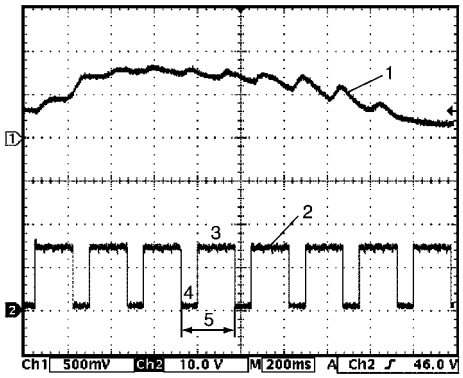
I4RS0B110058-

2. Heated oxygen sensor-1 heater signal

Reference waveform No.10

Heated oxygen sensor-1 heater signal (2) with engine idling

Measurement terminal	CH1: “C37-10” to “C37-57” CH2: “C37-46” to “C37-58”
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



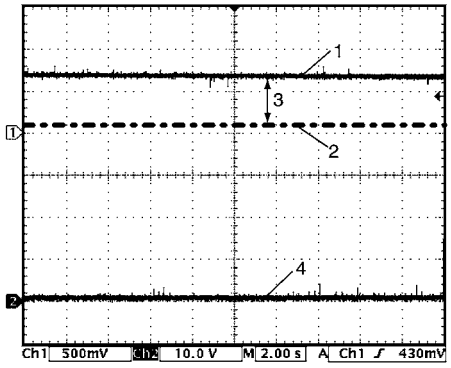
I4RS0B110059-

1.	Heated oxygen sensor-1 signal
3.	OFF signal
4.	ON signal
5.	One duty cycle

Reference waveform No.11

Heated oxygen sensor-2 heater signal (4) with engine idling

Measurement terminal	CH1: “C37-11” to “C37-57” CH2: “C37-47” to “C37-58”
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 10 V/DIV TIME: 2 s/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 60 km/h (37 mph) for 10 min. • Engine at specified idle speed



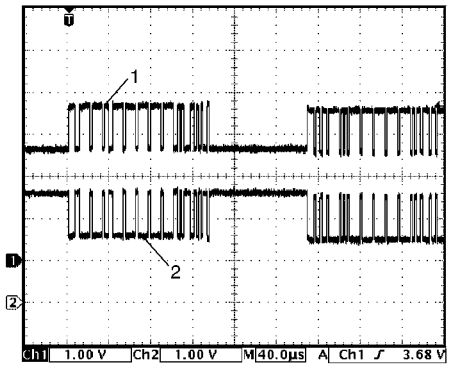
I4RS0B110060-

1.	Heated oxygen sensor-2 signal upper limit
2.	Heated oxygen sensor-2 signal lower limit
3.	Normal waveform range

Reference waveform No.12

CAN communication line signal from TCM (for A/T or AMT model) with ignition switch turned ON

Measurement terminal	CH1: “C37-13” to “C37-58” CH2: “C37-12” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μs/DIV
Measurement condition	Ignition switch turned ON (Signal pattern is depending on engine condition)



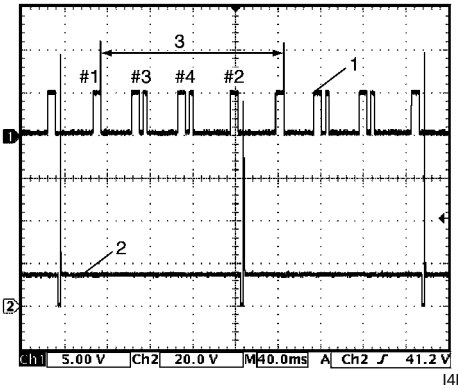
I4RS0B110061-

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

Reference waveform No.13

No.3 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-16” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



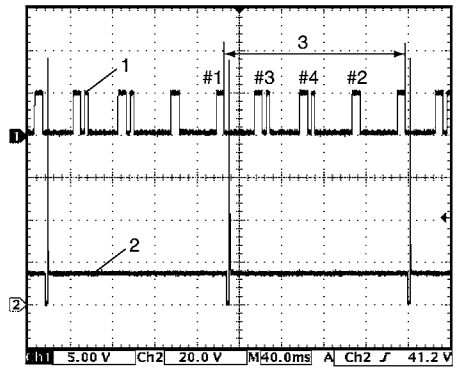
I4RS0A110092-

1.	Cylinder reference signal (CMP reference signal)
3.	720° crank angle

Reference waveform No.14

No.4 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-17” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



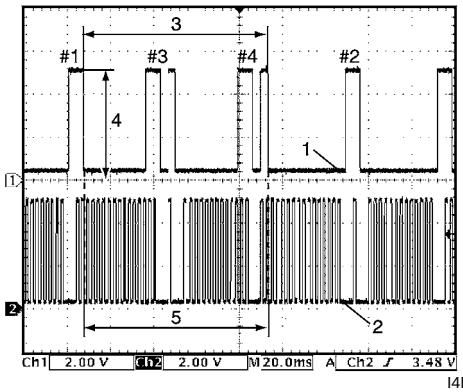
I4RS0A110093-

1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.15

CMP sensor signal with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-21” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 20 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



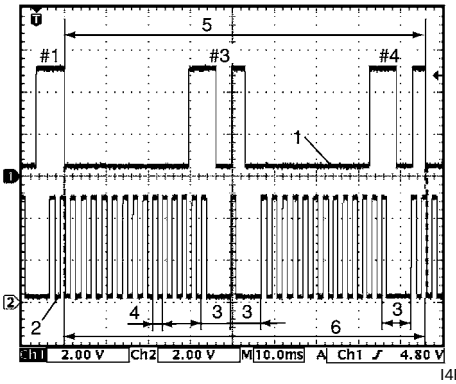
I4RS0A110094-

1. Cylinder reference signal (CMP reference signal)
2. CKP signal
3. 360° crank angle
4. 4 – 5 V
5. 36 – 6 = 30 CKP pulse

Reference waveform No.16

CMP sensor signal with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-21” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



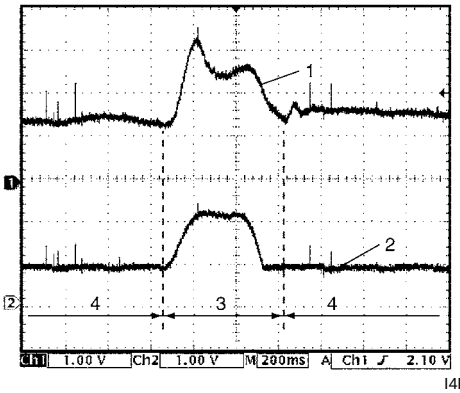
I4RS0A110095-

1. Cylinder reference signal (CMP reference signal)
2. CKP signal
3. 30° crank angle
4. 10° crank angle
5. 360° crank angle
6. 36 – 6 = 30 CKP pulse

Reference waveform No.17

Mass air flow sensor signal (1) with engine racing

Measurement terminal	CH1: “C37-26” to “C37-27” CH2: “C37-54” to “C37-55”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine racing

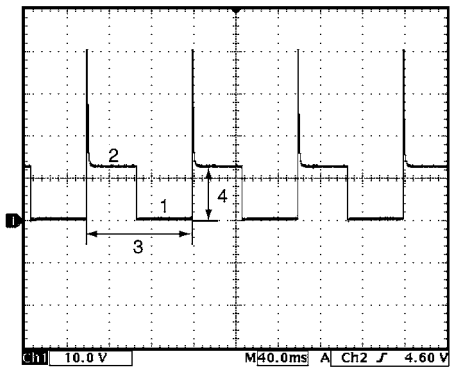


I4RS0B110066-

2. Throttle position sensor signal
3. Racing
4. Idle

Reference waveform No.18
EVAP canister purge valve signal

Measurement terminal	CH1: “C37-29” to “C37-58”
Oscilloscope setting	CH1: 10 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Set EVAP canister purge valve at 52% by using “Misc Test” of scan tool

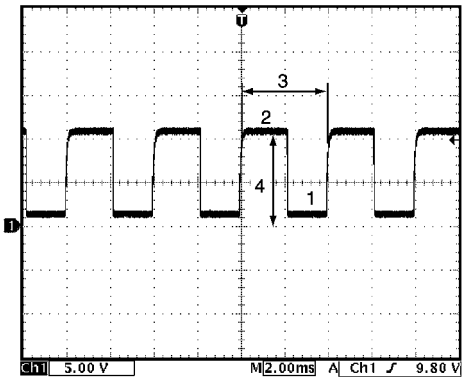


I4RS0B110067-

1. ON signal
2. OFF signal
3. One duty cycle
4. 10 – 14 V

Reference waveform No.19
IAC valve signal with ignition switch turned ON

Measurement terminal	CH1: “C37-49” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Ignition switch turned ON

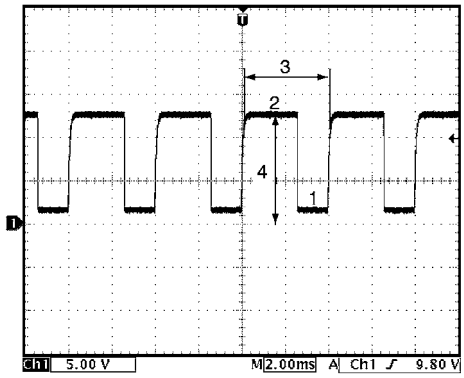


I4RS0B110068-

1. ON signal
2. OFF signal
3. One duty cycle (Approx. 4 msec.)
4. 8 – 14 V

Reference waveform No.20
IAC valve signal

Measurement terminal	CH1: “C37-49” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

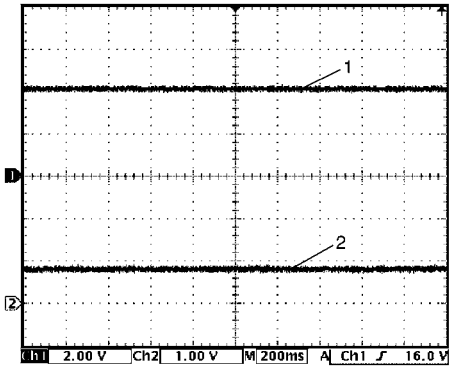


I4RS0B110069-

1. ON signal
2. OFF signal
3. One duty cycle (Approx. 4 msec.)
4. 8 – 14 V

Reference waveform No.21
Manifold absolute pressure sensor signal (1) with ignition switch turned ON

Measurement terminal	CH1: “C37-53” to “C37-55” CH2: “C37-54” to “C37-55”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Ignition switch turned ON



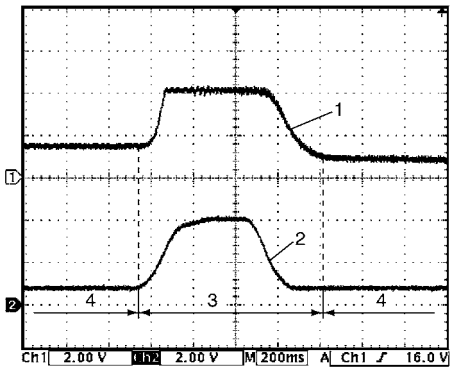
I4RS0B110070-

2. Throttle position sensor signal

Reference waveform No.22

Manifold absolute pressure sensor signal (1) with engine racing

Measurement terminal	CH1: “C37-53” to “C37-55” CH2: “C37-54” to “C37-55”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine racing



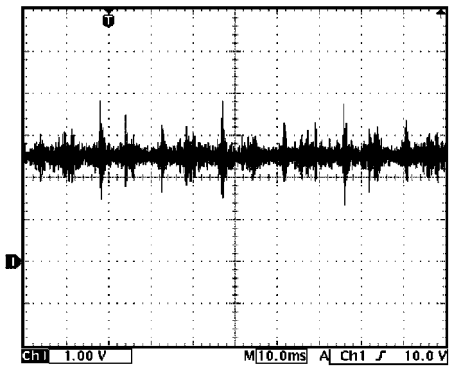
I4RS0B110071-

2. Throttle position sensor signal
3. Racing
4. Idle

Reference waveform No.23

Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: “C37-56” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Run engine at 4000 r/min.

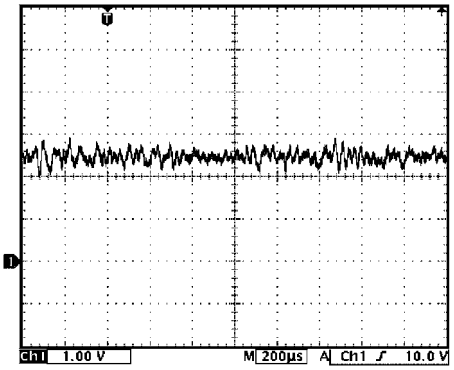


I4RS0B110072-

Reference waveform No.24

Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: “C37-56” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV TIME: 200 μs/DIV
Measurement condition	• After warmed up to normal operating temperature • Run engine at 4000 r/min.

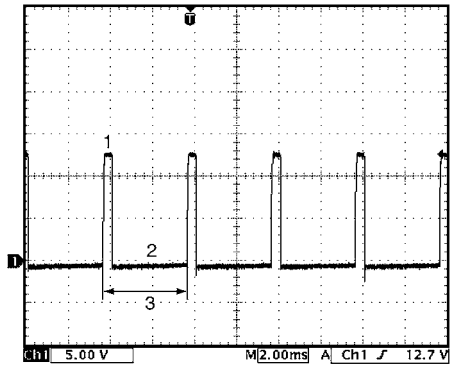


I4RS0B110073-

Reference waveform No.25

Oil control valve signal with engine idling (for M15 engine model)

Measurement terminal	CH1: “C37-60” to “C37-59”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	At the moment of the ignition switch turned on



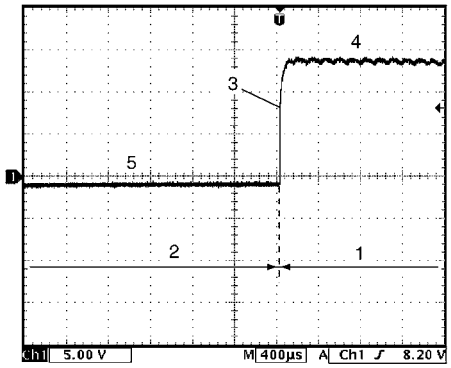
I4RS0B110074-

1. ON signal
2. OFF signal
3. Only duty cycle

Reference waveform No.26

Oil control valve signal with engine racing (for M15 engine model)

Measurement terminal	CH1: “C37-60” to “C37-59”
Oscilloscope setting	CH1: 5 V/DIV TIME: 400 μs/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 20 km/h (12 mph) and depress accelerator pedal fully



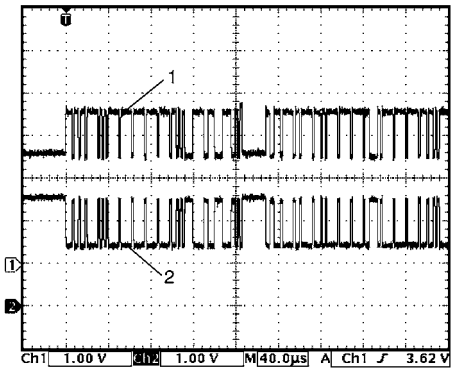
I4RS0B110075-

1.	Accelerator pedal depressed fully
2.	Accelerator pedal depressed partially
3.	Oil control valve signal
4.	ON signal
5.	OFF signal

Reference waveform No.27

CAN communication line signal from BCM with ignition switch turned ON

Measurement terminal	CH1: “E23-3” to “C37-58” CH2: “E23-18” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μs/DIV
Measurement condition	Ignition switch turned ON (Signal pattern is depending on engine condition)



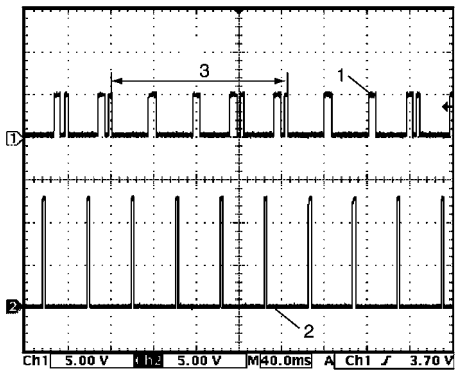
I4RS0B110076-

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

Reference waveform No.28

Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “E23-4” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



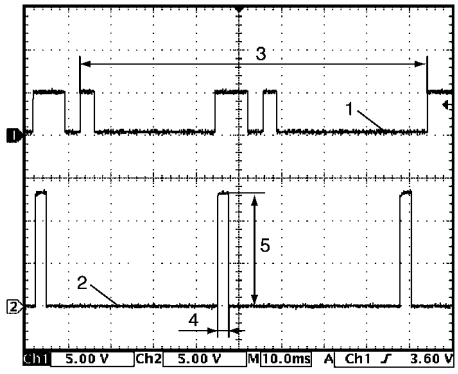
I4RS0A110096-

1.	Cylinder reference signal (CMP reference signal)
3.	720° crank angle

Reference waveform No.29

Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “E23-4” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



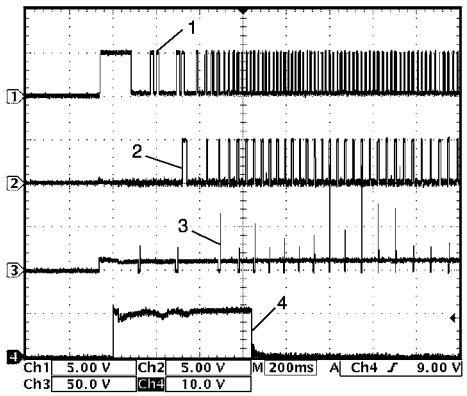
I4RS0A110097-

1.	Cylinder reference signal (CMP reference signal)
3.	360° crank angle
4.	2 to 4 msec.
5.	10 – 14 V

Reference waveform No.30

Ignition coil signal and fuel injector signal with engine cranking

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58” CH3: “C37-1” to “C37-58” CH4: “C37-48” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV CH3: 50 V/DIV, CH4: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at cranking



I4RS0A110098-

1. Cylinder reference signal (CMP reference signal)
2. Ignition coil No.1 and No.4 signal
3. No.1 fuel injector signal
4. Engine start signal

Resistance Check

1) Remove ECM from its bracket referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.

CAUTION:

Never touch terminals of ECM itself or connect voltmeter or ohmmeter (2).

2) Connect special tool to ECM connectors securely.

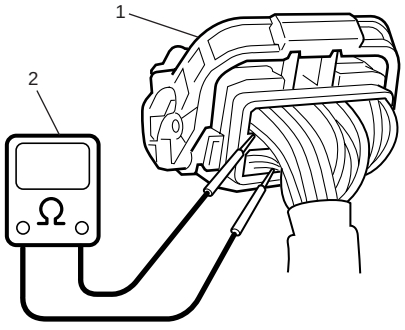
NOTE:

Do not connect the other connector of special tool to ECM.

3) Check resistance between each pair of terminals of disconnected connectors (1) as listed in the following table.

CAUTION:

- **Be sure to connect ohmmeter probe from wire harness side of coupler.**
- **Be sure to turn OFF ignition switch for this check.**
- **Resistance in the following table represents that measured when parts temperature is 20 °C (68 °F).**



I4RS0A110086-

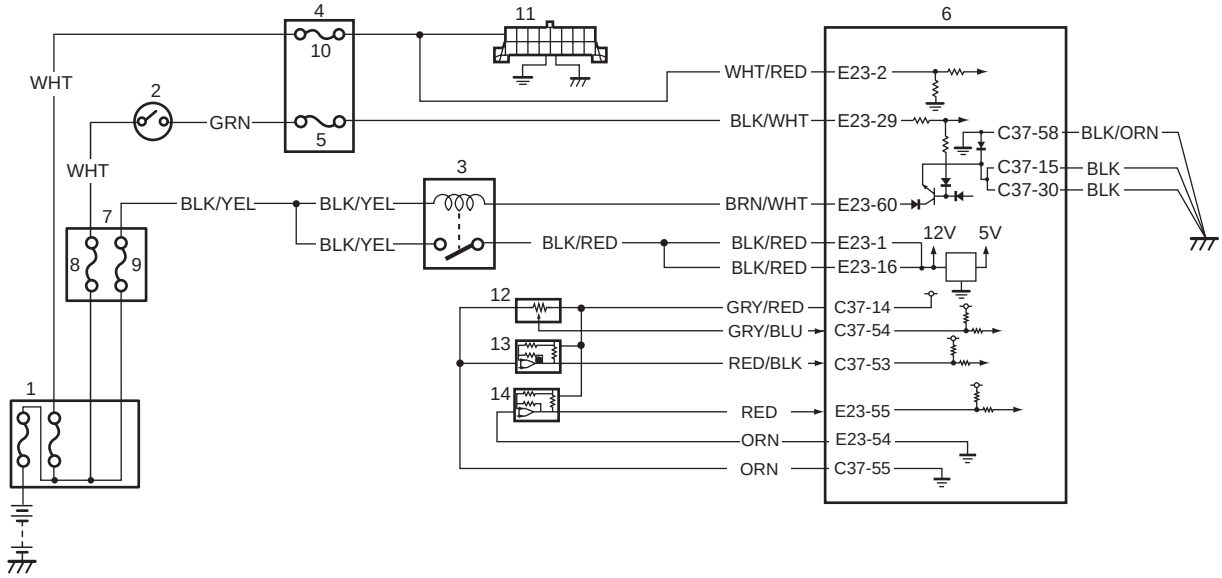
Terminals	Circuit	Standard resistance	Condition
C37-47 to E23-29	Heater of HO2S-2	4 – 15 Ω	—
E23-46 to E23-1/16	Radiator cooling fan relay No.1	160 – 240 Ω	—
E23-60 to E23-29	Main relay	160 – 240 Ω	Battery disconnected and ignition switch turned ON
E23-15 to E23-29	Fuel pump relay	160 – 240 Ω	—
C37-16 to E23-1/16	No.3 fuel injector	10.8 – 18.2 Ω	—
C37-17 to E23-1/16	No.4 fuel injector		

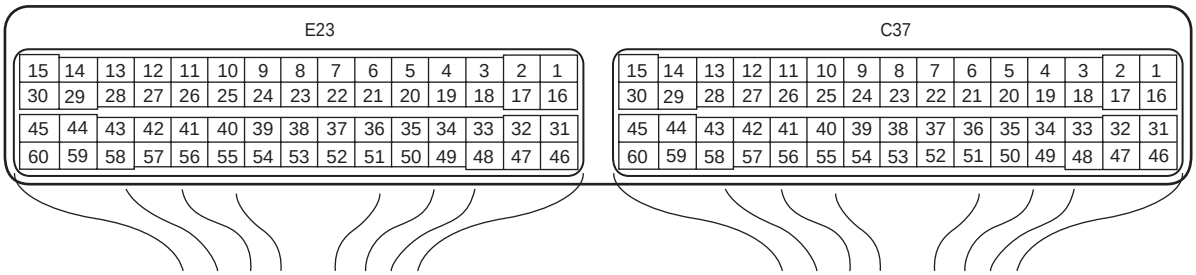
Terminals	Circuit	Standard resistance	Condition
C37-4 to E23-1/16	EGR valve (stepping motor No.1 coil)	20 – 31 Ω	—
C37-29 to E23-1/16	EVAP canister purge valve	28 – 35 Ω	—
C37-2 to E23-1/16	No.2 fuel injector	10.8 – 18.2 Ω	—
C37-3 to E23-1/16	EGR valve (stepping motor No.2 coil)	20 – 31 Ω	—
C37-18 to E23-1/16	EGR valve (stepping motor No.4 coil)		
C37-19 to E23-1/16	EGR valve (stepping motor No.3 coil)		
C37-46 to E23-29	Heater of HO2S-1	2 – 11 Ω	—
C37-1 to E23-1/16	No.1 fuel injector	10.8 – 18.2 Ω	—
E23-47 to E23-1/16	A/C compressor relay	160 – 240 Ω	—
C37-60 to C37-59	Oil control valve (for M15 engine model)	6 – 15 Ω	—
E23-45 to E23-1/16	Throttle actuator control relay (for AMT model)	160 – 240 Ω	—

ECM Power and Ground Circuit Check

S4RS0A1104066

Wiring Diagram





I4RS0A110099-

1. Main fuse box	5. "IG COIL" fuse	9. "FI" fuse	13. MAP sensor
2. Ignition switch	6. ECM	10. "RADIO" fuse	14. A/C refrigerant pressure sensor
3. Main relay	7. Relay box	11. DLC	
4. BCM (included in junction block assembly)	8. "IG ACC" fuse	12. TP sensor	

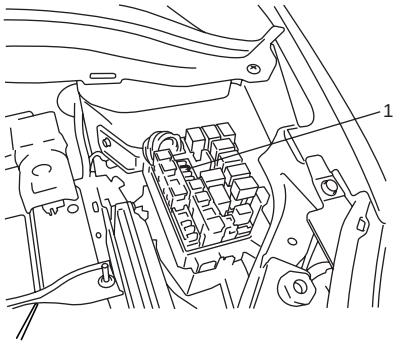
Circuit Description

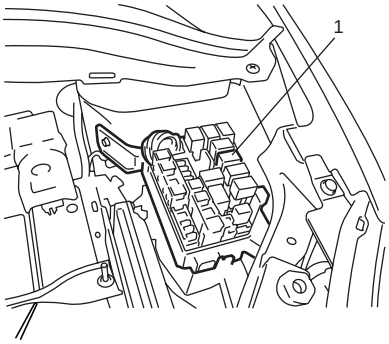
When the ignition switch is turned ON, the main relay turns ON (the contact point closes) and the main power is supplied to ECM.

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**

Step	Action	Yes	No
1	**Circuit fuse check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection to ECM connector at “E23-2”, “E23-29”, “E23-60”, “E23-1”, “E23-16”, “C37-58”, “C37-15” and “C37-30” terminals. 3) If OK, check “RADIO” fuse and “IG COIL” fuse for blowing. *Are “RADIO” fuse and “IG COIL” fuse in good condition?*	Go to Step 2.	Replace fuse(s) and check for short in circuits connected to fuse(s).
2	**Power supply circuit check** 1) Measure voltage between “E23-2” terminal of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 3.	“WHT/RED” or “WHT” wire is open circuit.
3	**Ignition signal check** 1) Turn ignition switch to ON position. 2) Measure voltage between “E23-29” terminal of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 4.	“BLK/WHT” or “GRN” wire is open circuit.
4	**Main relay circuit check** 1) Turn ignition switch to OFF position. 2) Check “FI” fuse (1) (15 A) in relay box for blowing.  I4RS0A110016- 3) If OK, measure voltage between “E23-60” terminal of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 5.	Go to Step 9.
5	**Main relay circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Measure voltage between “E23-60” terminal of ECM connector and body ground. *Is voltage 0 – 1 V?*	Go to Step 7.	Go to Step 6.

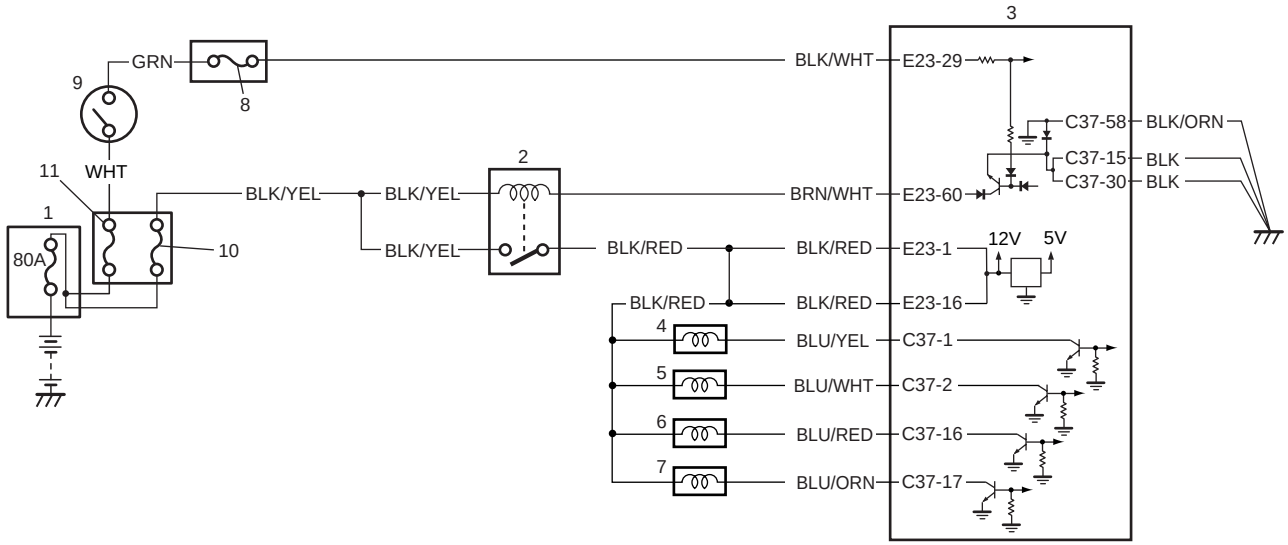
Step	Action	Yes	No
6	**ECM ground circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Measure resistance between each “C37-58”, “C37-15” and “C37-30” terminals of ECM connector and body ground. *Is resistance 1 Ω or less?*	Substitute a known-good ECM and recheck.	“BLK/ORN” or “BLK” wire is open or high resistance circuit.
7	**Main relay circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Using service wire, ground “E23-60” terminal of ECM connector and measure voltage between each “E23-1” and “E23-16” terminals of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 11.	Go to Step 8.
8	**Main relay circuit check** 1) Remove main relay (1) from relay box.  I4RS0A110017- 2) Check for proper connection to main relay connector at “BLK/YEL” and “BLK/RED” wire terminals. 3) If OK, measure resistance between each “E23-1” and “E23-16” wire terminals of ECM connector and “BLK/RED” wire terminal of main relay connector. *Is resistance 1 Ω or less?*	Go to Step 9.	“BLK/RED” wire is open circuit or high resistance circuit.
9	**Main relay circuit check** 1) Remove main relay from relay box with ignition switch turned OFF. 2) Measure voltage between “BLK/YEL” wire terminal of main relay connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 10.	“BLK/YEL” wire is open circuit.
10	**Main relay check** 1) Check main relay referring to “Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: in Section 1C”. *Is main relay in good condition?*	“BRN/WHT” wire is open or high resistance circuit.	Replace main relay.

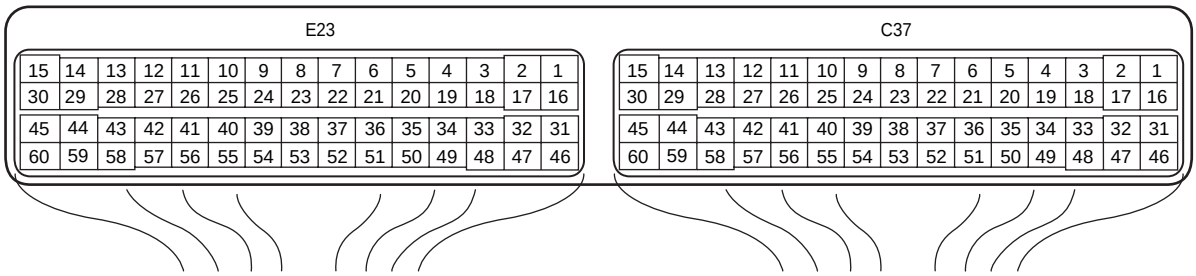
Step	Action	Yes	No
11	**Sensor power source circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure each voltage between “C37-14” terminal of ECM connector and vehicle body ground. *Is each voltage 4 – 6 V?*	ECM power and ground circuit is in good condition.	Go to Step 12.
12	**Sensor power source circuit check** 1) Disconnect connectors from ECM, TP sensor, MAP sensor, A/C refrigerant pressure sensor and accelerator pedal position (APP) sensor with ignition switch turned OFF. 2) Measure each resistance between “C37-14” terminal of ECM connector and vehicle body ground. *Is each resistance infinity?*	Check internal short circuit of TP sensor, MAP sensor and/or A/C refrigerant pressure sensor.	“GRY/RED” wire is shorted to ground circuit.

Fuel Injector Circuit Check

S4RS0A1104056

Wiring Diagram





I4RS0A110077-

1. Main fuse box	4. No.1 injector	7. No.4 injector	10. “FI” fuse
2. Main relay	5. No.2 injector	8. “IG COIL” fuse	11. “IG ACC” fuse
3. ECM	6. No.3 injector	9. Ignition switch	

Troubleshooting

NOTE:

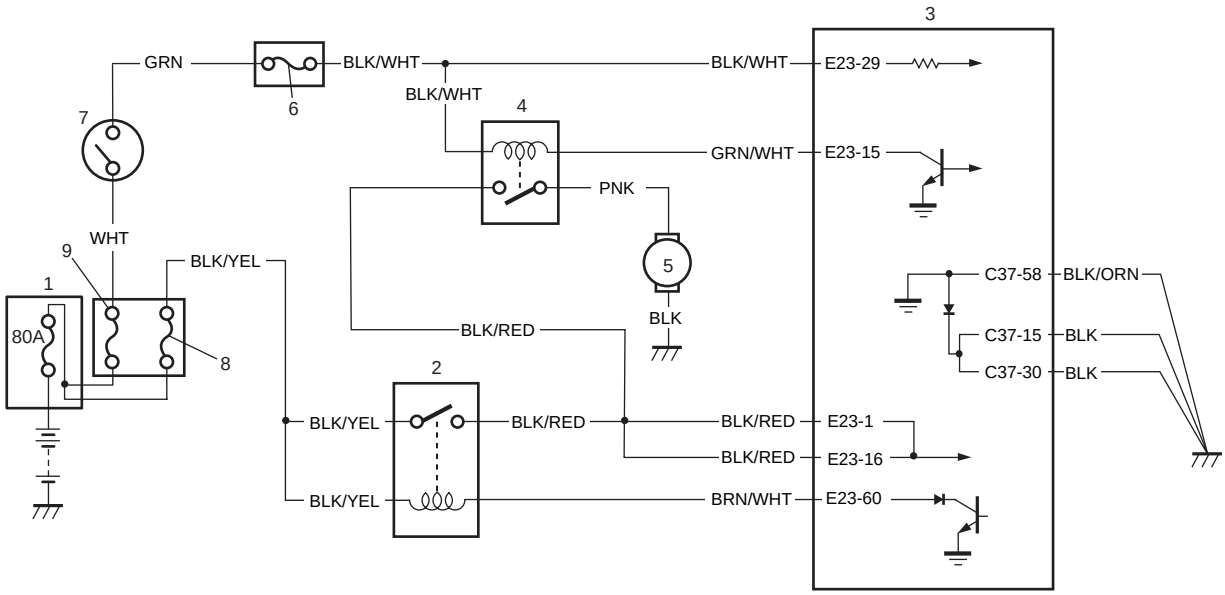
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

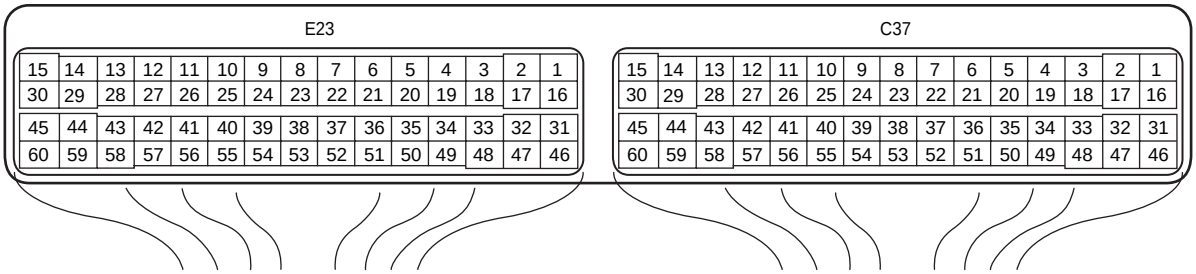
Step	Action	Yes	No
1	**Fuel injector check for operating sound** 1) Using sound scope, check each injector for operating sound at engine cranking. *Do all 4 injector make operating sound?*	Fuel injectors circuit is in good condition.	Go to Step 2.
2	**Fuel injector resistance check** 1) Disconnect connectors from fuel injectors with ignition switch turned OFF. 2) Check for proper connection to fuel injector at each terminals. 3) If OK, check all 4 fuel injectors for resistance referring to "Fuel Injector Inspection: in Section 1G". *Are all injectors in good condition?*	Go to Step 3.	Faulty fuel injector.
3	**Fuel injector insulation resistance check** 1) Check that there is insulation between each fuel injector terminal and engine ground. *Is there insulation?*	Go to Step 4.	Faulty fuel injector.
4	**Fuel injector power supply check** 1) Measure voltage between each "BLK/RED" wire terminal of fuel injector connector and engine ground with ignition switch turned ON. *Is voltage 10 – 14 V?*	Go to Step 5.	"BLK/RED" wire is open or shorted to ground circuit. If it is in good condition, go to "ECM Power and Ground Circuit Check: ".
5	**Wire circuit check** 1) Turn OFF ignition switch. 2) Disconnect connectors from ECM. 3) Measure resistance between each "BLU/YEL", "BLU/WHT", "BLU/RED", "BLU/ORN" wire terminal of fuel injector connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"BLU/YEL", "BLU/WHT", "BLU/RED" and/or "BLU/ORN" wire(s) are shorted to ground.
6	**Wire circuit check** 1) Measure voltage between each "BLU/YEL", "BLU/WHT", "BLU/RED", "BLU/ORN" wire terminal of fuel injector connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 7.	"BLU/YEL", "BLU/WHT", "BLU/RED" and/or "BLU/ORN" wire(s) are shorted to power supply circuit.
7	**Fuel injector drive signal check** 1) Connect connectors to each fuel injector and ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between each "C37-1", "C37-2", "C37-16", "C37-17" terminal of ECM connector and vehicle body ground. *Is voltage 10 – 14 V?*	Check fuel injector referring to "Fuel Injector Inspection: in Section 1G". If check result is satisfactory, substitute a known-good ECM and recheck.	"BLU/YEL", "BLU/WHT", "BLU/RED" and/or "BLU/ORN" wire(s) are open circuit.

Fuel Pump and Its Circuit Check

S4RS0A1104057

Wiring Diagram





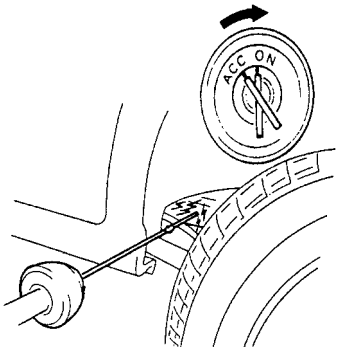
I4RS0A110078-

1. Main fuse box	4. Fuel pump relay	7. Ignition switch
2. Main relay	5. Fuel pump	8. “FI” fuse
3. ECM	6. “IG COIL” fuse	9. “IG ACC” fuse

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**

Step	Action	Yes	No
1	**Fuel pump control system check for operation** *Is fuel pump heard to operate 3 sec. after ignition switch is turned ON?*  I2RH01110132-	Fuel pump circuit is in good condition.	Go to Step 2.
2	**Fuel pump relay power supply check** 1) Disconnect fuel pump relay from relay box with ignition switch turned OFF. 2) Check for proper connection to fuel pump relay at each terminal. 3) If OK, turn ON ignition switch, measure voltage between “BLK/WHT” wire terminal of fuel pump relay connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 3.	“BLK/WHT” wire is open or shorted to ground circuit.
3	**Fuel pump relay power supply check** 1) Turn ON ignition switch, measure voltage between “BLK/RED” wire terminal of fuel pump relay connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 4.	“BLK/RED” wire is open circuit.
4	**Fuel pump relay check** 1) Check fuel pump relay referring to “Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: in Section 1C”. *Is relay in good condition?*	Go to Step 5.	Faulty relay.
5	**Fuel pump relay drive signal check** 1) Connect fuel pump relay to relay box. 2) Connect voltmeter between “E23-15” terminal of ECM connector and vehicle body ground. 3) Measure voltage 3 second after ignition switch is turned ON. *Is voltage 10 – 14 V?*	Go to Step 6.	“GRN/WHT” wire is open circuit or shorted to ground circuit.
6	**Fuel pump relay drive signal check** 1) Measure voltage within 3 second after ignition switch is turned ON. *Is voltage 0 – 1 V?*	Go to Step 7.	Substitute a known-good ECM and recheck.

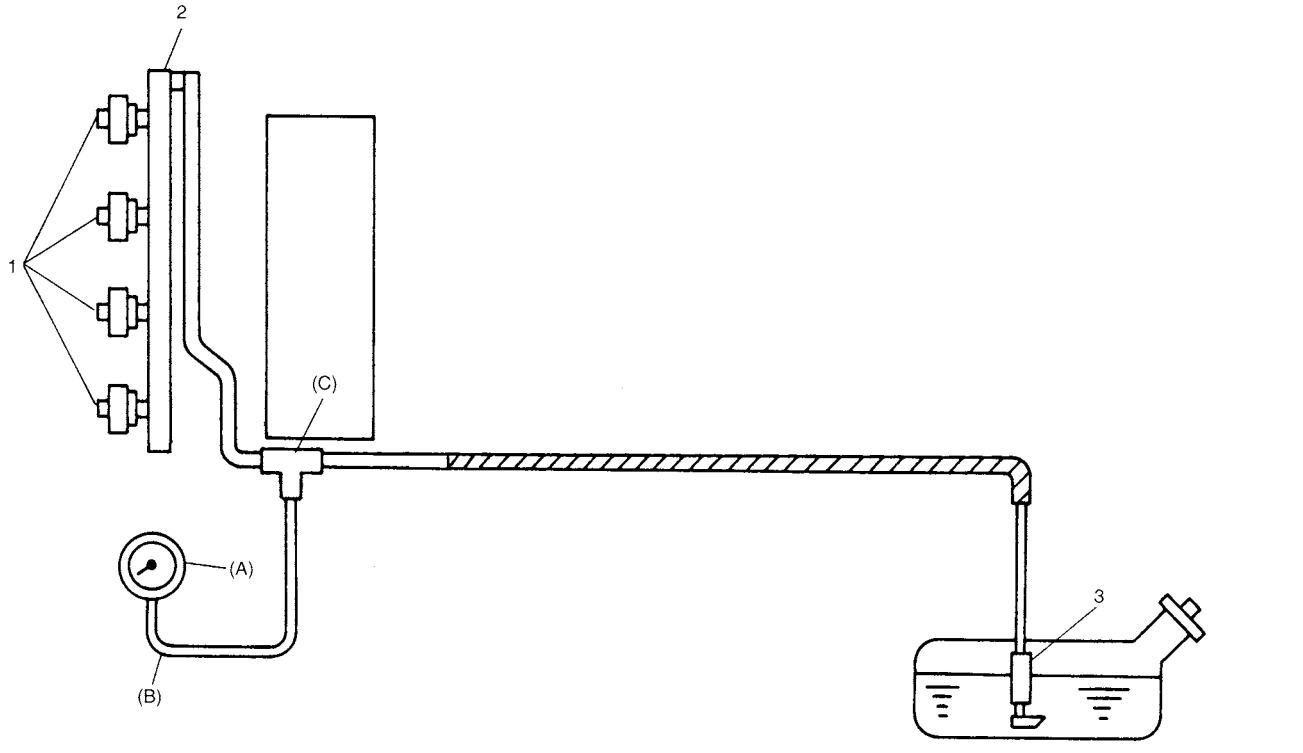
Step	Action	Yes	No
7	**Wire circuit check** 1) Turn OFF ignition switch. 2) Detach fuel tank referring to “Fuel Tank Removal and Installation: in Section 1G”. 3) Disconnect connector from fuel pump. 4) Measure resistance between “PNK” wire terminal of fuel pump connector and vehicle body ground. *Is resistance infinity?*	Go to Step 8.	“PNK” wire is shorted to ground.
8	**Fuel pump circuit check** 1) Turn OFF ignition switch. 2) Connect service wire between “E23-15” terminal of ECM connector and vehicle body ground. 3) Turn ON ignition switch, measure voltage between “PNK” terminal at fuel pump connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 9.	“PNK” wire is open circuit.
9	**Fuel pump circuit check** 1) Turn OFF ignition switch. 2) Measure resistance between “BLK” wire terminal at fuel pump connector and vehicle body ground. *Is resistance less than 5 Ω?*	Faulty fuel pump.	“BLK” wire is open circuit.

Fuel Pressure Check

S4RS0A1104058

System Diagram

Special tool
(A): 09912–58442
(B): 09912–58432
(C): 09912–58490



I3RM0A110081-

1.	Injector
2.	Delivery pipe
3.	Fuel filter and fuel pump

Troubleshooting

NOTE:

Before using the following flow, check to make sure that battery voltage is higher than 11 V. If battery voltage is low, pressure becomes lower than specification even if fuel pump and line are in good condition.

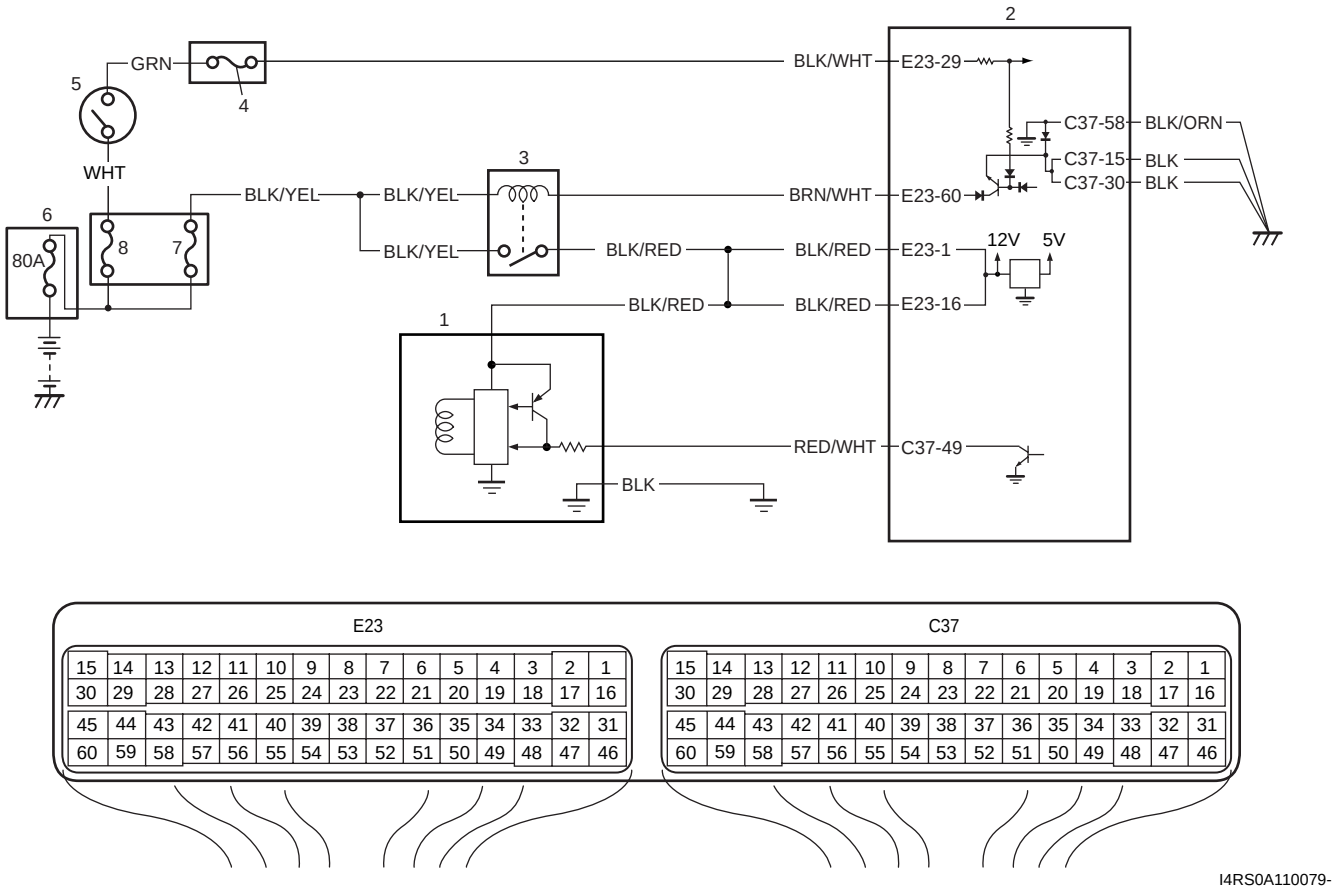
Step	Action	Yes	No
1	**Fuel pressure check** 1) Check fuel pressure referring to “Fuel Pressure Inspection: in Section 1G”. *Is check result satisfactory?*	Go to Step 2.	Go to Step 5.
2	**Fuel pressure check** 1) Start engine and warm it up to normal operating temperature. 2) Keep engine speed at 4000 rpm. *Does fuel pressure show about the same value as Step 1?*	Go to Step 3.	Go to Step 8.
3	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for fuel leakage. *Are they in good condition?*	Go to Step 4.	Repair or replace defective part.

Step	Action	Yes	No
4	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for damage or deform. *Are they in good condition?*	Faulty fuel pressure regulator.	Repair or replace damaged or deformed part.
5	*Was fuel pressure higher than specification in Step 1?*	Go to Step 6.	Go to Step 7.
6	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for damage or deform. *Are they in good condition?*	Faulty fuel pressure regulator.	Repair or replace damaged or deformed part.
7	**Fuel pump operating sound check** 1) Remove fuel filler cap and then turn ON ignition switch. *Can you hear operating sound?*	Go to Step 8.	Faulty fuel pump.
8	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for damage or deform. *Are they in good condition?*	Clogged fuel filter, faulty fuel pump, faulty fuel pressure regulator or fuel leakage from hose connection in fuel tank.	Repair or replace defective part.

Idle Air Control System Check

S4RS0A1104059

Wiring Diagram



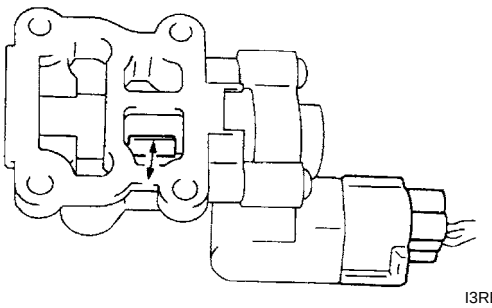
I4RS0A110079-

1. IAC valve	4. "IG COIL" fuse	7. "FI" fuse
2. ECM	5. Ignition switch	8. "IG ACC" fuse
3. Main relay	6. Main fuse box	

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

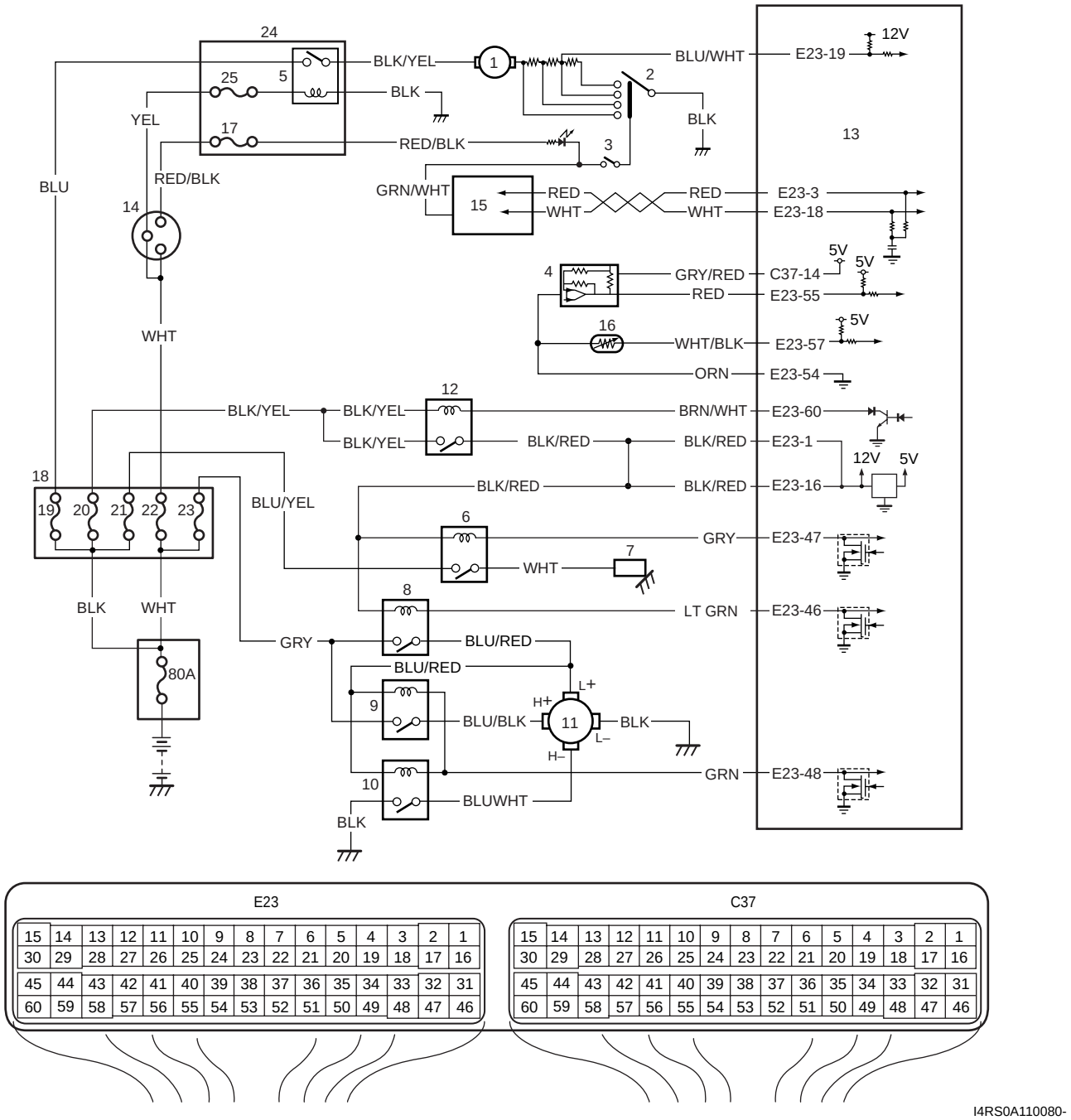
Step	Action	Yes	No
1	1) Check engine idle speed and IAC duty referring to "Idle Speed / Idle Air Control (IAC) Duty Inspection: ". *Is idle speed within specification?*	Go to Step 2.	Go to Step 4.
2	*Is IAC duty within specification in Step 1?*	Go to Step 3.	Check for Vacuum leak, EVAP canister purge control system, Clog of IAC air passage, Accessory engine load, "Electric Load Signal Circuit Check: ", Closed throttle position (TP sensor), Stuck of PCV valve.
3	*Is engine idle speed kept at specified speed even with headlight turned ON?*	System is in good condition.	Go to Step 7.
4	*Was idle speed higher than specification in Step 1?*	Go to Step 5.	Go to Step 7.
5	**A/C system circuit check** 1) Check A/C System circuit referring to Step 1 of "A/C System Circuits Check: ". *Is it in good condition?*	Go to Step 6.	Repair or replace A/C system circuit or A/C system.
6	**ECT sensor check** 1) Check ECT sensor performance referring to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". *Is it in good condition?*	Go to Step 7.	Replace ECT sensor and recheck.
7	**Idle air control system check** 1) Remove IAC valve from throttle body referring to "Idle Air Control (IAC) Valve Removal and Installation: in Section 1C". 2) Check IAC valve for operation referring to "Idle Air Control (IAC) Valve On-Vehicle Inspection: in Section 1C".  I3RB0A110051- *Is check result satisfactory?*	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 8.

Step	Action	Yes	No
8	**Idle air control valve circuit check** 1) Check idle air control valve circuit referring to Step 4 to 10 of “DTC P0505: Idle Air Control System: ”. *Is circuit in good condition?*	Replace IAC valve.	Repair IAC valve circuit.

A/C System Circuits Check

S4RS0A1104060

Wiring Diagram



I4RS0A110080-

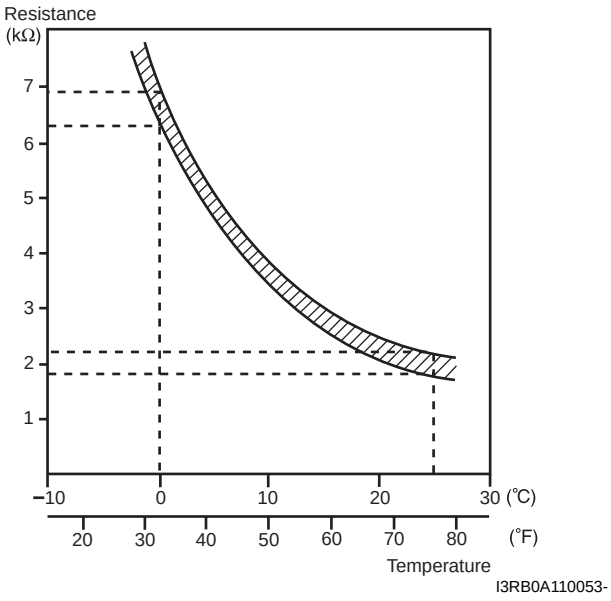
1. Blower fan motor	8. Radiator cooling fan motor relay No.1	15. BCM	22. "IG ACC" fuse
2. Blower fan switch	9. Radiator cooling fan motor relay No.2	16. Evaporator outlet air temp. sensor	23. "RDTR FAN" fuse
3. A/C switch	10. Radiator cooling fan motor relay No.3	17. "IG1 SIG" fuse	24. Junction block assembly
4. A/C refrigerant pressure sensor	11. Radiator cooling fan motor	18. Relay box	25. "IG2 SIG" fuse
5. Blower motor relay	12. Main relay	19. "HTR FAN" fuse	
6. Compressor relay	13. ECM	20. "FI" fuse	
7. A/C compressor	14. Ignition switch	21. "A/C COMP" fuse	

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	**Reception data check from BCM** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check DTC for reception data from BCM. *Is there DTC P1678?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**A/C switch signal circuit check** 1) Start engine and select "DATA LIST" mode on scan tool. 2) Check A/C switch signal under following conditions respectively. **A/C switch signal** **Engine running, A/C switch OFF: OFF** **Engine running, A/C switch ON and blower speed selector turned 1st position or more: ON** *Is check result satisfactory?*	Go to Step 3.	Check A/C switch circuit.
3	**DTC check of ECT sensor circuit** 1) Check ECM for DTC of ECT sensor circuit. *Is there DTC P0116, DTC P0117 or DTC P0118?*	Go to applicable DTC diag. flow.	Go to Step 4.
4	**Radiator cooling fan control system check** *Is radiator cooling fan started when A/C and blower speed selector switch are turned ON with engine running?*	Go to Step 10.	Go to Step 5.
5	**Radiator cooling fan control circuit check** 1) Check DTC with scan tool. *Is DTC P0480 displayed?*	Go to "DTC P0480: Fan 1 (Radiator Cooling Fan) Control Circuit: ".	Go to Step 6.

Step	Action	Yes	No
6	**A/C evaporator outlet air temp. sensor check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection to “E23-57” and “E23-54” wire terminals of ECM connector. 3) If OK, measure resistance between “E23-57” and “E23-54” wire terminals of ECM connector. **Evaporator temp. sensor resistance** **At 0 °C: 6.3 – 6.9 kΩ** **At 25 °C: 1.8 – 2.2 kΩ**  *Is resistance within specification?*	Go to Step 7.	Faulty A/C evaporator outlet air temp. sensor or its circuit.
7	**DTC check of A/C refrigerant pressure sensor circuit** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check ECM for DTC of A/C refrigerant pressure sensor circuit. *Is there DTC P0532 or DTC P0533?*	Go to applicable DTC diag. flow.	Go to Step 8.
8	**A/C refrigerant pressure sensor voltage check** 1) Check A/C refrigerant pressure sensor voltage referring to “Inspection of ECM and Its Circuits: ”. *Is voltage within specified value?*	Go to Step 9.	Check amount of refrigerant. If OK, replace A/C refrigerant pressure sensor.
9	**Radiator cooling fan check** 1) Check radiator cooling fan referring to “Radiator Cooling Fan Motor On-Vehicle Inspection: in Section 1F”. *Is check result satisfactory?*	Radiator cooling fan drive circuit malfunction. If circuit is OK, go to Step 6.	Replace radiator cooling fan motor.
10	**A/C compressor control system check** *Is A/C compressor started when A/C and blower speed selector switch are turned ON with engine running?*	A/C system is in good condition.	Go to Step 11.

Step	Action	Yes	No
11	**A/C compressor relay circuit check** 1) Measure voltage between “E23-47” wire terminal of ECM connector and vehicle body ground under following conditions respectively. **Voltage between “E23-47” terminal of ECM connector and ground** **While engine running and A/C switch turned OFF: 10 – 14 V** **While engine running, A/C and blower speed selector switch turned ON: 0 – 1 V** *Is check result satisfactory?*	Go to Step 12.	Go to Step 13.
12	**A/C compressor relay check** 1) Check A/C compressor relay referring to “Compressor Relay Inspection: in Section 7B”. *Is it in good condition?*	A/C compressor drive circuit malfunction.	Replace A/C compressor relay.
13	**A/C compressor relay circuit check** 1) Remove A/C compressor relay with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between “BLK/RED” wire terminal of A/C compressor relay connector and vehicle body ground. *Is voltage 10 –14 V?*	Go to Step 14.	“BLK/RED” wire open circuit.
14	**A/C compressor relay check** 1) Check A/C compressor relay referring to “Compressor Relay Inspection: in Section 7B”. *Is it in good condition?*	“GRY” wire open circuit. If OK, substitute a known-good ECM and recheck.	Replace A/C compressor relay.

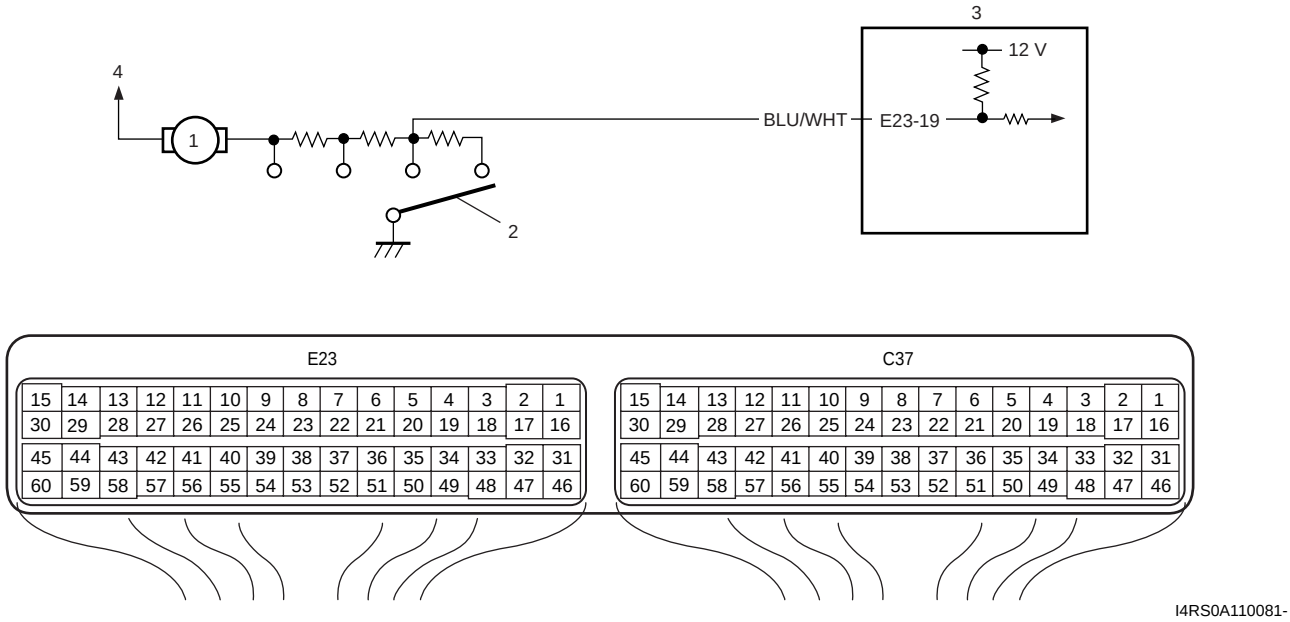
NOTE:

When A/C evaporator outlet air temp. is below 2.5 °C (36.5 °F), A/C remains OFF (“E23-47” terminal voltage becomes 10 – 14 V). This condition is not abnormal.

Electric Load Signal Circuit Check

S4RS0A1104061

Wiring Diagram



1. Blower fan motor	3. ECM
2. Blower fan switch	4. To blower motor relay

Troubleshooting

NOTE:

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: ”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: ”.**

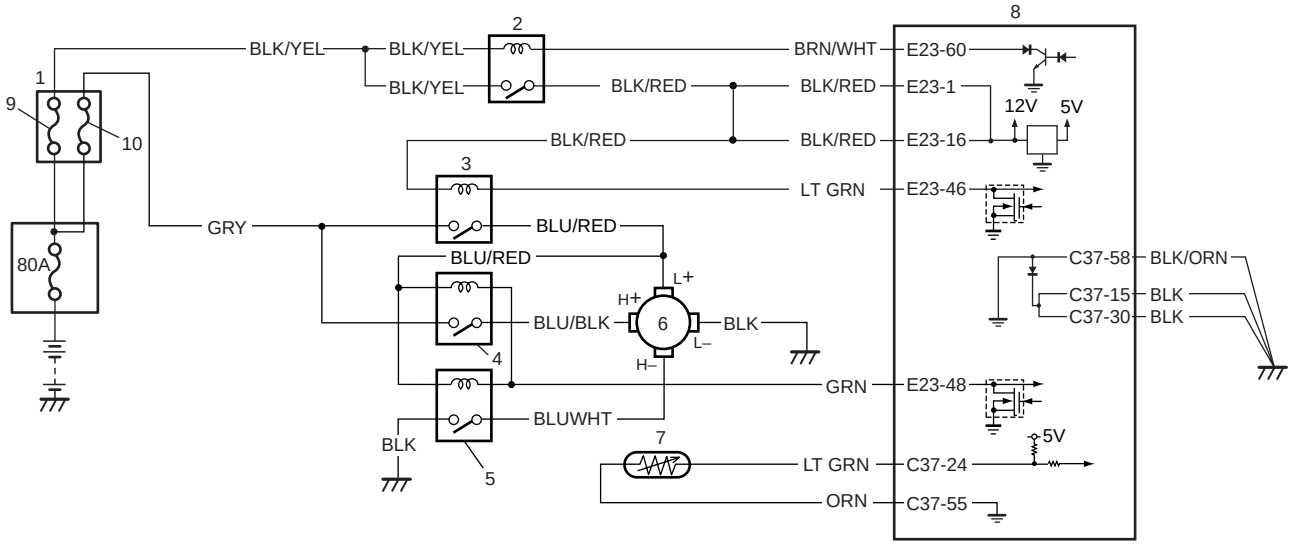
Step	Action	Yes	No
1	*Do you have SUZUKI scan tool?*	Go to Step 2.	Go to Step 3.
2	**Electric load signal circuit check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Check electric load signal under following conditions respectively. **Electric load signal** **Ignition switch turned ON, blower speed selector turned OFF or 1st position: OFF** **Ignition switch turned ON, blower speed selector turned to 2nd position or more: ON** *Is check result satisfactory?*	Electric load signal circuit is in good condition.	“BLU/WHT” wire is open circuit or short circuit, or blower circuit malfunction.

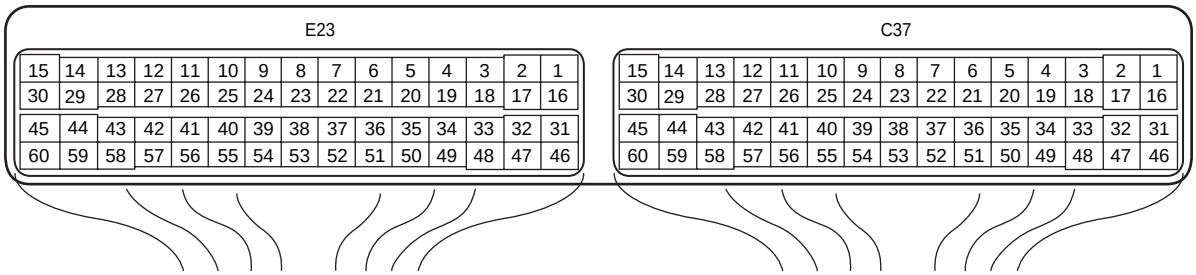
Step	Action	Yes	No
3	**Electric load signal circuit check** 1) Turn ON ignition switch. 2) Check voltage at terminal “E23-19” of ECM connector connected, under following conditions respectively. **Voltage at “E23-19”** **Ignition switch turned ON, blower speed selector turned OFF or 1st position: 10 – 14 V** **Ignition switch turned ON, blower speed selector turned to 2nd position or more: 0 V** *Is each voltage as specified?*	Electric load signal circuit is in good condition.	“BLU/WHT” wire is open circuit or short circuit, or electric load circuit malfunction.

Radiator cooling fan Low Speed Control System Check

S4RS0A1104062

Wiring Diagram





I4RS0A110082-

1. Relay box	5. Radiator cooling fan relay No. 3	9. “FI” fuse
2. Main relay	6. Radiator cooling fan motor	10. “RDTR FAN” fuse
3. Radiator cooling fan relay No. 1	7. ECT sensor	
4. Radiator cooling fan relay No. 2	8. ECM	

Troubleshooting

WARNING:

Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch at the "ON" position.

NOTE:

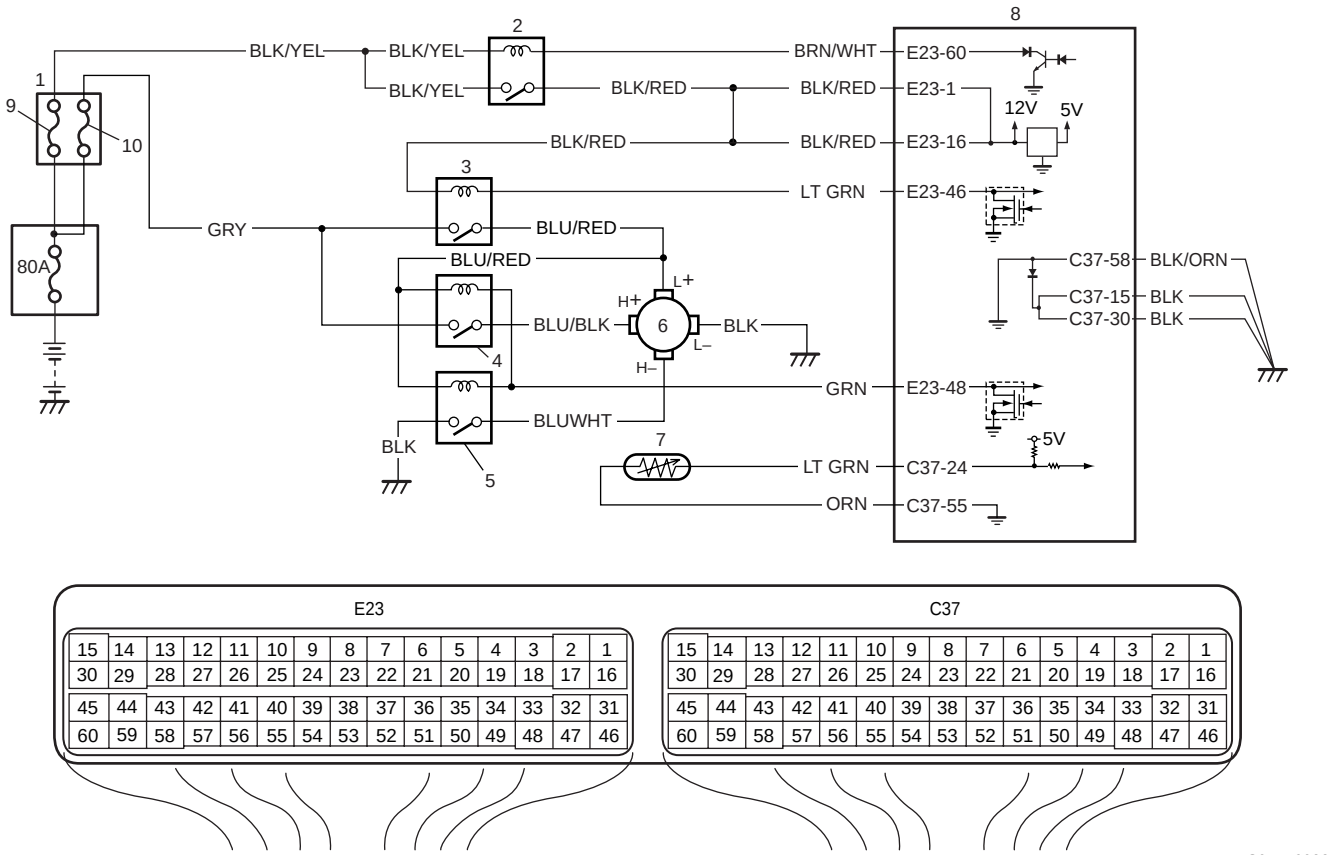
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	*Is there DTC(s) of ECT sensor circuit (DTC P0116 / P0117 / P0118) and/or radiator cooling fan circuit (DTC P0480)?*	Go to corresponding DTC flow.	Go to Step 2.
2	**Low speed radiator cooling fan control circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select "DATA LIST" mode on scan tool. 3) Warm up engine until coolant temp. is 97.5 °C, 207.5 °F or higher and A/C switch turns OFF. (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) *Is radiator cooling fan started at low speed when engine coolant temp. reached above temp.?*	Radiator cooling fan low speed control system is in good condition.	Perform from Step 2 to Step 8 in DTC P0480 diag. flow. If OK, Go to Step 3.
3	**Radiator cooling fan control check** 1) Disconnect radiator cooling fan control relays No. 2, and No. 3 from relays box with ignition switch turned OFF. 2) Run engine when ECT is over 97.5 °C, 207.5 °F. 3) Measure voltage between vehicle body ground and "BLU/RED" wire terminal of disconnected radiator cooling fan motor connector. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLU/RED" wire is open or high resistance circuit.
4	**Check radiator cooling fan wire circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "BLK" wire terminal of disconnected radiator cooling fan motor connector and vehicle body ground. *Is resistance below 1 Ω?*	Go to Step 5.	"BLK" wire is open or high resistance circuit.
5	**Radiator cooling fan check** 1) Check radiator cooling fan referring to "Radiator Cooling Fan Motor On-Vehicle Inspection: in Section 1F". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty radiator cooling fan.

Radiator cooling fan High Speed Control System Check

S4RS0A1104084

Wiring Diagram



I4RS0A110082-

1. Relay box	5. Radiator cooling fan relay No. 3	9. "FI" fuse
2. Main relay	6. Radiator cooling fan motor	10. "RDTR FAN" fuse
3. Radiator cooling fan relay No. 1	7. ECT sensor	
4. Radiator cooling fan relay No. 2	8. ECM	

Troubleshooting

WARNING:

Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch at the "ON" position.

NOTE:

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: ".**
- **When measuring circuit voltage, resistance d/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: ".**

Step	Action	Yes	No
1	*Is there DTC(s) of ECT sensor circuit (DTC P0116 / P0117 / P0118) and/or radiator cooling fan circuit (DTC P0480)?*	Go to corresponding DTC flow.	Go to Step 2.
2	**Low speed radiator cooling fan control circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Warm up engine until coolant temp. is 97.5 °C, 207.5 °F or higher and A/C switch turns OFF. (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) *Is radiator cooling fan started at low speed when engine coolant temp. reached above temp.?*	Go to Step 3.	Perform from Step 2 to Step 5 in “Radiator cooling fan Low Speed Control System Check: ”.
3	**High speed radiator cooling fan control circuit check** 1) Start engine and select “DATA LIST” mode on scan tool. 2) Warm up engine until coolant temp. is 102.5 °C, 216.5 °F or higher and A/C switch turns OFF. (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) *Is radiator cooling fan started at high speed when engine coolant temp. reached above temp?*	Radiator cooling fan control system is in good condition.	Perform from Step 9 to Step 14 in DTC P0480 diag. flow. If OK, Go to Step 4.
4	**Radiator cooling fan control No. 2 and No. 3 check** 1) Run engine when ECT is over 102.5 °C, 216.5 °F. 2) Measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage lower than 1.5 V?*	Go to Step 5.	Faulty ECM.
5	**Radiator cooling fan No. 2 wire circuit check** 1) Remove radiator cooling fan control relay No.2 with ignition switch turned OFF. 2) Measure voltage between “GRY” wire terminal of disconnected radiator cooling fan control relay No. 2 connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 6.	“GRY” wire is open or high resistance circuit.
6	**Radiator cooling fan No. 2 wire circuit check** 1) Disconnect connector from radiator cooling fan motor with ignition switch turned OFF. 2) Measure resistance between “BLU/BLK” wire terminal of disconnected radiator cooling fan control relay No. 2 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	“BLU/BLK” wire is shorted to ground circuit.
7	**Radiator cooling fan No. 2 wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “BLU/BLK” wire terminal of disconnected radiator cooling fan control relay No. 2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	“BLU/BLK” wire is shorted to power supply circuit.

Step	Action	Yes	No
8	**Radiator cooling fan control No. 2 check** 1) Connect radiator cooling fan control relay No. 2 to relay box with ignition switch turned OFF. 2) Run engine when ECT is over 102.5 °C, 216.5 °F. 3) Measure voltage between vehicle body ground and "BLU/BLK" wire terminal of disconnected radiator cooling fan motor connector. *Is voltage 10 – 14 V?*	Go to Step 10.	Go to Step 9.
9	**Radiator cooling fan control relay No.2 check** 1) Remove radiator cooling fan control relay No.2 with ignition switch turned OFF. 2) Check radiator cooling fan control relay No.2 referring to "Radiator Cooling Fan Relay Inspection: in Section 1F" *Is it in good condition?*	"BLU/BLK" wire is open or high resistance circuit.	Faulty radiator cooling fan control relay No.2.
10	**Radiator cooling fan No. 3 wire circuit check** 1) Remove radiator cooling fan control relay No.3 with ignition switch turned OFF. 2) Measure resistance between vehicle body ground and "BLK" wire terminal of disconnected radiator cooling fan control relay No. 3 connector in relay box. *Is resistance below 1 Ω?*	Go to Step 11.	"BLK" wire is open or high resistance circuit.
11	**Radiator cooling fan control No. 3 check** 1) Connect radiator cooling fan control relay No. 3 to relay box with ignition switch turned OFF. 2) Run engine when ECT is over 102.5 °C, 216.5 °F. 3) Measure resistance between vehicle body ground and "BLU/WHT" wire terminal of disconnected radiator cooling fan motor connector. *Is resistance below 2 Ω?*	Go to Step 13.	Go to Step 12.
12	**Radiator cooling fan control relay No. 3 check** 1) Remove radiator cooling fan control relay No.3 with ignition switch turned OFF. 2) Check radiator cooling fan control relay No.3 referring to "Radiator Cooling Fan Relay Inspection: in Section 1F" *Is it in good condition?*	"BLU/WHT" wire is open or high resistance circuit.	Faulty radiator cooling fan control relay No.3.
13	**Radiator cooling fan check** 1) Check radiator cooling fan referring to "Radiator Cooling Fan Motor On-Vehicle Inspection: in Section 1F". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty radiator cooling fan.

Repair Instructions

Idle Speed / Idle Air Control (IAC) Duty Inspection

S4RS0A1106001

Before idle speed / IAC duty check, make sure of the following.

- Lead wires and hoses of electronic fuel injection and engine and emission control systems are connected securely.
- Accelerator cable has some play, that is, it is not tight.
- Valve lash is checked according to maintenance schedule.
- Ignition timing is within specification.
- All accessories (wipers, heater, lights, A/C, etc.) are out of service.
- Air cleaner has been properly installed and is in good condition.
- No abnormal air drawn in from air intake system.

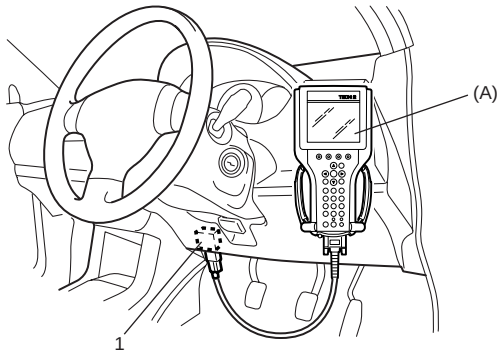
After all items are confirmed, check idle speed and IAC duty as follows.

NOTE:

Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), and set parking brake and block drive wheels.

1) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

Special tool
(A): SUZUKI scan tool



I4RS0A110013-

2) Warm up engine to normal operating temperature.
3) Check engine idle speed and "IAC duty" by using "Data List" mode on scan tool to check "IAC duty".
4) If duty and/or idle speed is out of specification, inspect idle air control system referring to "Idle Air Control System Check: ".

Engine idle speed and IAC duty

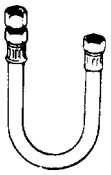
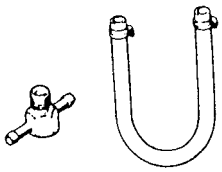
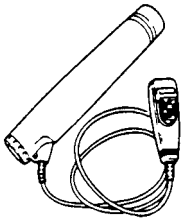
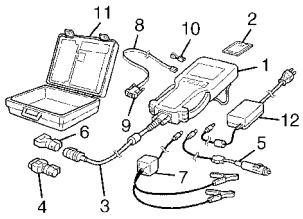
	A/C OFF	A/C ON
M/T vehicle	**700 ± 50 rpm 10 – 55%**	**850 ± 50 rpm**
A/T vehicle at P/N range	**750 ± 50 rpm 10 – 55%**	**850 ± 50 rpm**

5) Check that specified engine idle speed is obtained with A/C turned ON if vehicle is equipped with A/C. If not, check A/C system circuit and idle air control system.

Special Tools and Equipment

Special Tool

S4RS0A1108001

09912–58432 Fuel pressure gauge hose This tool is included in fuel pressure gauge set (09912-58413). ☞ 	09912–58442 Fuel pressure gauge This tool is included in fuel pressure gauge set (09912-58413). ☞
09912–58490 3-way joint & hose ☞ 	09930–76420 Timing-light (dry cell type) ☞ 
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞ 	

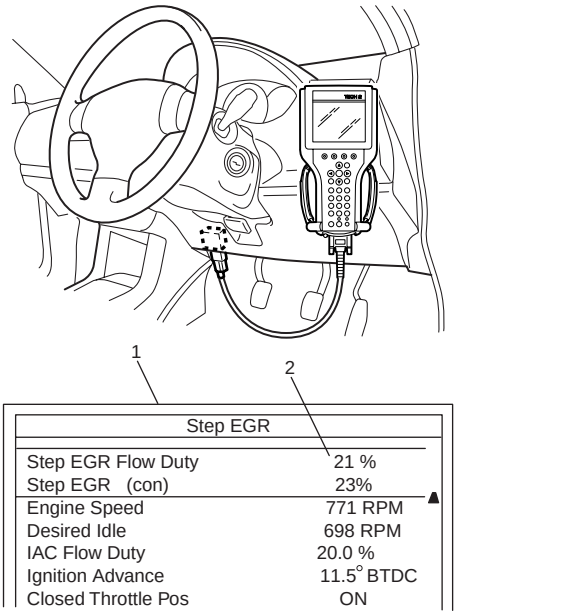
Aux. Emission Control Devices

Diagnostic Information and Procedures

EGR System Inspection

S4RS0A1204001

1) Connect SUZUKI scan tool to data link connector (DLC) with ignition switch turned OFF.
2) Turn ON ignition switch and erase DTC using “CLEAR DTC” in “TROUBLE CODES” menu.
3) Start engine and warm it up to normal operating temperature then select “DATA LIST” mode on scan tool.
4) Make sure that vehicle condition is as follows.
   - Vehicle speed = 0 km/h (0 KPH)
   - Engine speed ≤ 900 rpm
   - Engine coolant temp. ≥ 90 °C, 164 °F
5) With engine idling (without depressing accelerator pedal), open EGR valve by using “STEP EGR” mode in “MISC TEST” menu. In this state, as EGR valve opening increases engine idle speed drops. If not, possible cause is clogged EGR gas passage, stuck or faulty EGR valve.



I4RS0A120001-

1. SUZUKI scan tool display
2. EGR valve opening (0: Close, 100: Full open)

Repair Instructions

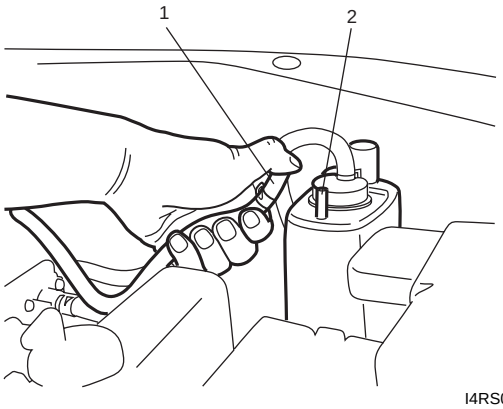
EVAP Canister Purge Inspection

S4RS0A1206001

NOTE:

Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in “P” range) and that parking brake lever is pulled all the way up.

1) Disconnect purge hose (1) from EVAP canister (2).
2) Place finger against the end of disconnected hose and check that vacuum is not felt there when engine is cool and running at idle speed. If check result is not satisfactory, check EVAP canister purge valve, wire harness and ECM.



I4RS0A120002-

EVAP Canister Purge Valve and Its Circuit Inspection

S4RS0A1206002

WARNING:

Do not apply vacuum by mouth; otherwise harmful fuel vapor can be breathed in.

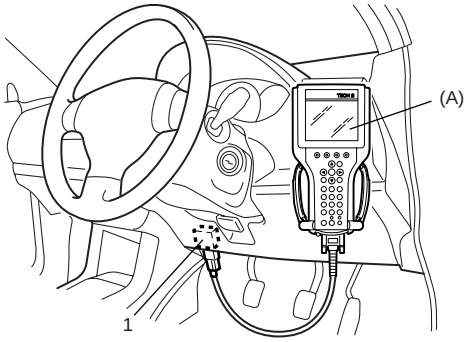
CAUTION:

Do not apply vacuum more than –86 kPa (–12.47 psi); otherwise EVAP canister purge valve could be damaged.

1) Prepare to operate EVAP canister purge valve as follows.
   a) When using SUZUKI scan tool:
      i) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF and disconnect purge valve vacuum hoses from intake manifold and EVAP canister.

ii) Turn ON ignition switch, clear DTC and select “MISC TEST” mode on SUZUKI scan tool.

Special tool
(A): SUZUKI scan tool



I4RS0A120003-

b) When not using SUZUKI scan tool:

NOTE:

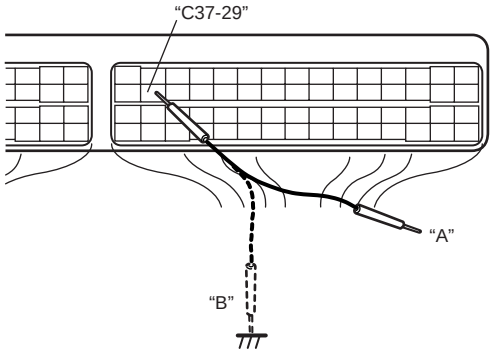
Before performed this check, be sure to read the “Precautions of ECM Circuit Inspection: in Section 1A”.

i) Disconnect purge valve vacuum hoses from intake manifold and EVAP canister.

ii) Remove ECM from its bracket with ECM connectors connected referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.

iii) Connect special tool between ECM and ECM connector referring to “Inspection of ECM and Its Circuits: in Section 1A”.

iv) Turn ON ignition switch.
Using service wire, ground “C37-29” terminal circuit of special tool (valve ON: “B”) and unground it (valve OFF: “A”).

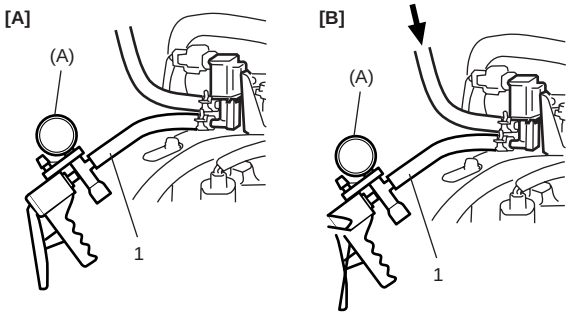


I4RS0A120004-

2) Check purge valve for operation and vacuum passage for clog when valve is switched ON and OFF by using SUZUKI scan tool or service wire.
If check result is not satisfactory, check vacuum hoses, EVAP canister purge valve, wire harness and connections.

EVAP canister purge valve specification
[A] Valve OFF: When vacuum (–60 kPa (–8.7 psi)) is applied to hose (1), vacuum can be applied.
[B] Valve ON: When vacuum is applied to hose (1), vacuum can not be applied.

Special tool
(A): 09917–47011

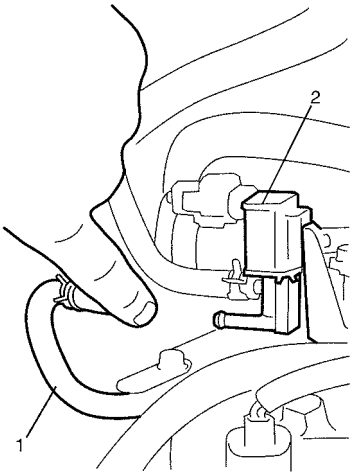


I3RB0A120005-

Vacuum Passage Inspection

S4RS0A1206003

Start engine and run it at idle speed. Disconnect vacuum hose (1) from EVAP canister purge valve (2). With finger placed against disconnected hose, check that vacuum is applied.
If it is not applied, clean vacuum passage by blowing compressed air.

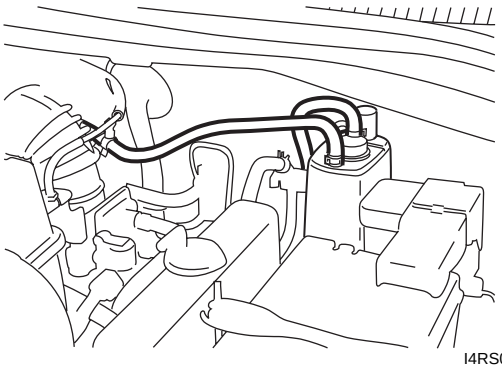


I3RM0A120006-

Vacuum Hose Inspection

S4RS0A1206004

Check hoses for connection, leakage, clog and deterioration.
Replace as necessary.



I4RS0A120005-

EVAP Canister Purge Valve Inspection

S4RS0A1206005

WARNING:

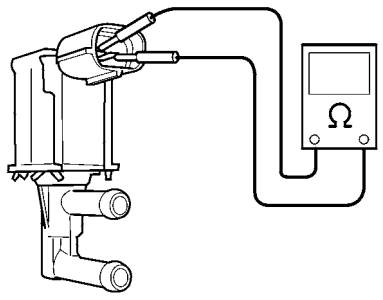
Do not apply vacuum by mouth; otherwise harmful fuel vapor can be breathed in.

CAUTION:

Do not apply vacuum more than –86 kPa (–12.47 psi); otherwise EVAP canister purge valve could be damaged.

1) With ignition switch turned OFF, disconnect coupler and vacuum hoses from canister purge valve.
2) Remove EVAP canister purge valve from air cleaner assembly.
3) Check resistance between two terminals of EVAP canister purge valve.
   If resistance is not as specified, replace EVAP canister purge valve.

   EVAP canister resistance
   30 – 34 Ω at 20 °C (68 °F)



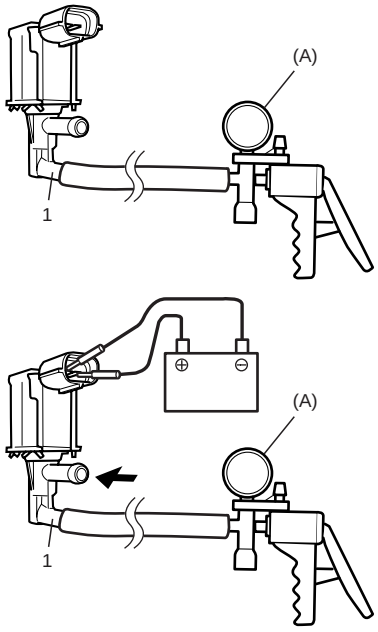
I3RM0A120008-

4) With coupler disconnected, apply vacuum (–60 kPa (–8.7 psi)) to pipe (1). If vacuum can be applied, go to next step. If vacuum can not be applied, replace EVAP canister purge valve.
5) In this state, connect 12 V-battery to EVAP canister purge valve terminals. If vacuum can not be applied, EVAP canister purge valve is in good condition.
   If applied, replace EVAP canister purge valve.

WARNING:

Do not suck the air through valve. Fuel vapor inside valve is harmful.

Special tool
(A): 09917–47011



I3RB0A120007-

6) Install EVAP canister purge valve to air cleaner assembly.

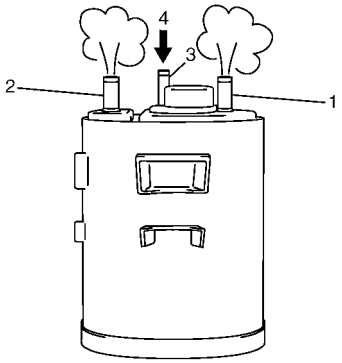
EVAP Canister Inspection

S4RS0A1206006

WARNING:

DO NOT SUCK nozzles on EVAP canister. Fuel vapor inside EVAP canister is harmful.

1) Check outside of EVAP canister visually.
2) Disconnect vacuum hoses from EVAP canister.
3) Check that there is no restriction of flow through purge pipe (1) and air pipe (2) when air is blown (4) into tank pipe (3).
   If any faulty condition is found in this inspection, replace EVAP canister.



I4RS0A120006-

EGR Valve Removal and Installation

S4RS0A1206007

Removal

1) Disconnect negative cable at battery.
2) Remove air intake pipe.
3) Remove EGR pipe.
4) Disconnect EGR valve connector.
5) Remove EGR valve and gasket from cylinder head.

Installation

Reverse removal procedure noting the following.

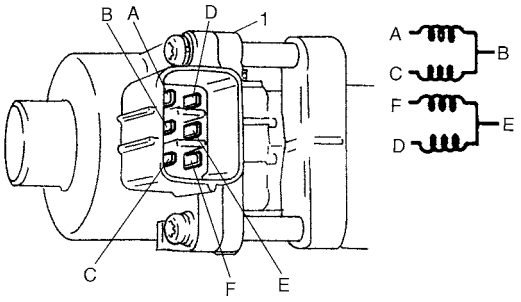
- Clean mating surface of valve and cylinder head.
- Use new gaskets.

EGR Valve Inspection

S4RS0A1206008

1) Check resistance between following terminals of EGR valve (1) in each pair.
   If found faulty, replace EGR valve assembly.

   EGR valve resistance (A – B, C – B, F – E, D – E terminal)
   20 – 24 Ω



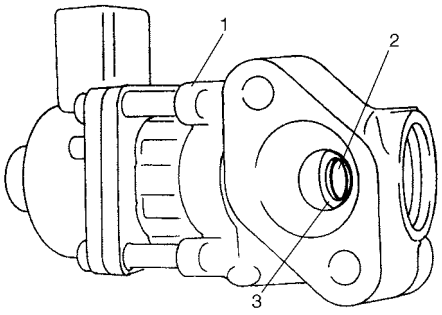
I2RH0B120005-

2) Remove carbon from EGR valve gas passage.

CAUTION:

Do not use any sharp-edged tool to remove carbon.
Be careful not to damage or bend EGR valve (1), valve seat (3) and rod.

3) Inspect valve (2), valve seat and rod for fault, cracks, bend or other damage.
   If found faulty, replace EGR valve assembly.



I2RH0B120006-

PCV Hose Inspection

S4RS0A1206009

NOTE:

Be sure to check that there is no obstruction in PCV valve or its hoses before checking IAC duty, for obstructed PCV valve or hose hampers its accurate adjustment.

Check hoses for connection, leakage, clog and deterioration.
Replace as necessary.

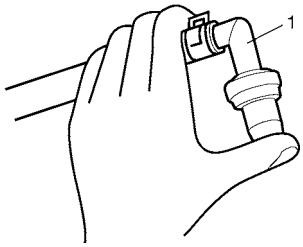
PCV Valve Inspection

S4RS0A1206010

NOTE:

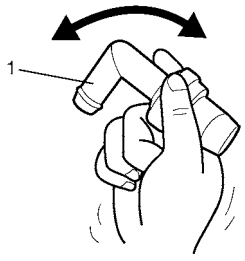
Be sure to check that there is no obstruction in PCV valve or its hoses before checking IAC duty, for obstructed PCV valve or hose hampers its accurate adjustment.

1) Detach air cleaner assembly.
2) Disconnect PCV valve from cylinder head cover and install plug to head cover hole.
3) Install air cleaner assembly temporarily.
4) Run engine at idle.
5) Place your finger over end of PCV valve (1) to check for vacuum.
   If there is no vacuum, check for clogged valve.
   Replace as necessary.



I2RH0B120007-

6) After checking vacuum, stop engine and remove PCV valve (1).
   Shake valve and listen for rattle of check needle inside the valve. If valve does not rattle, replace it.



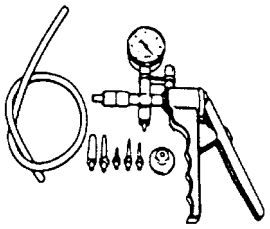
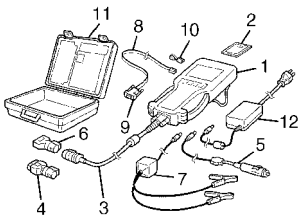
I2RH0B120008-

7) After checking, remove plug and install PCV valve.
8) Install air cleaner assembly securely.

Special Tools and Equipment

Special Tool

S4RS0A1208001

09917–47011 Vacuum pump gauge ☞ / ☞		SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞	

Engine Electrical Devices

Repair Instructions

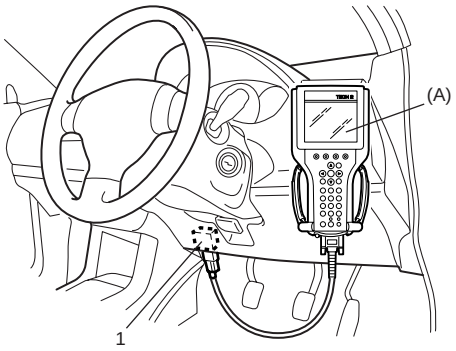
Idle Air Control (IAC) Valve Operation Inspection

S4RS0A1306001

Using SUZUKI scan tool

1) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

   Special tool
   (A): SUZUKI scan tool



I4RS0A130001-

2) Warm up engine to normal operating temperature.
3) Clear DTC and select “MISC TEST” mode on SUZUKI scan tool.
4) Check that idle speed increases and/or reduces when IAC valve is opened and/or when closed by SUZUKI scan tool.
   If idle speed does not change, check IAC valve and wire harness.

Not Using SUZUKI Scan Tool

1) Warm up engine to normal operating temperature.
2) Stop engine.
3) Turn ignition switch to ON position.
4) Disconnect IAC valve connector.
5) Start engine.
6) Connect IAC valve connector.
7) Check that idle speed increases and/or reduces when connector is connected to IAC valve.
   If idle speed does not change, check IAC valve and wire harness.

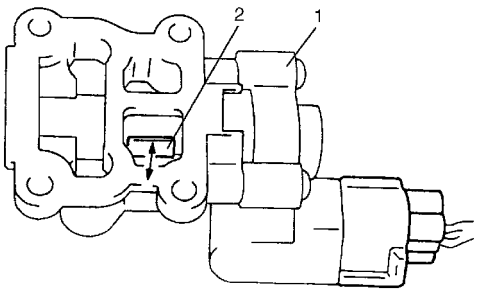
Idle Air Control (IAC) Valve On-Vehicle Inspection

S4RS0A1306002

1) Remove IAC valve referring to “Idle Air Control (IAC) Valve Removal and Installation: ”.
2) Connect each connector to IAC valve (1) and TP sensor.
3) Check that rotary valve (2) of IAC valve opens and closes once and then stops in about 60 ms as soon as ignition switch is turned ON.

NOTE:

- **This check should be performed by two people, one person turns on ignition switch while the other checks valve operation.**
- **As valve operation is momentary, it may be overlooked. To prevent this, perform this operation check 3 times or more continuously.**
  If rotary valve of IAC valve does not operate at all, check wire harness for open and short. If wire harness is in good condition, replace IAC valve and recheck.



I2RH0B130002-

4) Install IAC valve referring to “Idle Air Control (IAC) Valve Removal and Installation: ”.

Idle Air Control (IAC) Valve Removal and Installation

S4RS0A1306003

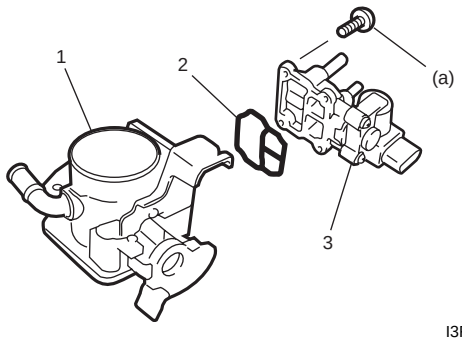
Removal

1) Remove throttle body referring to “Throttle Body Removal and Installation: in Section 1D”.
2) Remove IAC valve from throttle body.

Installation

1) Install new gasket (2) to throttle body (1).
2) Install IAC valve (3) to throttle body.
Tighten IAC valve screws to specified torque.

Tightening torque
IAC valve screw (a): 3.5 N·m (0.35 kg-m, 2.5 lb-ft)



I3RB0A130001-

3) Install throttle body referring to “Throttle Body Removal and Installation: in Section 1D”.

Engine Control Module (ECM) Removal and Installation

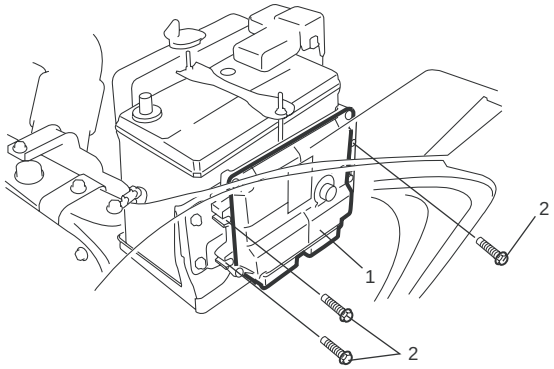
S4RS0A1306004

CAUTION:

As ECM consists of precision parts, be careful not to expose it to excessive shock.

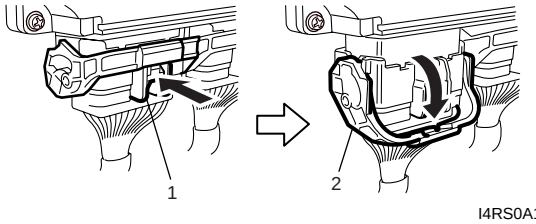
Removal

1) Disconnect negative cable at battery.
2) Remove ECM (1) from its bracket by removing its mounting bolts (2).



I4RS0A130002-

3) Disconnect connectors from ECM as follows.
   a) Push lock (1) to release locking of lock lever (2).
   b) Turn lock lever to arrow direction until it stops.

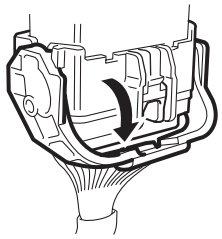


I4RS0A130003-

Installation

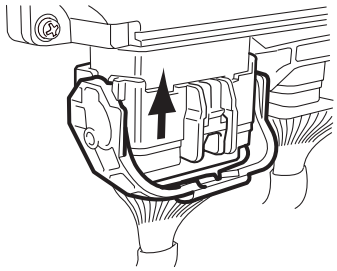
Reverse removal procedure noting the following:

- Connect connectors to ECM as follows.
  a. Make sure that lock lever of ECM connector is unlock position.



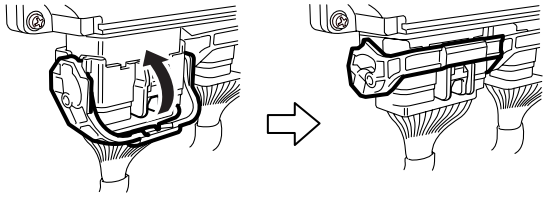
I4RS0B130021-

  b. Insert ECM connectors to ECM until it stops with unlocked lock lever.



I4RS0B130022-

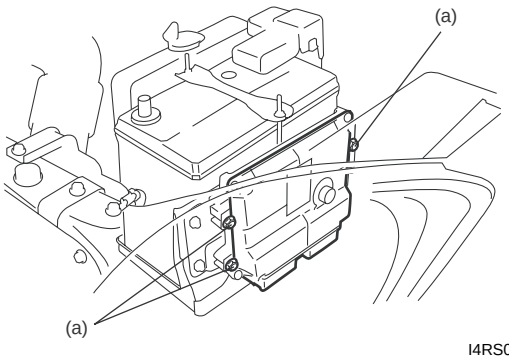
  c. Lock ECM connectors securely by pulling its lock lever up.



I4RS0A130004-

- Tighten ECM mounting bolts to specified torque.

Tightening torque
ECM mounting bolt (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)



I4RS0A130005-

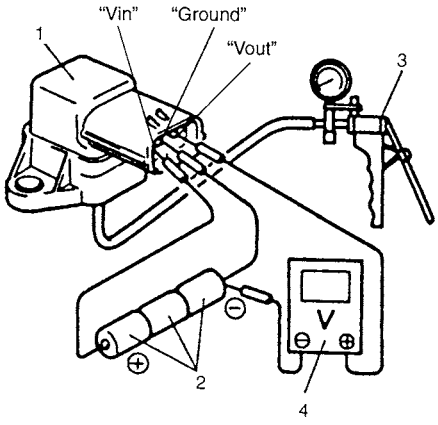
Manifold Absolute Pressure (MAP) Sensor Inspection

S4RS0A1306005

1) Remove air cleaner assembly.
2) Disconnect connector from MAP sensor.
3) Remove MAP sensor.
4) Arrange 3 new 1.5 V batteries (2) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin” terminal of sensor and negative terminal to “Ground” terminal. Then check voltage between “Vout” and “Ground”. Also, check if voltage reduces when vacuum is applied up to 400 mmHg by using vacuum pump (3).
   If check result is not satisfactory, replace MAP sensor (1).

Output voltage (When input voltage is 4.5 – 5.5 V, ambient temp. 20 – 30 °C, 68 – 86 °F)

Altitude (Reference)		Barometric pressure		Output voltage
(ft)	(m)	(mmHg)	(kPa)	(V)
0 – 2000	0 – 610	760 – 707	100 – 94	3.3 – 4.3
2001 – 5000	611 – 1524	Under 707 over 634	94 – 85	3.0 – 4.1
5001 – 8000	1525 – 2438	Under 634 over 567	85 – 76	2.7 – 3.7
8001 – 10000	2439 – 3048	Under 567 over 526	76 – 70	2.5 – 3.3



I3RM0A130005-

5) Install MAP sensor securely.
6) Connect MAP sensor connector securely.
7) Install air cleaner assembly.

Throttle Position (TP) Sensor On-Vehicle Inspection

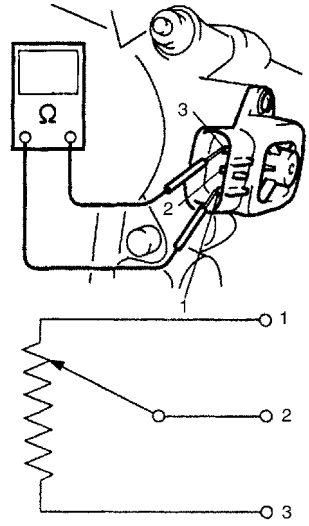
S4RS0A1306006

1) Disconnect negative cable at battery.
2) Disconnect TP sensor connector.
3) Using ohmmeter, check resistance between terminals under each condition.
   If check result is not satisfactory, replace TP sensor.

TP sensor resistance
Between terminals “1” and “3”: 4.0 – 6.0 kΩ
Between terminals “2” and “3”: 20 Ω – 6.0 kΩ, varying according to throttle valve opening

NOTE:

There should be more than 2 kΩ resistance difference between when throttle valve is at idle position and when it is fully open.



I3RB0A130003-

1. Reference voltage terminal
2. Output voltage terminal
3. Ground terminal

4) Connect TP sensor connector securely.
5) Connect negative cable to battery.

Throttle Position (TP) Sensor Removal and Installation

S4RS0A1306007

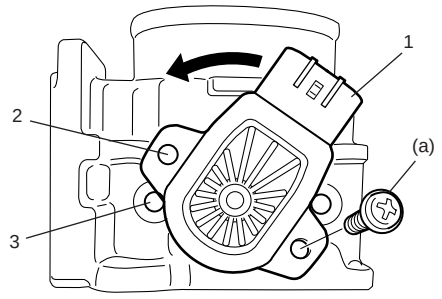
Removal

1) Disconnect negative cable at battery.
2) Disconnect TP sensor connector and remove TP sensor from throttle body.

Installation

1) Install TP sensor (1) to throttle body.
   Fit TP sensor to throttle body in such way that its holes (3) are a little away from TP sensor screw holes (2) as shown in the figure and turn TP sensor counterclockwise so that those holes align.

   Tightening torque
   TP sensor screw (a): 2.5 N·m (0.25 kg-m, 1.8 lb-ft)



I3RB0A130004-

2) Connect connector to TP sensor securely.
3) Connect negative cable to battery.

Engine Coolant Temperature (ECT) Sensor Removal and Installation

S4RS0A1306008

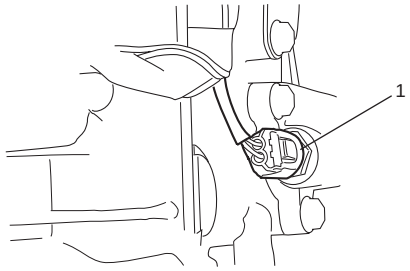
Removal

1) Disconnect negative cable at battery.
2) Drain coolant referring to “Cooling System Draining: in Section 1F”.

   WARNING:

   To avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot.
   Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

3) Remove air intake pipe.
4) Disconnect connector from ECT sensor (1).



I2RH0B130008-

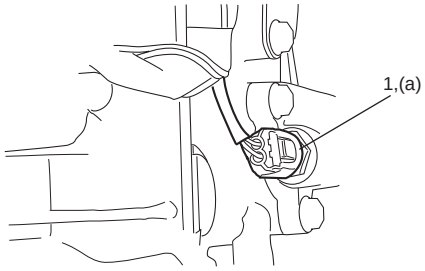
5) Remove ECT sensor from thermostat case.

Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of ECT sensor and thermostat case.
- Check O-ring for damage and replace, if necessary.
- Tighten ECT sensor (1) to specified torque.

  Tightening torque
  ECT sensor (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)



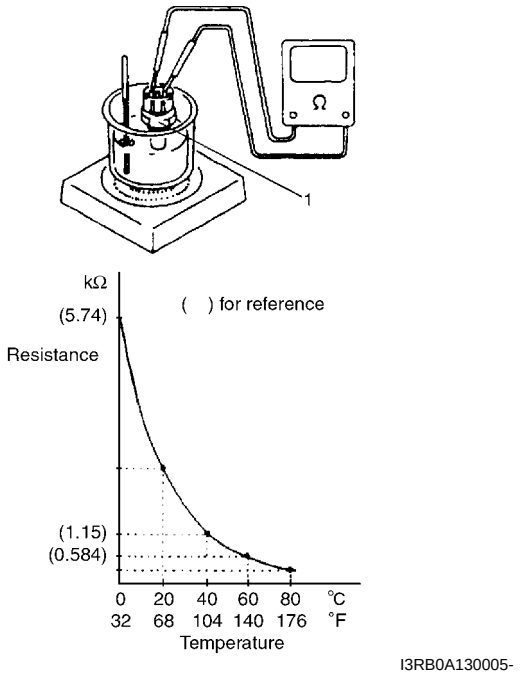
I2RH0B130009-

- Connect connector to ECT sensor securely.
- Refill coolant referring to “Cooling System Flush and Refill: in Section 1F”.

Engine Coolant Temperature (ECT) Sensor Inspection

S4RS0A1306009

Immerse temperature sensing part of ECT sensor (1) in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown, replace ECT sensor.



I3RB0A130005-

Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection

S4RS0A1306010

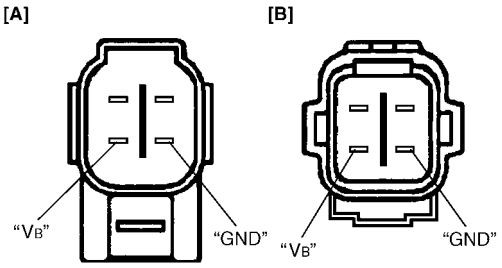
1) Disconnect sensor connector.
2) Using ohmmeter, measure resistance between terminals "V_B" and "GND" of sensor connector.
   If found faulty, replace oxygen sensor.

NOTE:

Temperature of sensor affects resistance value largely. Make sure that sensor heater is at correct temperature.

Resistance of oxygen sensor heater
HO2S-1: 5.0 – 6.4 Ω at 20 °C (68 °F)
HO2S-2: 11.7 – 14.5 Ω at 20 °C (68 °F)

Viewed from terminal side



I4RS0A130006-

[A]:	HO2S-1
[B]:	HO2S-2

3) Connect sensor connector securely.

Heated Oxygen Sensor (HO2S-1 and HO2S-2) Removal and Installation

S4RS0A1306011

Removal

WARNING:

To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.

1) Disconnect negative cable at battery.
2) Disconnect connector of heated oxygen sensor and release its wire harness from clamps.
3) Perform following items before removing heated oxygen sensor.
   a) For HO2S-1, remove exhaust manifold referring to "Exhaust Manifold Removal and Installation: in Section 1K", if necessary.
   b) For HO2S-2, hoist vehicle.
4) Remove heated oxygen sensor (1) from exhaust pipe or exhaust manifold.

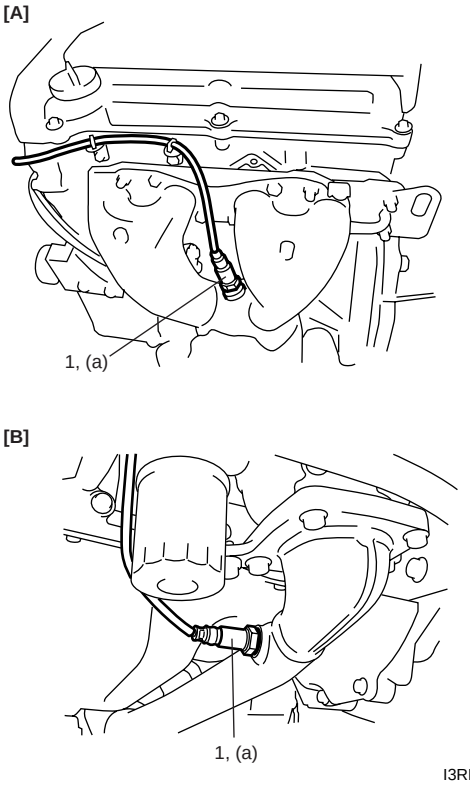
Installation

Reverse removal procedure noting the following.

- Tighten heated oxygen sensor (1) to specified torque.

  Tightening torque
  Heated oxygen sensor (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

- Install exhaust manifold referring to “Exhaust Manifold Removal and Installation: in Section 1K”, if removed.
- Connect connector of heated oxygen sensor (1) and clamp wire harness securely.
- After installing heated oxygen sensor, start engine and check that no exhaust gas leakage exists.



I3RM0A130007-

[A]: HO2S-1
[B]: HO2S-2

Camshaft Position (CMP) Sensor Removal and Installation

S4RS0A1306013

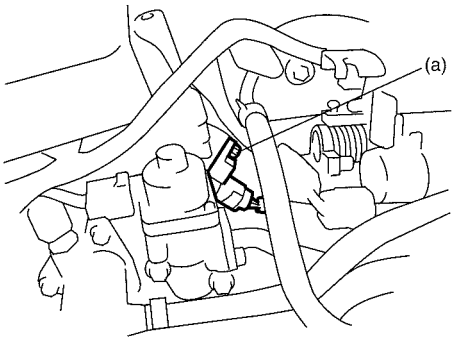
Removal

1) Disconnect negative cable at battery.
2) Disconnect connector from CMP sensor.
3) Remove camshaft position sensor from cylinder head.

Installation

1) Install camshaft position sensor to cylinder head.

   Tightening torque
   CMP sensor bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A130013-

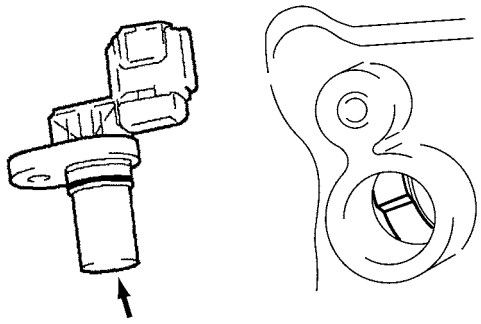
2) Connect connector to CMP sensor securely.
3) Connect negative cable to battery.

Camshaft Position (CMP) Sensor Inspection

S4RS0A1306014

Visual check

- Check that O-ring is free from damage.
- Check that end face of sensor and signal rotor tooth are free from any metal particles and damage.

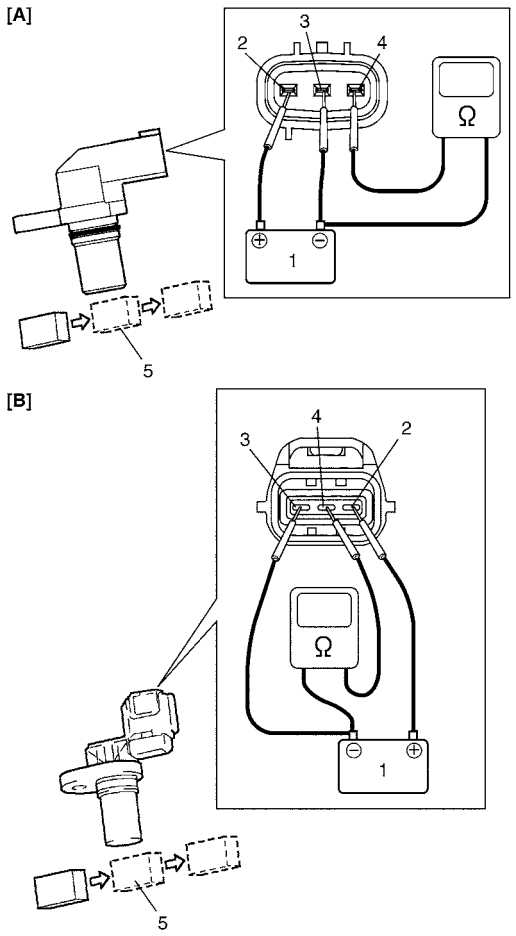


I4RS0B130015-

Performance check

1) Remove metal particles on end face of CMP sensor, if any.
2) Arrange 12 V battery (1) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using ohmmeter, measure resistance between “Vout” terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of CMP sensor.
   If resistance does not vary as specified below, replace CMP sensor.

CMP sensor resistance
Resistance varies from less than 220 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 220 Ω (ON)



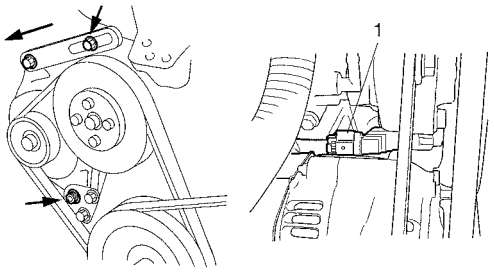
I4RS0B130016-

Crankshaft Position (CKP) Sensor Removal and Installation

S4RS0A1306015

Removal

1) Disconnect negative cable at battery.
2) Remove generator drive belt, loosen pivot bolt and move generator rearward.
3) Disconnect connector from crankshaft position sensor.
4) Remove crankshaft position sensor (1) from cylinder block.

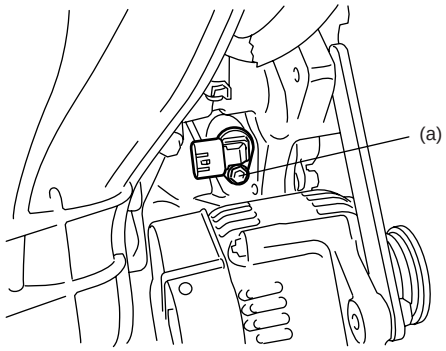


I2RH0B130012-

Installation

1) Install crankshaft position sensor to cylinder block. Tighten CKP sensor bolt to specified torque.

Tightening torque
CKP sensor bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A130007-

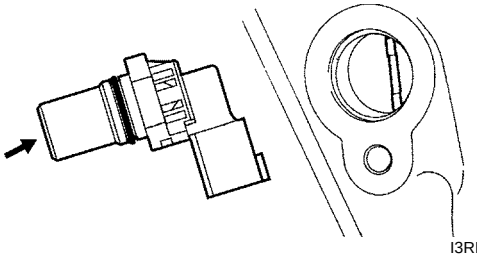
2) Connect connector to CKP sensor securely.
3) Adjust generator drive belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: in Section 1F”.
4) Connect negative cable to battery.

Crankshaft Position (CKP) Sensor Inspection

S4RS0A1306023

Visual check

- Check that O-ring is free from damage.
- Check that end face of sensor and signal pulley tooth are free from any metal particles and damage.



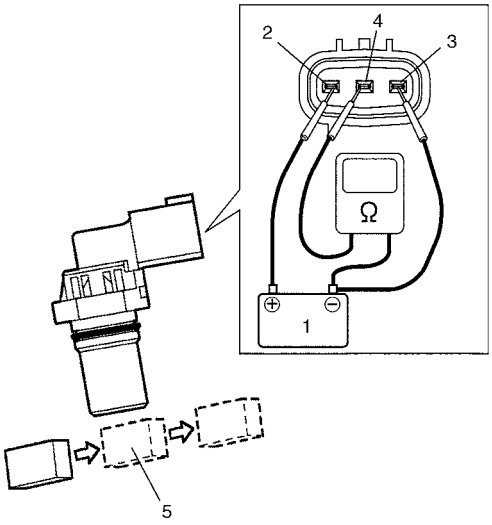
I3RB0A130006-

Performance check

1) Remove metal particles on end face of CKP sensor, if any.
2) Arrange 12 V battery (1) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using ohmmeter, measure resistance between “Vout” terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of CKP sensor.
   If resistance does not vary as specified below, replace CKP sensor.

CKP sensor resistance

Resistance varies from less than 220 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 220 Ω (ON)



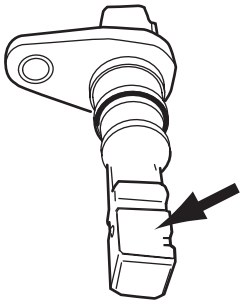
I4RS0B130017-

Vehicle Speed Sensor (VSS) Inspection (M/T model)

S4RS0A1306016

Visual check

- Check that O-ring is free from damage
- Check that end face of sensor and signal rotor tooth are free from any metal particles and damage.



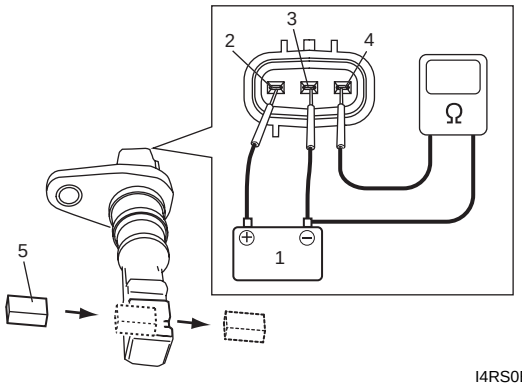
I4RS0B130018-

Performance check

1) Remove metal particles on end face of VSS, if any.
2) Arrange 12 V battery (1) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using ohmmeter, measure resistance between “Vout” terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of VSS.
   If resistance does not vary as specified below, replace VSS.

VSS resistance

Resistance varies from less than 100 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 100 Ω (ON)



I4RS0B130019-

Knock Sensor Removal and Installation

S4RS0A1306018

Removal

1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Remove right side drive shaft referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”.
4) Disconnect knock sensor connector (1).
5) Remove knock sensor (2) from cylinder block.

Installation

Reverse removal procedure for installation.

Tightening torque

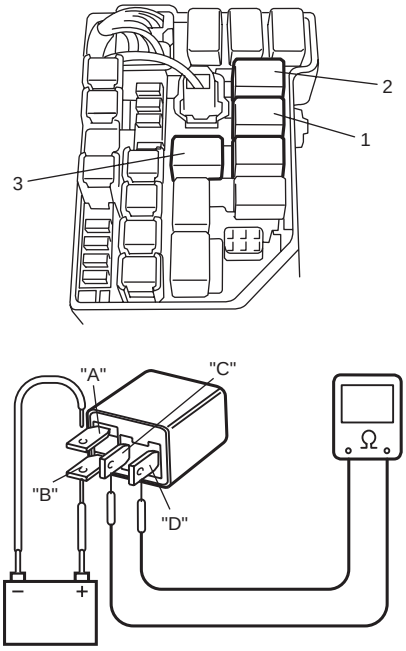
Knock sensor (a): 22 N·m (2.2 kg-m, 16.0 lb-ft)

I3RB0A130007-

Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection

S4RS0A1306019

1) Disconnect negative cable at battery.
2) Remove main relay (1), fuel pump relay (3) and starting motor control relay (2) from relay box.
3) Check that there is no continuity between terminal “C” and “D”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “B” of relay. Connect battery negative (–) terminal to terminal “A” of relay. Check for continuity between terminal “C” and “D”. If there is no continuity when relay is connected to the battery, replace relay.



I4RS0A130014-

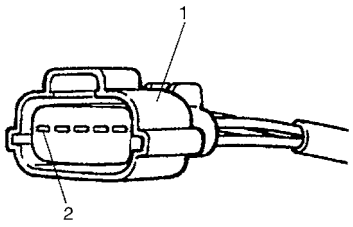
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection

S4RS0A1306020

NOTE:

Before performed this inspection, be sure to read the “Precautions of ECM Circuit Inspection: in Section 1A”.

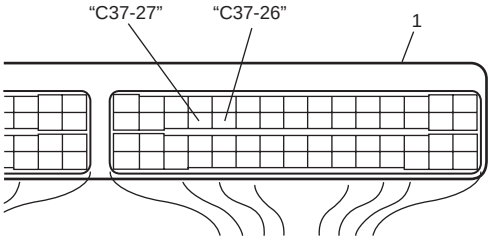
1) Disconnect negative cable at battery.
2) Disconnect MAF and IAT sensor connector.
3) Connect voltmeter to “BLK/RED” wire terminal (2) of MAF and IAT sensor connector (1) disconnected and ground.



I3RB0A130009-

4) Turn ON ignition switch position and check that voltage is battery voltage.
   If not, check if wire harness is open or connection is poor.
5) Turn OFF ignition switch position and connect connector to MAF and IAT sensor.
6) Remove ECM from its bracket referring to “Engine Control Module (ECM) Removal and Installation: ”
7) Connect special tool between ECM and ECM connector referring to “Inspection of ECM and Its Circuits: in Section 1A”.
8) Turn ON ignition switch position and check MAF signal voltage between “C37-26” terminal circuit and “C37-27” terminal circuit of special tool.

   MAF signal voltage between “C37-26” terminal circuit and “C37-27” terminal circuit of special tool
   MAF signal voltage of MAF and IAT sensor with ignition switch turned ON: 0.5 – 1.0 V



I4RS0A130009-

1. ECM

9) Start engine and check that voltage is lower than 5 V and it rises as engine speed increases.

   MAF signal voltage between “C37-26” terminal circuit and “C37-27” terminal circuit of special tool
   MAF signal reference voltage of MAF and IAT sensor at specified Idle speed: 1.3 – 1.8 V

10) If check result is not as specified above, cause may lie in wire harness, connector connection, MAF and IAT sensor or ECM.

Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Removal and Installation

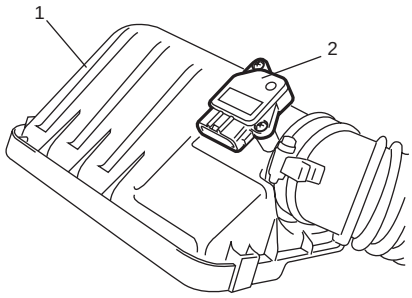
S4RS0A1306021

CAUTION:

- **Do not disassemble MAF and IAT sensor.**
- **Do not expose MAF and IAT sensor to any shock.**
- **Do not clean MAF and IAT sensor.**
- **If MAF and IAT sensor has been dropped, it should be replaced.**
- **Do not blow compressed air by using air gun or the like.**
- **Do not put finger or any other object into MAF and IAT sensor. Malfunction may occur.**

Removal

1) Disconnect negative cable at battery.
2) Disconnect MAF and IAT sensor connector.
3) Remove air cleaner case (1).
4) Remove MAF and IAT sensor (2) from air cleaner case.



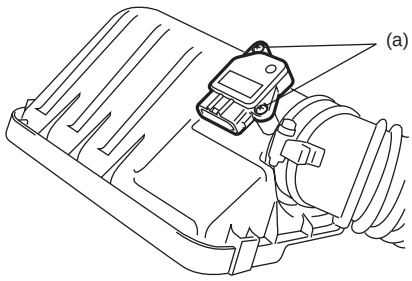
I4RS0A130010-

Installation

Reverse removal procedure noting the followings.

- Tighten MAF and IAT sensor screws to specified torque.

  Tightening torque
  MAF and IAT sensor screw (a): 1.5 N·m (0.15 kg-m, 1.1 lb-ft)



I4RS0A130011-

- Connect MAF and IAT sensor connector securely.

Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection

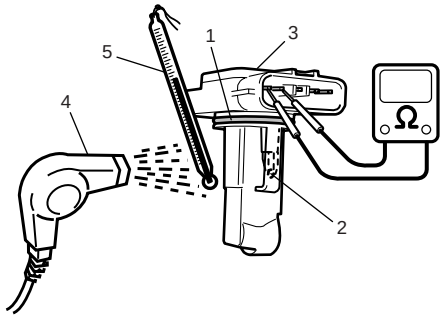
S4RS0A1306022

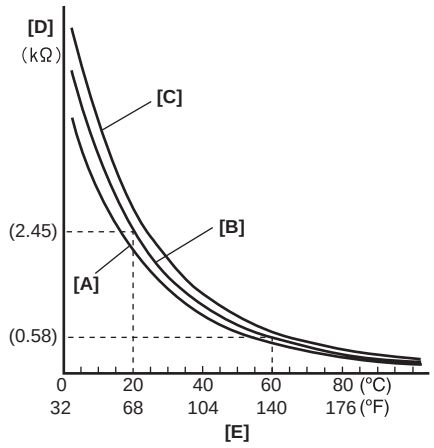
CAUTION:

Do not heat up MAF and IAT sensor more than 100 °C (212 °F). Otherwise, MAF and IAT sensor will be damaged.

- Check sensor O-ring (1) for damage and deterioration. Replace as necessary.
- Blow hot air to temperature sensing part (2) of MAF and IAT sensor (3) using hot air drier (4) and measure resistance between sensor terminals while heating air gradually.
  If measured resistance does not show such characteristic as shown, replace MAF and IAT sensor.

Intake air temperature sensor resistance
–20 °C (–4 °F): 13.6 – 18.4 kΩ
20 °C (68 °F): 2.21 – 2.69 kΩ
60 °C (140 °F): 0.493 – 0.667 kΩ





I4RS0A130012-

[A]:	Lower limit
[B]:	Nominal
[C]:	Upper limit
[D]:	Resistance
[E]:	Temperature
5.	Temperature gauge

Specifications

Tightening Torque Specifications

S4RS0A1307001

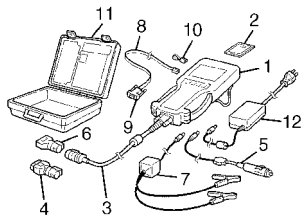
Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
IAC valve screw	3.5	0.35	2.5	☞
ECM mounting bolt	8	0.8	6.0	☞
TP sensor screw	2.5	0.25	1.8	☞
ECT sensor	15	1.5	11.0	☞
Heated oxygen sensor	45	4.5	32.5	☞
CMP sensor bolt	10	1.0	7.5	☞
CKP sensor bolt	10	1.0	7.5	☞
Knock sensor	22	2.2	16.0	☞
MAF and IAT sensor screw	1.5	0.15	1.1	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A1308001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞		

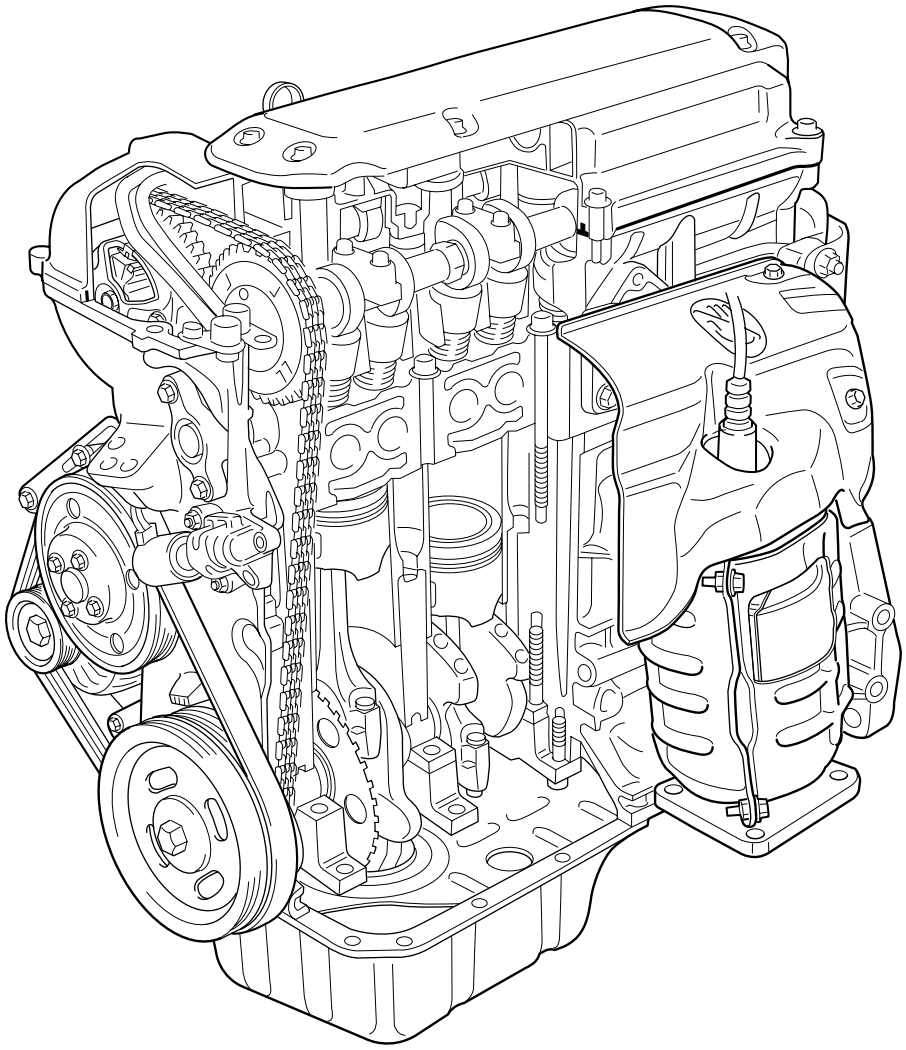
Engine Mechanical

General Description

Engine Construction Description

S4RS0A1401001

The engine is water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit with its DOHC (Double overhead camshaft) valve mechanism arranged for “V” type valve configuration and 16 valves (4 valves/one cylinder). The double overhead camshaft is mounted over the cylinder head; it is driven from crankshaft through timing chain, and no push rods are provided in the valve train system.



I3RM0A140001-

Camshaft Position Control (VVT Variable Valve Timing) System Description

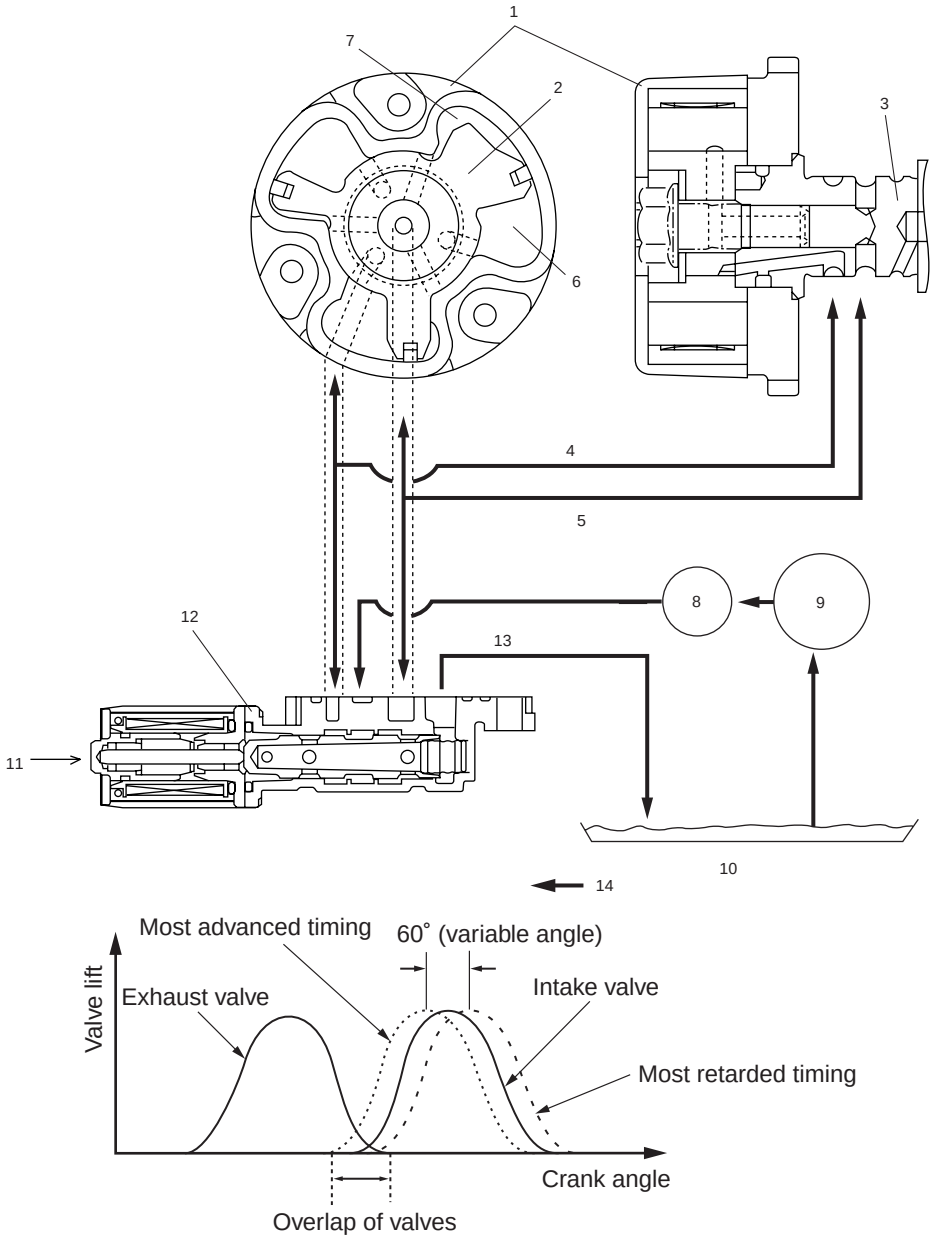
S4RS0A1401002

System Description

The VVT system is an electronic control system which continuously vary and optimize the intake valve timing in response to the engine operating condition.

The optimized intake valve timing produce such an air intake with high efficiency that both the higher power generation and lower fuel consumption can be attained in the whole engine speed range from low to high. In the area of the average engine load, low emission of nitrogen oxides (NOx) and high fuel efficiency can also be attained by making the valve opening overlap between the intake and exhaust valves longer.

For the brief of the system operation, the intake valve timing is varied by the cam timing sprocket (1) which varies the rotational phase between the intake camshaft (3) and sprocket. The rotor (2) in the cam timing sprocket is actuated by switching or adjusting the hydraulic pressure applied to the chambers for the timing advancing (7) and/or retarding (6). To switch or adjust the hydraulic pressure appropriately, ECM operates the oil control valve (12) with detecting the engine speed, intake air value, throttle opening, engine coolant temperature and camshaft position (angle).

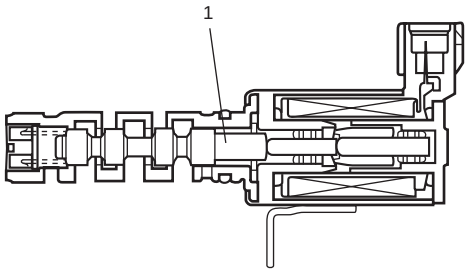


I3RH0B140002-

4. Oil passage to chamber for timing retarding	8. Oil filter	10. Oil pan	12. Oil flow
5. Oil passage to chamber for timing advancing	9. Oil pump	11. Control signal from ECM	

Oil Control Valve

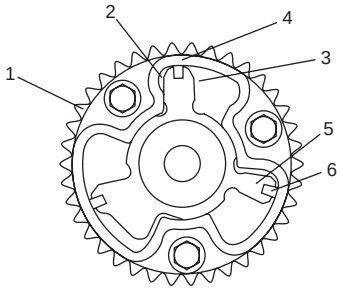
The oil control valve switches and adjusts the hydraulic pressure applied to the cam timing sprocket by moving the spool valve (1) according to the duty pulse signals output from the ECM. By this operation, the intake valve timing is varied continuously. Signals output from the ECM are the duty pulse of about 240 Hz.



I3RH0B140003-

Cam Timing Sprocket

The cam timing sprocket is equipped with the chambers for timing advancing (2) and retarding (3) which are separated by the rotor (5). The rotor rotates receiving the hydraulic pressure applied to both the chambers. The sprocket (1) is installed on the housing (4) and the rotor is secured on the intake camshaft by fastening the bolts. Therefore, the actuation of the rotor makes the phase difference between the sprocket and intake camshaft.

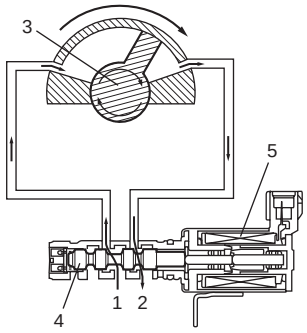


I3RH0B140004-

6. Seal

Timing Advancing

When the duty ratio of the signal output from the ECM is heavy, the spool valve (4) of the oil control valve moves to the left (opposite direction against the coil (5)). By this spool valve movement, the pressurized oil (1) is led into the chambers for timing advancing and the oil in the chambers for timing retarding is drained. This operations actuate the rotor (3) and result in the advanced timing of the intake valve.

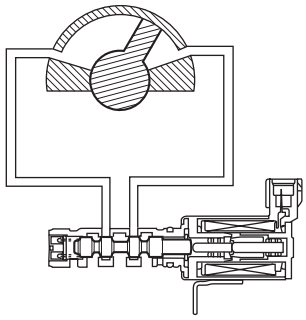


I3RH0B140005-

2. Drain

Timing Holding

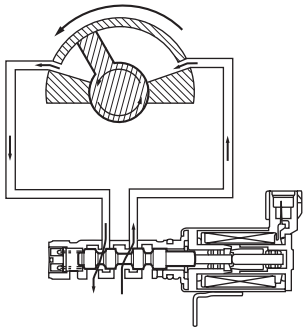
When the duty ratio of the signal output from the ECM shows that of holding, the spool valve of the oil control valve is located at hold position. Because this condition generates no oil pressure changes in both chambers, the rotor is fixed at a target position.



I3RH0B140006-

Timing Retarding

When the duty ratio of the signal output from the ECM is light, the spool valve of the oil control valve moves to the right (head for the coil). By this spool valve movement, the pressurized oil is led into the chambers for timing retarding and the oil in the chambers for timing advancing is drained. This operations actuate the rotor and result in the retarded timing of the intake valve.



I3RH0B140007-

Targeted Timing Varying Operation

Driving condition	Valve timing	Target of control	Effect
Engine running at idle speed	Most retarded	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold.	Stabilization of the engine rotation at idle speed.
Average engine load range	To the advanced side	To lengthen the valve opening overlap in order to enhance the internal exhaust gas recirculation and reduce the pumping loss.	Improvement of the fuel efficiency. Lowering of the exhaust emission.
Light engine load range	To the retarded side	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold.	Keeping of the engine stability.

Driving condition	Valve timing	Target of control	Effect
Low or average engine speed range with heavy engine load	To the advanced side	To advance the closing timing of the intake valve in order to improve the volumetric efficiency.	Improvement of generating the engine torque at low and average engine speed.
High engine speed range with heavy engine load	To the retarded side	To retard the closing timing of the intake valve in order to improve the volumetric efficiency.	Improvement of generating the engine power.
Low engine coolant temperature	Most retarded	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold and reduce the fuel increasing. To slow the fast idle speed of the engine as a result of stabilizing the engine idling.	Stabilization of the fast idling of the engine. Improvement of the fuel efficiency.
At engine starting and stopping	Most retarded	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold.	Improvement of start ability.

Diagnostic Information and Procedures

Compression Check

S4RS0A1404001

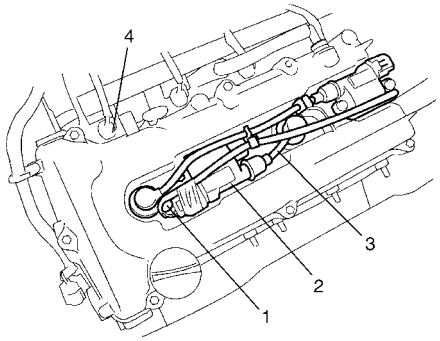
Check compression pressure on all 4 cylinders as follows:

1) Warm up engine to normal operating temperature.
2) Stop engine after warming up.

NOTE:

After warming up engine, place transaxle gear shift lever in “Neutral”, and set parking brake and block drive wheels.

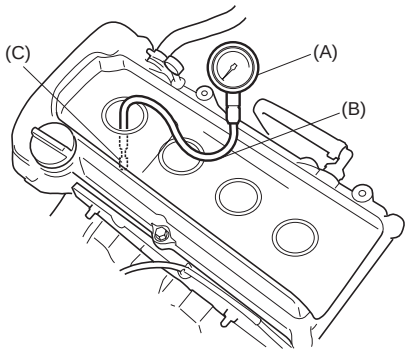
3) Disconnect ignition coil couplers (1).
4) Remove ignition coil assemblies (2) with high-tension cord (3).
5) Remove all spark plugs.
6) Disconnect fuel injector wires (4) at the coupler.



I2RH0B140003-

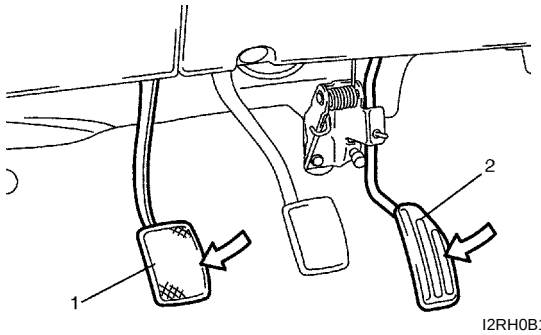
7) Install special tools (Compression gauge) into spark plug hole.

Special tool
(A): 09915–64512
(B): 09915–64530
(C): 09915–67010



I3RH0B140009-

8) Disengage clutch (1) (to lighten starting load on engine) for M/T vehicle, and depress accelerator pedal (2) all the way to make throttle fully open.



I2RH0B140005-

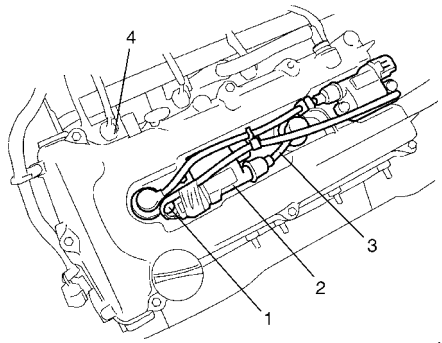
9) Crank engine with fully charged battery, and read the highest pressure on compression gauge.

NOTE:

- **For measuring compression pressure, crank engine at least 250 r/min. by using fully charged battery.**
- **If measured compression pressure is lower than limit value, check installation condition of special tool. If it is properly installed, possibility is compression pressure leakage from where piston ring and valve contact.**

Compression pressure
Standard: 1400 kPa (14.0 kg/cm^2, 199.0 psi)
Limit: 1100 kPa (11.0 kg/cm^2, 156.0 psi)
Max. difference between any two cylinders: 100 kPa (1.0 kg/cm^2, 14.2 psi)

10) Carry out Steps 7) through 9) on each cylinder to obtain 4 readings.
11) After checking, install spark plugs and ignition coil assemblies (2) with high-tension cord (3).
12) Connect ignition coil couplers (1).
13) Connect fuel injector wires (4) at the coupler.



I2RH0B140003-

Engine Vacuum Check

S4RS0A1404002

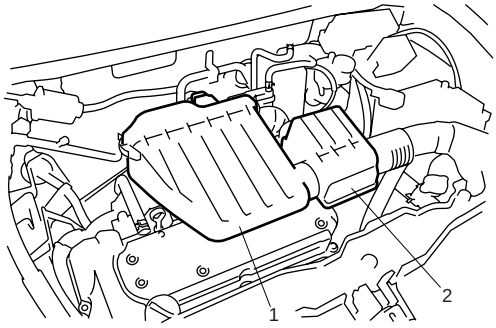
The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

1) Warm up engine to normal operating temperature.

NOTE:

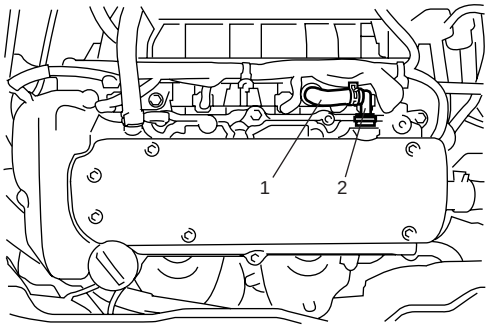
After warming up engine, be sure to place transaxle gear shift lever in "Neutral", and set parking brake and block drive wheels.

2) Stop engine and turn off the all electric switches.
3) Remove air cleaner case (1) and resonator (2).



I3RM0A140002-

4) Remove PCV hose (1) from PCV valve (2).

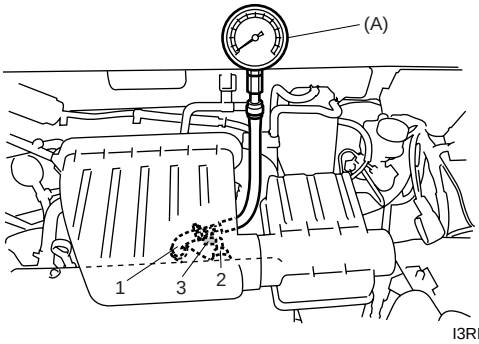


I3RH0B140011-

5) Connect special tool (Vacuum gauge) to PCV hose (1).

Special tool
(A): 09915–67311

6) Blind PCV valve (2) using tape (3) or the like.



I3RM0A140003-

7) Install air cleaner case and resonator.
8) Run engine at specified idle speed and read vacuum gauge. Vacuum should be within specification.

Vacuum specification (at sea level)
59 – 73 kPa (45 – 55 cmHg, 17.7 – 21.6 in.Hg) at specified idle speed

9) After checking, disconnect special tool (Vacuum gauge) from PCV valve.
10) Detach blind cap from PCV valve.
11) Install air cleaner case and resonator.

Valve Lash (Clearance) Inspection

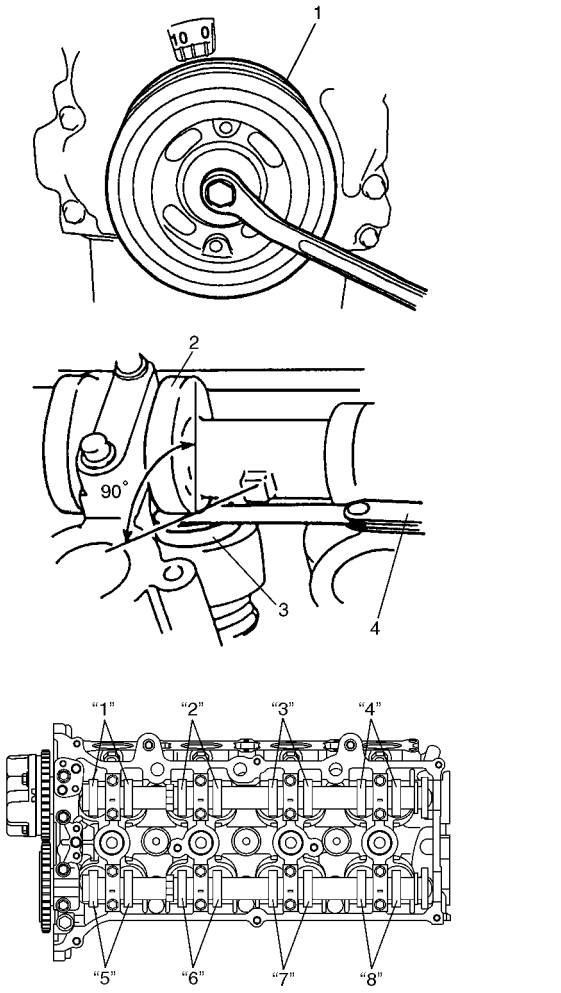
S4RS0A1404003

1) Remove negative cable at battery.
2) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
3) Remove right side engine under cover, if necessary.
4) Using 17 mm wrench, turn crankshaft pulley (1) clockwise until cam lobes (2) become perpendicular to shim faces (3) at valves “1” and “7” as shown in the figure.
5) Check valve lashes with thickness gauge (4) according to the following procedure.
   a) Check valve lashes at valves “1” and “7”.
   b) Turn camshafts by 90° (by turning crankshaft with wrench).
   c) Make sure that cam lobes are perpendicular to shim faces at valves to be checked (in this case, “3” and “8”), if not, adjust it by turning crankshaft. Check valve lashes.
   d) In the same manner as b) – c), check valve lashes at valves “4” and “6”.
   e) In the same manner as b) – c) again, check valve lashes at valves “2” and “5”.

If valve lash is out of specification, record valve lash and adjust it to specification by replacing shim.

Valve clearance specification

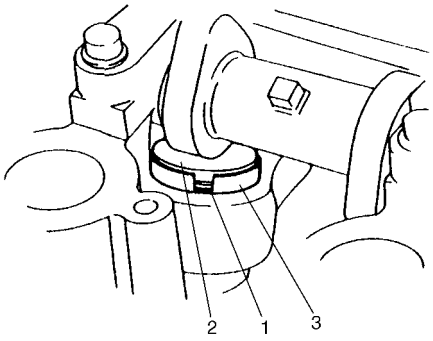
	When cold (Coolant temperature is 15 – 25 °C (59 – 77 °F))	When hot (Coolant temperature is 60 – 68 °C (140 – 154 °F))
Intake	**0.18 – 0.22 mm (0.007 – 0.009 in.)**	**0.21 – 0.27 mm (0.008 – 0.011 in.)**
Exhaust	**0.28 – 0.32 mm (0.011 – 0.013 in.)**	**0.30 – 0.36 mm (0.012 – 0.014 in.)**



I3RM0A140004-

Replacement of Shim

1) Close the valve whose shim (2) is to be replaced by turning crankshaft, then turn tappet (3) till its cut section (1) faces inside as shown in the figure.

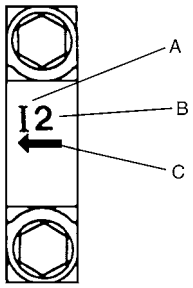


I2RH0B140006-

2) Lift down the valve by turning crankshaft to 360°.
3) Hold tappet at that position using special tool as follows.
   a) Remove its housing bolts.
   b) Check housing No. and select special tool corresponding to housing No., referring to "Special tool selection table".

Special tool selection table

No. on camshaft housing	Embossed mark on special tool
I2	IN2
I3, I4, I5	IN345
E2	EX2
E3, E4, E5	EX345



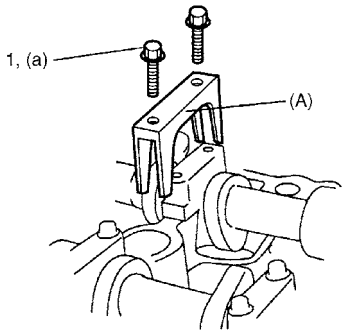
I2RH0B140011-

A: I: Intake side or E: Exhaust side
B: Position from timing chain side
C: Pointing to timing chain side

   c) Hold down the tappet so as not to contact the shim by installing special tool on camshaft housing with housing bolt (1) tighten housing bolts to specified torque.

Special tool
(A): 09916–67020
(A): 09916–67021

Tightening torque
Camshaft housing bolts (a): 8 N·m (0.8 kg-m, 6.0 lb-ft) (for tightening of special tool)

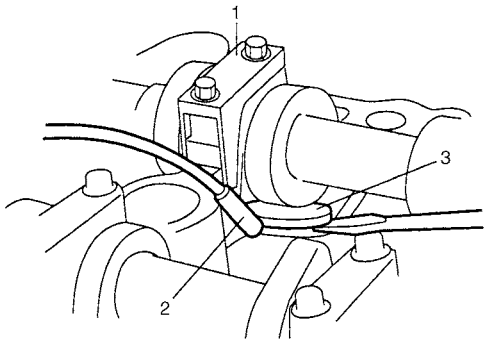


I3RM0A140005-

4) Turn camshaft by approximately 90° clockwise and remove shim (3).

WARNING:

Never put in the hand between camshaft and tappet.

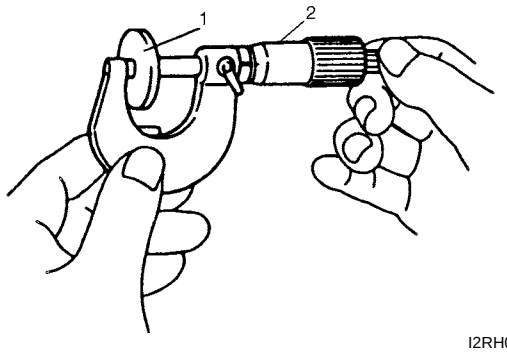


I2RH0B140013-

1. Special tool
2. Magnet

5) Using a micrometer (2), measure the thickness of the removed shim (1), and determine replacement shim by calculating the thickness of new shim with the following formula and table.

Shim thickness specification
Intake side:
A = B + C – 0.20 mm (0.008 in.)
Exhaust side:
A = B + C – 0.30 mm (0.012 in.)
A: Thickness of new shim
B: Thickness of removed shim
C: Measured valve clearance



I2RH0B140014-

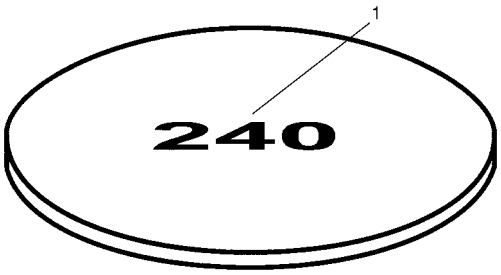
For example of intake side:
When thickness of removed shim is 2.40 mm (0.094 in.), and measured valve clearance is 0.45 mm (0.018 in.).
A = 2.40 mm (0.094 in.) + 0.45 mm (0.018 in.) – 0.20 mm (0.008 in.) = 2.65 mm (0.104 in.)
Calculated thickness of new shim = 2.65 mm (0.104 in.)

6) Select new shim No. (1) with a thickness as close as possible to calculated value.

Available new shims No.

Thickness mm (in.)	Shim No.	Thickness mm (in.)	Shim No.
2.175 (0.0856)	218	2.600 (0.1024)	260
2.200 (0.0866)	220	2.625 (0.1033)	263
2.225 (0.0876)	223	2.650 (0.1043)	265
2.250 (0.0886)	225	2.675 (0.1053)	268
2.275 (0.0896)	228	2.700 (0.1063)	270
2.300 (0.0906)	230	2.725 (0.1073)	273
2.325 (0.0915)	233	2.750 (0.1083)	275
2.350 (0.0925)	235	2.775 (0.1093)	278
2.375 (0.0935)	238	2.800 (0.1102)	280
2.400 (0.0945)	240	2.825 (0.1112)	283
2.425 (0.0955)	243	2.850 (0.1122)	285
2.450 (0.0965)	245	2.875 (0.1132)	288
2.475 (0.0974)	248	2.900 (0.1142)	290
2.500 (0.0984)	250	2.925 (0.1152)	293
2.525 (0.0994)	253	2.950 (0.1161)	295
2.550 (0.1004)	255	2.975 (0.1171)	298
2.575 (0.1014)	258	3.000 (0.1181)	300

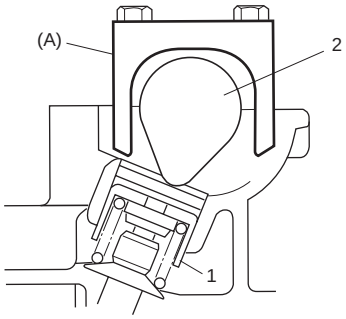
7) Install new shim facing shim No. side with tappet.



I2RH0B140015-

8) Lift valve by turning crankshaft counterclockwise (in opposite direction against above Step 4)) and remove special tool.

Special tool
(A): 09916–67020
(A): 09916–67021

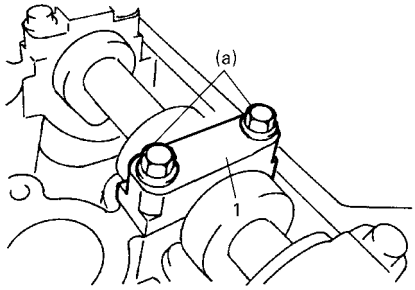


I3RM0A140006-

1.	Tappet
2.	Camshaft

9) Install camshaft housing (1) and tighten bolts to specified torque.

Tightening torque
Camshaft housing bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B140149-

10) Check valve clearance again after adjusting it.
11) After checking and adjusting all valves.
12) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.

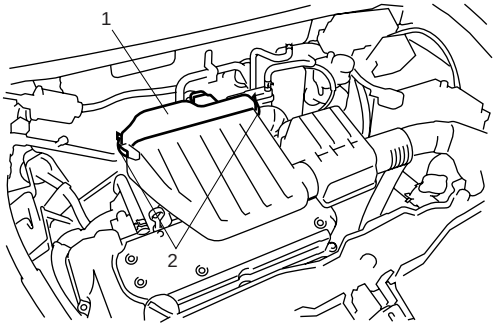
Repair Instructions

Air Cleaner Element Removal and Installation

S4RS0A1406001

Removal

1) Open air cleaner case (1) by unhooking its clamps (2).
2) Remove air cleaner element from case.



I3RM0A140007-

Installation

Reverse removal procedure for installation.

Air Cleaner Element Inspection and Cleaning

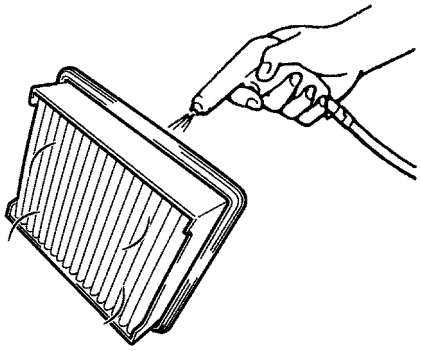
S4RS0A1406002

Inspection

Check air cleaner element for dirt. Replace excessive dirty element.

Cleaning

Blow off dust by compressed air from air outlet side of element.



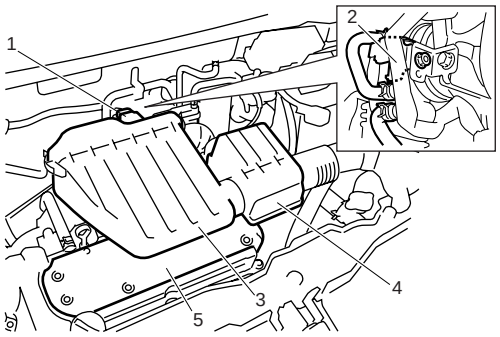
I2RH0B140150-

Cylinder Head Cover Removal and Installation

S4RS0A1406011

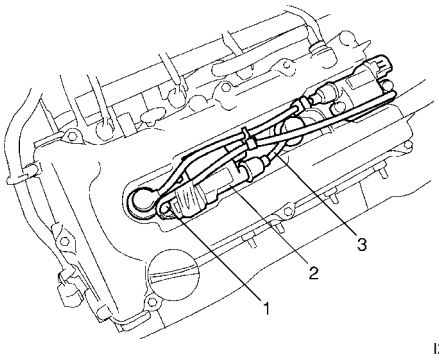
Removal

1) Disconnect negative cable at battery.
2) Disconnect MAF sensor coupler (1).
3) Remove EVAP canister purge valve (2).
4) Remove air cleaner case (3) and resonator (4).
5) Remove cylinder head upper cover (5).



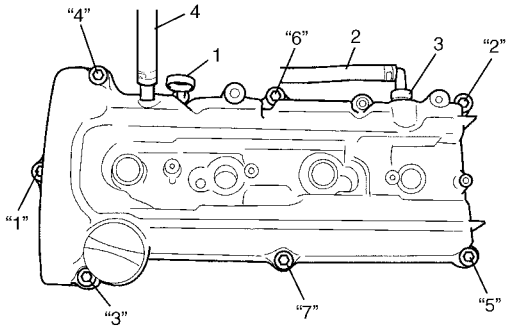
I3RM0A140008-

6) Disconnect ignition coil couplers (1).
7) Remove ignition coil assemblies (2) with high-tension cord (3).
8) Remove wire harness clamp (4) from cylinder head cover.



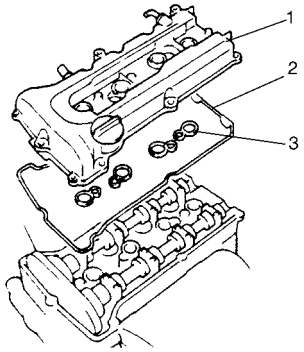
I2RH0B140032-

9) Remove oil level gauge (1).
10) Disconnect PCV hose (2) from PCV valve (3) and disconnect breather hose (4) from cylinder head cover.
11) Remove cylinder head cover mounting bolts in such order as indicated in the figure.



I2RH0B140033-

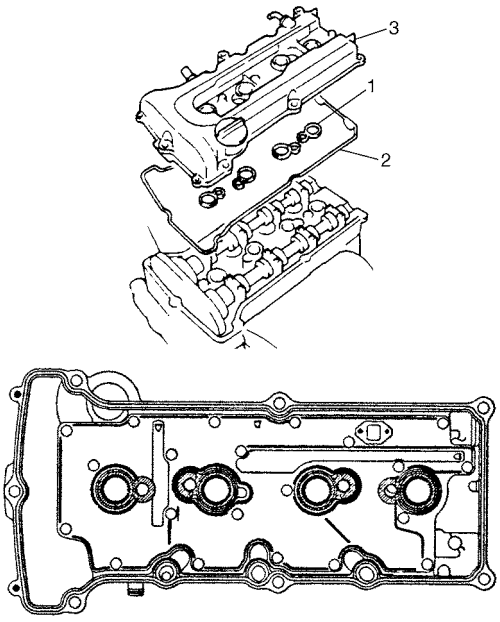
12) Remove cylinder head cover (1) with cylinder head cover gasket (2) and spark plug hole gasket (3).



I2RH0B140034-

Installation

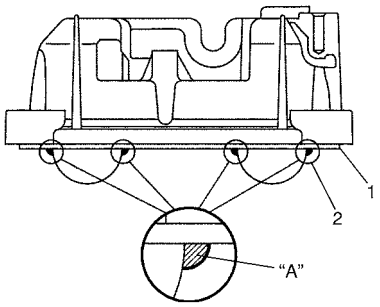
1) Install new spark plug hole gaskets (1) and new cylinder head cover gasket (2) to cylinder head cover (3) as shown in the figure.



I2RH0B140035-

2) Remove oil, old sealant, and dust from sealing surfaces on cylinder head and cover. After cleaning, apply sealant “A” to the following point.
   - Cylinder head cover gasket (1) sealing surface area (2) as shown.

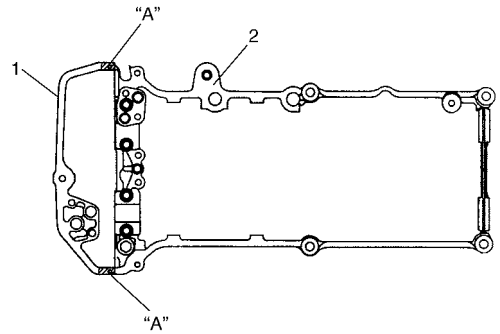
     “A”: Water tight sealant 99000–31250



I2RH0B140036-

   - Timing chain cover (1) and cylinder head (2) mating surface as shown.

     “A”: Water tight sealant 99000–31250



I2RH0B140037-

3) Install cylinder head cover to cylinder head.

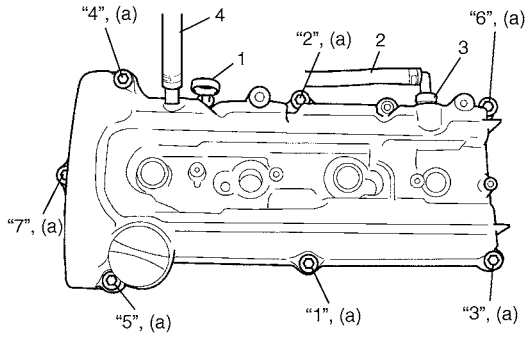
   NOTE:

   When installing cylinder head cover, use care so that cylinder head cover gasket or spark plug hole gaskets will not get out of place or fall off.

4) Tightening bolts in such order as indicated in the figure a little at a time till they are tightened to specified torque.

   Tightening torque
   Cylinder head cover bolt (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)

5) Connect PCV hose (2) to PCV valve (1).
6) Connect breather hose (4).
7) Install oil level gauge.



I3RH0B140016-

8) Install wire harness clamp to cylinder head cover.
9) Install ignition coil assemblies with high-tension cord.
10) Connect ignition coil couplers and clamp harness securely.
11) Install cylinder head upper cover.
12) Install air cleaner case and resonator.
13) Connect negative cable at battery.

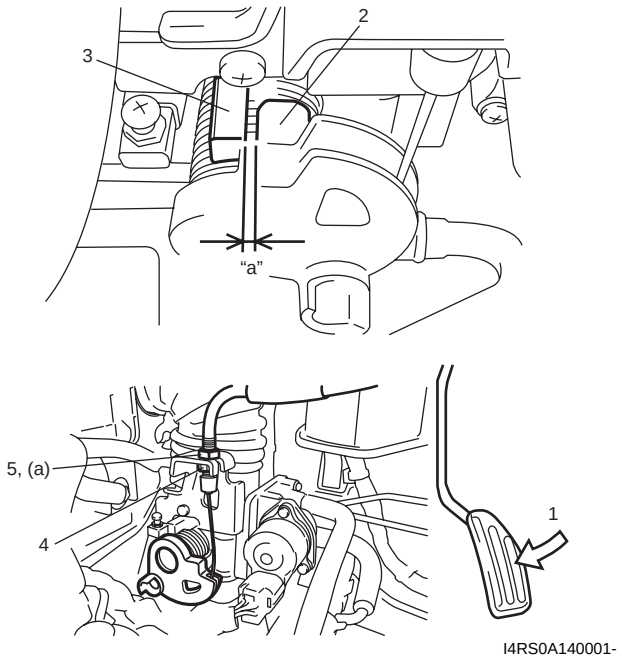
Accelerator Cable Adjustment

S4RS0A1406003

With accelerator pedal depressed fully (1), check clearance between throttle lever (2) and lever stopper (3) of throttle body.
If measured value is out of specification, adjust it to specification with cable adjusting nut (4), and then tighten accelerator cable locking nut to specified torque.

Tightening torque
Accelerator cable locking nut (a): 12 N·m (1.2 kg-m, 9.0 lb-ft)

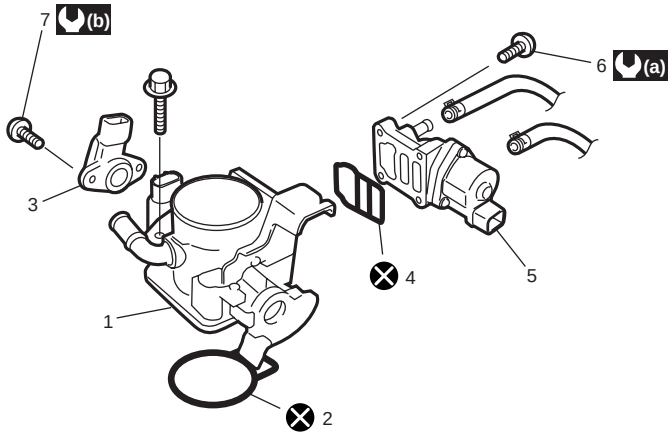
Accelerator cable adjustment clearance (with pedal depressed fully)
"a": 0.5 – 2.0 mm (0.02 – 0.07 in.)



I4RS0A140001-

Throttle Body Components

S4RS0A1406004



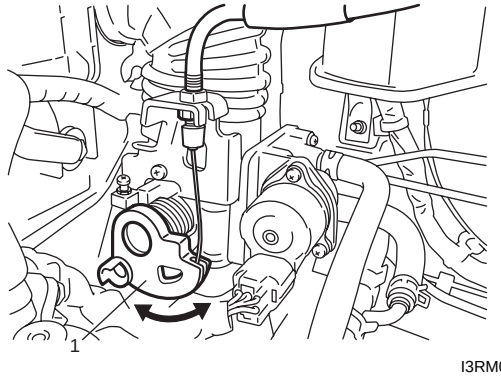
I4RS0A140002-

1. Throttle body	5. Idle air control valve	(b) : 2.5 N·m (0.25 kg-m, 2.0 lb-ft)
2. Throttle body gasket	6. IAC valve screws	⊗ : Do not reuse.
3. TP sensor	7. TP sensor screws	
4. Gasket	(a) : 3.5 N·m (0.35 kg-m, 2.5 lb-ft)	

Throttle Body On-Vehicle Inspection

S4RS0A1406005

Check that throttle lever (1) moves smoothly.



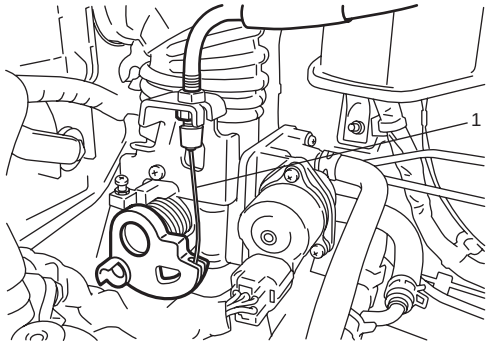
I3RM0A140011-

Throttle Body Removal and Installation

S4RS0A1406006

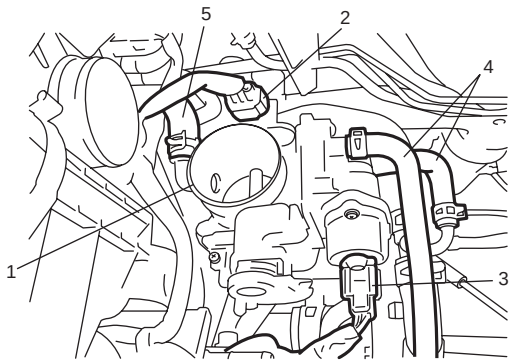
Removal

1) Disconnect negative cable at battery.
2) Drain coolant referring to “Cooling System Draining: in Section 1F”.
3) Disconnect accelerator cable (1) from throttle body.



I3RM0A140012-

4) Detach EVAP canister and purge valve chamber, and remove air cleaner outlet hose.
5) Disconnect connectors from TP sensor (2) and IAC valve (3).
6) Disconnect engine coolant hoses (4) and breather hose (5) from throttle body (1).



I3RM0A140013-

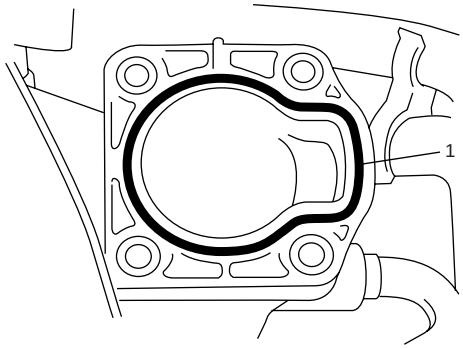
7) Remove throttle body from intake manifold.
8) Remove TP sensor and IAC valve from throttle body.

NOTE:

While disassembling and assembling throttle body, use special care not to deform levers on throttle valve shaft or cause damage to any other parts.

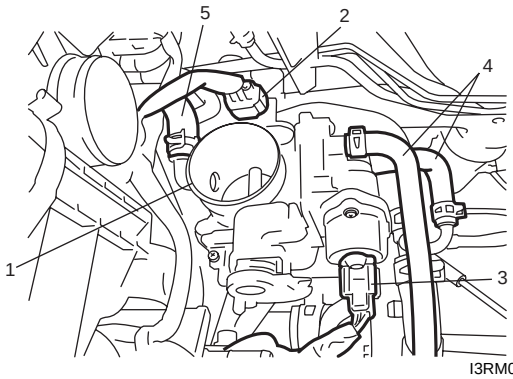
Installation

1) Install IAC valve to throttle body referring to “Idle Air Control (IAC) Valve Removal and Installation: in Section 1C”.
2) Install TP sensor to throttle body referring to “Throttle Position (TP) Sensor Removal and Installation: in Section 1C”.
3) Clean mating surfaces and install new throttle body gasket (1) to intake manifold.



I3RM0A140014-

4) Install throttle body (1) to intake manifold.
5) Connect connectors to TP sensor (2) and IAC valve (3) securely.
6) Connect engine coolant hoses (4) and breather hose (5).



I3RM0A140013-

7) Connect accelerator cable and adjust cable play to specification referring to “Accelerator Cable Adjustment: ”.
8) Install air cleaner outlet hose, purge valve chamber and EVAP canister.
9) Refill coolant referring to “Cooling System Flush and Refill: in Section 1F”.
10) Connect negative cable at battery.

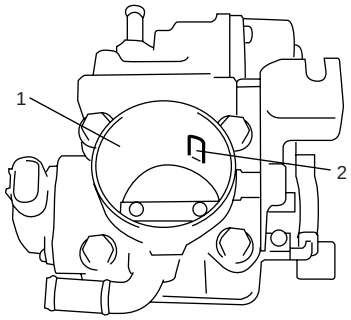
Throttle Body Cleaning

S4RS0A1406008

Clean throttle body bore (1) and idle air passage (2) by blowing compressed air.

NOTE:

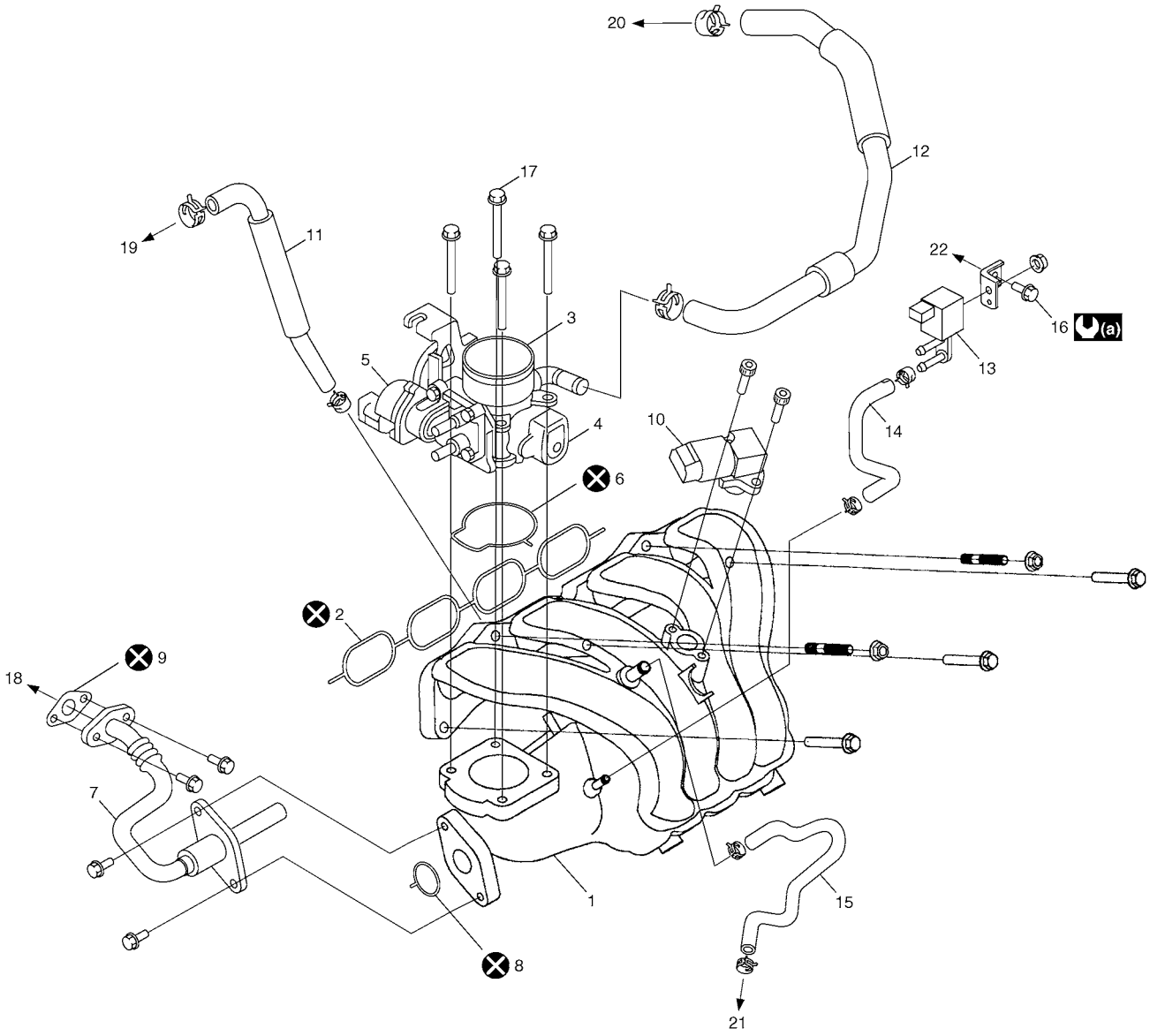
TP sensor, idle air control valve or other components containing rubber must not be placed in a solvent or cleaner both. A chemical reaction will cause these parts to swell, harden or get distorted.



I3RM0A140015-

Throttle Body and Intake Manifold Components

S4RS0A1406009



I4RS0A140003-

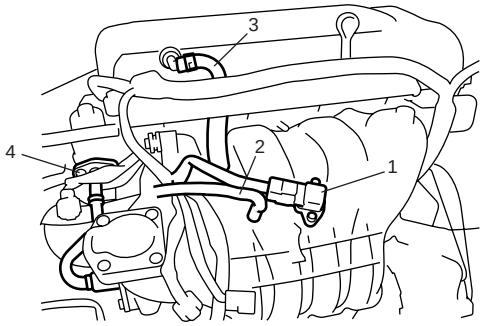
1. Intake manifold	7. EGR pipe	13. EVAP canister purge valve	19. To PCV valve
2. Intake manifold O-ring	8. O-ring	14. EVAP canister purge valve hose	20. To cylinder head cover
3. Throttle body	9. Gasket	15. Brake booster hose	21. To brake booster
4. TP sensor	10. MAP sensor	16. EVAP canister purge valve bracket bolt	22. To air cleaner case
5. IAC valve	11. PCV valve hose	17. Throttle body mounting bolt	(a) : 5 N·m (0.5 kg-m, 4.0 lb-ft)
6. O-ring	12. Breather hose	18. To EGR valve	: Do not reuse.

Intake Manifold Removal and Installation

S4RS0A1406010

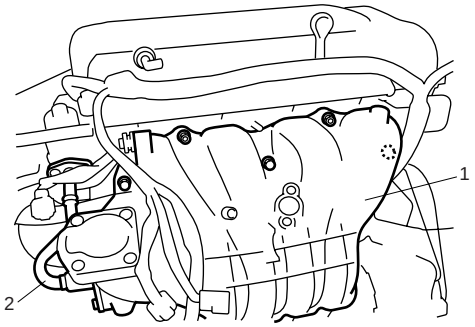
Removal

1) Remove throttle body referring to “Throttle Body Removal and Installation: ”.
2) Disconnect MAP sensor coupler (1).
3) Disconnect the following hoses:
   - Brake booster hose (2) from cylinder head cover
   - PCV hose (3) from PCV valve
4) Remove EGR pipe bolt (4) from EGR valve.



I4RS0A140004-

5) Remove intake manifold (1) and EGR pipe (2) from cylinder head, and then remove its gasket and O-ring.



I3RM0A140018-

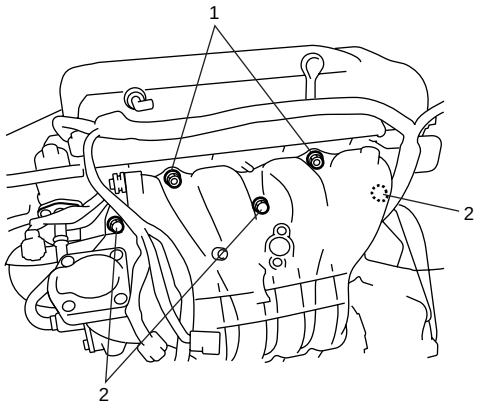
Installation

Reverse removal procedure for installation noting the followings.

- Use new intake manifold O-ring.
- Use new EGR pipe gasket and O-ring.
- Tighten EVAP canister purge valve bracket bolt to specified torque.

  Tightening torque
  EVAP canister purge valve bracket bolt: 5 N·m (0.5 kg-m, 4.0 lb-ft)

- Install intake manifold bolt (2) and nut (1) as shown in figure.

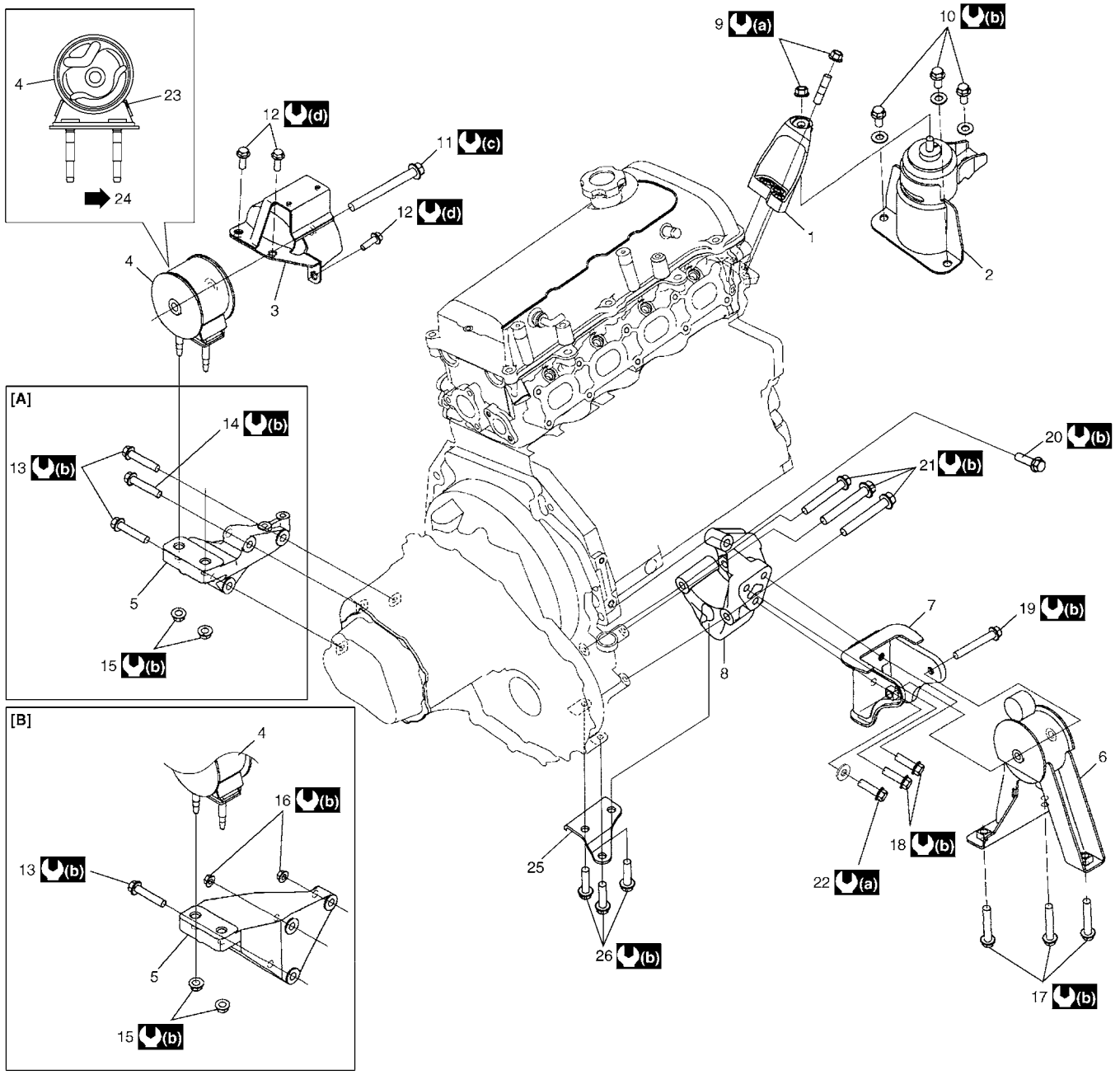


I4RS0A140005-

- Check to ensure that all removed parts are back in place.
  Reinstall any necessary parts which have not been reinstalled.
- Adjust accelerator cable play, referring to “Accelerator Cable Adjustment: ”.
- Refill cooling system referring to “Cooling System Flush and Refill: in Section 1F”.
- Upon completion of installation, turn ignition switch ON but engine OFF and check for fuel leaks.
- Finally, start engine and check for engine coolant leaks.

Engine Mountings Components

S4RS0A1406012



I4RS0A140006-

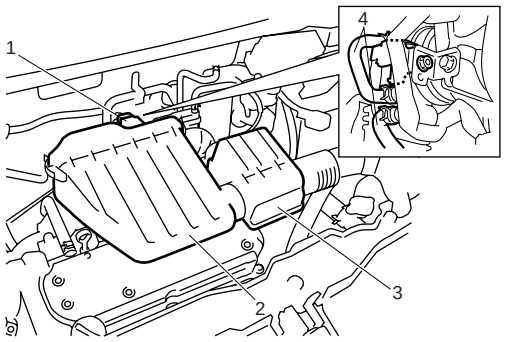
[A]: A/T model	10. Engine right mounting bolt	21. Engine rear mounting body bracket bolt
[B]: M/T model	11. Engine left mounting bush bolt	22. Engine rear mounting No.3 bracket bolt
1. Engine right mounting bracket	12. Engine left mounting No.1 bracket bolt	23. Yellow mark
2. Engine right mounting	13. Engine left mounting No.2 bracket bolt (short)	24. Vehicle forward
3. Engine left mounting No.1 bracket	14. Engine left mounting No.2 bracket bolt (long)	25. Engine rear mounting stiffener
4. Engine left mounting	15. Engine left mounting bracket nut	26. Engine rear mounting stiffener bolt
5. Engine left mounting No.2 bracket	16. Engine left mounting nut	(a) : 65 N·m (6.5 kg-m, 47.0 lb-ft)
6. Engine rear mounting	17. Engine rear mounting bolt	(b) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
7. Engine rear mounting No.1 bracket	18. Engine rear mounting No.1 bracket bolt	(c) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
8. Engine rear mounting No.2 bracket	19. Engine rear mounting bush bolt	(d) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
9. Engine right mounting nut	20. Engine rear mounting No.2 bracket bolt	

Engine Assembly Removal and Installation

S4RS0A1406013

Removal

1) Relieve fuel pressure according to “Fuel Pressure Relief Procedure: in Section 1G”.
2) Disconnect negative and positive cable at battery.
3) Remove battery and tray.
4) Remove engine hood after disconnecting windshield washer hose.
5) Remove right and left side engine under covers.
6) Remove A/C compressor belt by referring to “Compressor Drive Belt Removal and Installation: in Section 7B”.
7) Drain engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
8) Drain transaxle oil.
9) Drain coolant.
10) Remove cowl top plate referring to “Cowl Top Components: in Section 9K”.
11) Disconnect MAF sensor coupler (1).
12) Remove air cleaner case (2) and resonator (3).
13) Remove canister purge hose (4) from EVAP canister purge valve.



I3RM0A140022-

14) With hose connected, detach A/C compressor from its bracket (if equipped) referring to “Compressor Assembly Removal and Installation: in Section 7B”.

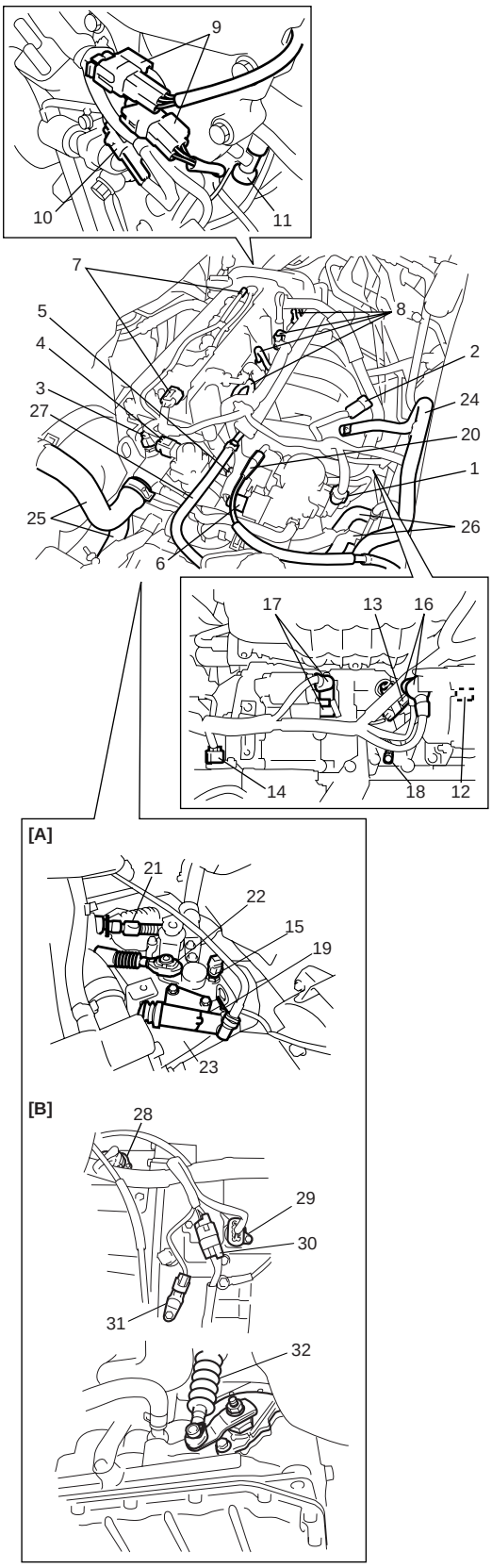
CAUTION:

Suspend removed A/C compressor at a place where no damage will be caused during removal and installation of engine assembly.

15) Disconnect the following electric wires:
    - TP sensor (1)
    - MAP sensor (2)
    - ECT sensor (3)
    - EGR valve (4)
    - CMP sensor (5)
    - IAC valve (6)
    - Ignition coil assembly (7)
    - Injectors (8)
    - Heated oxygen sensor (9)
    - Oil control valve (10)
    - Engine oil pressure switch (11)
    - CKP sensor (12)
    - Knock sensor (13)
    - VSS (14)
    - Back up light switch (15) (For M/T vehicle)
    - Generator (16)
    - Starting motor (17)
    - Ground terminal (18) from cylinder block
    - Battery ground cable (19) from transaxle
    - Output shaft speed sensor (VSS) (28) (For A/T vehicle)
    - Solenoid valve (29) (For A/T vehicle)
    - Transmission range sensor (30) (For A/T vehicle)
    - Input shaft speed sensor (31) (For A/T vehicle)
    - Magnet clutch switch of A/C compressor (if equipped)
    - Each wire harness clamps
16) Remove fuse box from its bracket.
17) Disconnect the following cables:
    - Accelerator cable (20)
    - Gear select control cable (21) (For M/T vehicle)
    - Gear shift control cable (22) (For M/T vehicle)
    - A/T select cable (32) (For A/T vehicle)
18) Disconnect the following hoses:
    - A/T fluid cooler hoses
    - Brake booster hose (24) from intake manifold
    - Radiator inlet and outlet hoses (25) from each pipe
    - Heater inlet and outlet hoses (26) from each pipe
    - Fuel feed hoses (27) from fuel feed pipe
19) With hose connected, detach clutch operating cylinder (23). (For M/T vehicle)

CAUTION:

Suspend removed clutch operating cylinder at a place where no damage will be caused during removal and installation of engine assembly.



I4RS0A140007-

[A]:	M/T vehicle
[B]:	A/T vehicle

20) Disconnect right and left drive shaft joints from differential gear referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”.

NOTE:

For engine and transaxle removal, it is not necessary to remove drive shafts from steering knuckle.

21) Remove exhaust No.1, No.2 and center pipes referring to “Exhaust Manifold Removal and Installation: in Section 1K”.

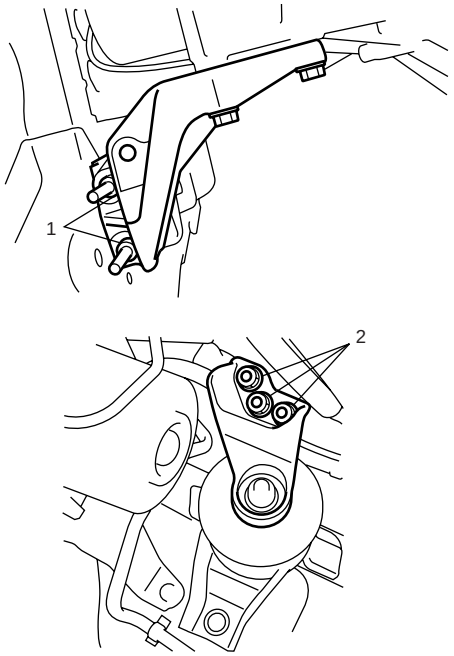
22) Support engine assemble by using supporting device referring to “Engine Supporting Points: in Section 0A”.

23) Remove suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B”.

24) Remove engine rear mounting from engine rear mounting No.1 bracket.

25) Support engine and transaxle with jack, and then remove supporting device.

26) Remove engine left mounting bracket nuts (1) and engine right mounting nuts (2).



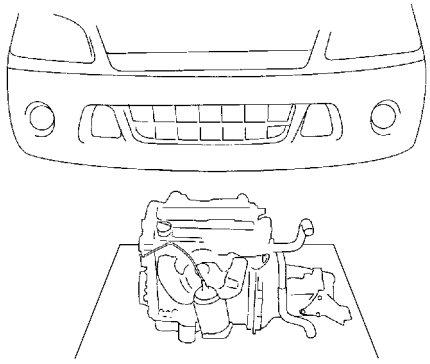
I4RS0A140008-

27) Before removing engine with transaxle from engine compartment, recheck to make sure all hoses, electric wires and cables are disconnected from engine and transaxle.

28) Lower engine with transaxle from engine compartment.

CAUTION:

Before lowering engine, to avoid damage to A/C compressor and clutch operating cylinder, make clearance by rising them. Be sure not to damage suspended A/C compressor and clutch operating cylinder.



I4RS0A140009-

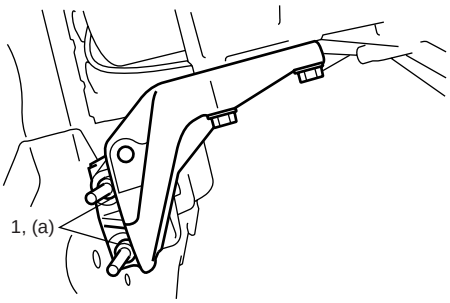
29) Disconnect transaxle from engine, referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B" or "Automatic Transaxle Unit Dismounting and Remounting: in Section 5A".

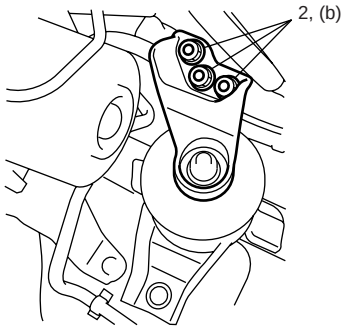
30) Remove clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation: in Section 5C".

Installation

1) Install clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation: in Section 5C".
2) Connect transaxle to engine referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B" or "Automatic Transaxle Unit Dismounting and Remounting: in Section 5A".
3) Lift engine and transaxle into engine compartment with jack.
4) Install engine left mounting bracket nuts (1) and engine right mounting nuts (2).
   Tighten these nuts to specified torque.

   Tightening torque
   Engine left mounting bracket nut (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
   Engine right mounting nut (b): 65 N·m (6.5 kg-m, 47.0 lb-ft)





I4RS0A140010-

5) Support engine assemble by using supporting device referring to "Engine Supporting Points: in Section 0A".
6) Install engine rear mounting to engine rear mounting No.1 bracket.

   Tightening torque
   Engine rear mounting bush bolt: 55 N·m (5.5 kg-m, 40.0 lb-ft)

7) Install suspension frame referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
8) Remove supporting device.
9) Install exhaust No.1, No.2 and center pipes referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".
10) Connect drive shaft joints referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
11) Reverse disconnected hoses, cables and electric wires for connection noting the followings.
    - Tighten nuts to specified torque.

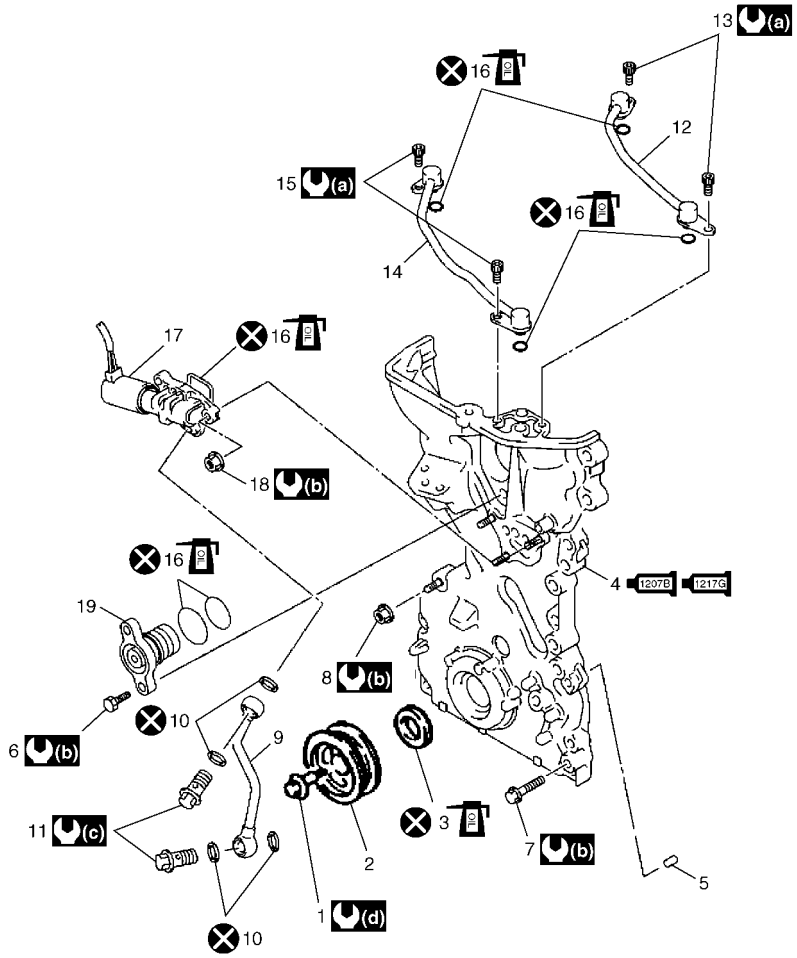
    Tightening torque
    Starting motor terminal nut: 11 N·m (1.1 kg-m, 8.0 lb-ft)
    Generator terminal nut: 6 N·m (0.6 kg-m, 4.5 lb-ft)

12) Install air cleaner case and resonator.
13) Install cowl top referring to "Cowl Top Components: in Section 9K".
14) Install A/C compressor to its bracket (if equipped) referring to "Compressor Assembly Removal and Installation: in Section 7B".

15) Adjust A/C compressor belt tension (if equipped) referring to “Compressor Drive Belt Inspection and Adjustment: in Section 7B”.
16) Adjust accelerator cable play referring to “Accelerator Cable Adjustment: ” in this section.
17) Check to ensure that all removed parts are back in place.
Reinstall any necessary parts which have not been reinstalled.
18) Refill cooling system with coolant referring to “Cooling System Flush and Refill: in Section 1F”.
19) Refill engine with engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
20) Refill transaxle with transaxle oil referring to “Manual Transaxle Oil Change: in Section 5B” or “A/T Fluid Change: in Section 5A”.
21) Install battery and tray.
22) Connect positive and negative cable at battery.
23) Verify that there is no fuel leakage, coolant leakage, oil leakage and exhaust gas leakage at each connection.

Timing Chain Cover Components

S4RS0A1406014



I4RS0A140011-

1. Crankshaft pulley bolt	9. Oil gallery pipe No.1	17. Oil control valve
2. Crankshaft pulley	10. Copper washer	18. Oil control valve mounting nut
3. Oil seal : Apply engine oil to oil seal lip.	11. Oil gallery pipe No.1 bolt	19. Cap
1207B 1217G 4. Timing chain cover : Apply sealant 99000-31140 to the mating surface of cylinder and cylinder head. : Apply sealant 99000-31260 to the mating surface of timing chain cover referring to the figure of Step 5) of “Installation” under “Timing Chain Cover Removal and Installation: ”.	12. Oil gallery pipe No.2	(a) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
5. Pin	13. Oil gallery pipe No.2 bolt	(b) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
6. Cap bolt	14. Oil gallery pipe No.3	(c) : 30 N·m (3.0 kg-m, 22.0 lb-ft)
7. Timing chain cover mounting bolts	15. Oil gallery pipe No.3 bolt	(d) : 150 N·m (15.0 kg-m, 108.5 lb-ft)
8. Timing chain cover mounting nut	16. O-ring : Apply engine oil.	: Do not reuse.

Timing Chain Cover Removal and Installation

S4RS0A1406015

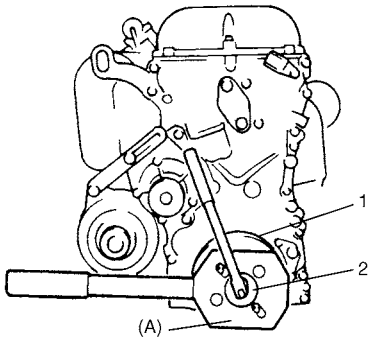
CAUTION:

- **Keep working table, tools and hands clean while overhauling.**
- **Use special care to handle aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Keep them always clean.**

Removal

1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation: ”.
2) Remove water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: in Section 1F”.
3) Remove crankshaft pulley bolt.
   To lock crankshaft pulley (1), use special tool with it as shown in the figure.

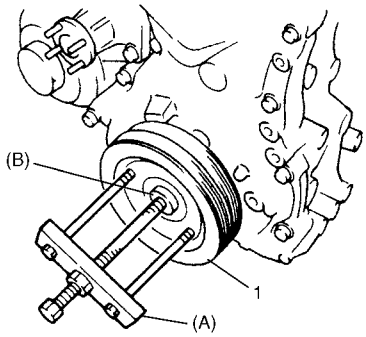
   Special tool
   (A): 09917–68221



I2RH0B140051-

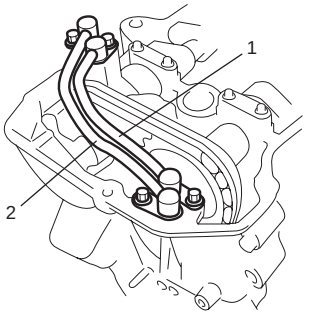
4) Remove crankshaft pulley (1).
   If it is hard to remove, use special tools as shown in the figure.

   Special tool
   (A): 09944–36011
   (B): 09926–58010



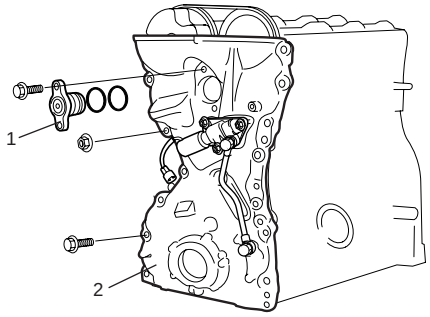
I2RH0B140052-

5) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
6) Remove oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E”.
7) Remove water pump pulley.
8) Remove A/C bracket from cylinder block.
9) Remove oil gallery pipes No.2 (1) and No.3 (2).



I3RH0B140021-

10) Remove cap (1) from timing chain cover (2).
11) Remove timing chain cover (2).



I3RH0B140022-

12) Remove oil control valve from timing chain cover referring to “Oil Control Valve Removal and Installation: ”.

Installation

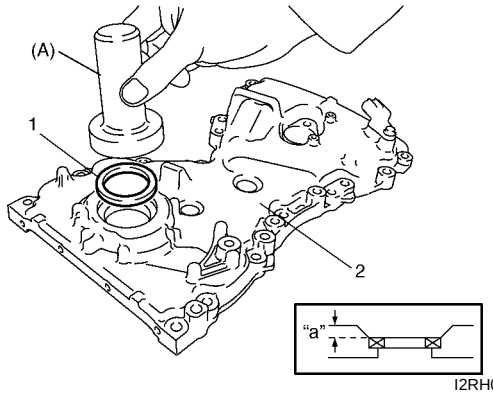
1) Clean sealing surface on timing chain cover, cylinder block and cylinder head.
   Remove oil, old sealant and dust from sealing surface.
2) Install oil seal (1) to timing chain cover, if removed.

   NOTE:

   When installing new oil seal, press fit to timing chain cover (2) by using special tool (bearing installer) as shown in the figure.

   Drive in dimension
   “a”: 1.5 mm (0.06 in.)

   Special tool
   (A): 09913–75810

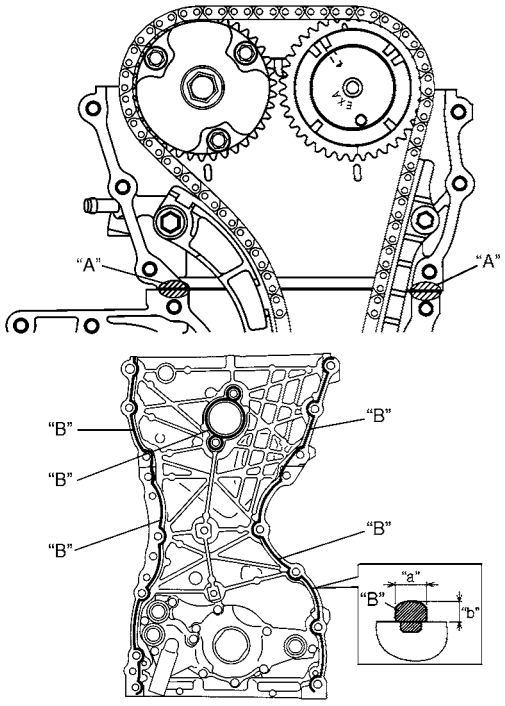


I2RH0B140058-

3) Install oil control valve to timing chain cover referring to “Oil Control Valve Removal and Installation: ”.
4) Apply sealant “A” to mating surface of cylinder and cylinder head and “B” to mating surface of timing chain cover as shown in the figure.

“A”: Sealant 99000–31140
“B”: Sealant 99000–31260

Sealant amount for timing chain cover
Width “a”: 3 mm (0.12 in.)
Height “b”: 2 mm (0.08 in.)



I3RH0B140025-

5) Apply engine oil to oil seal lip, then install timing chain cover (1). Tighten bolts and nut to specified torque.

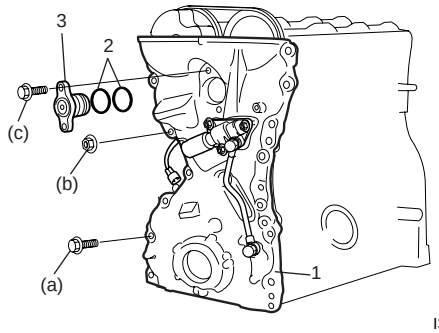
NOTE:

Before installing timing chain cover, check that pin is securely fitted.

Tightening torque
Timing chain cover bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
Timing chain cover nut (b): 25 N·m (2.5 kg-m, 18.0 lb-ft)

6) Apply engine oil to new O-rings (2) and install them to cap (3).
7) Install cap (3) to timing chain cover (1). Tighten bolts to specified torque.

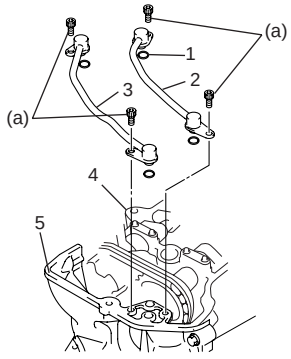
Tightening torque
Cap bolt (c): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I3RH0B140026-

8) Install new O-ring (1) to oil gallery pipes No.2 (2) and No.3 (3).
9) Install oil gallery pipes No.2 and No.3 to cylinder head (4) and timing chain cover (5). Tighten bolts to specified torque.

Tightening torque
Oil gallery pipe No.2 and No.3 bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



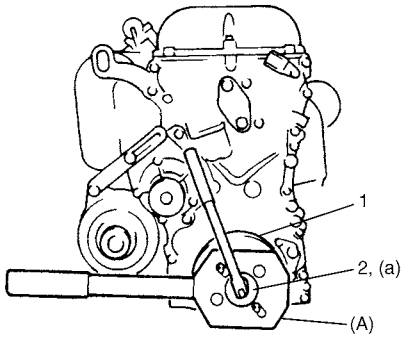
I3RH0B140027-

10) Install water pump pulley.
11) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
12) Install oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E”.

13) Install crankshaft pulley (1). Tighten bolt (2) to specified torque. To lock crankshaft pulley, use special tool with it as shown in the figure.

Special tool
(A): 09917–68221

Tightening torque
Crankshaft pulley bolt (a): 150 N·m (15.0 kg-m, 108.5 lb-ft)



I2RH0B140056-

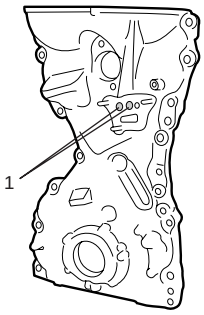
14) Install engine assembly to vehicle referring to "Engine Assembly Removal and Installation: ".

Timing Chain Cover Inspection

S4RS0A1406016

Oil Seal
Check oil seal lip for fault or other damage. Replace as necessary.

Timing Chain Cover
Inspect strainer (1) of oil passage for driving intake cam timing sprocket assembly (VVT actuator).
If clog or foreign matter exists, clean strainer.



I3RH0B140028-

Oil Control Valve Removal and Installation

S4RS0A1406043

Removal
Remove oil gallery pipe No.1 (1) and oil control valve (2) from timing chain cover (3).

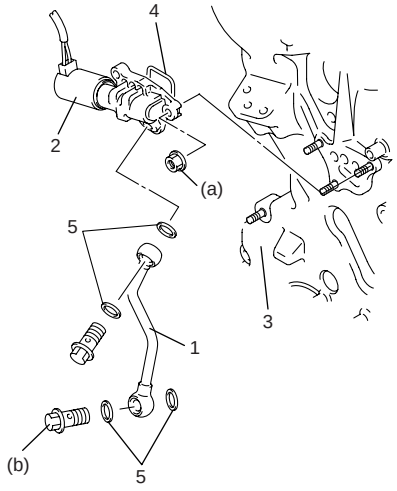
Installation

1) Install new O-ring (4) to oil control valve.
2) Install oil control valve to timing chain cover.
Tighten nuts to specification.

Tightening torque
Oil control valve mounting nut (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

3) Install oil gallery pipe No.1 with new copper washers (5) to timing chain cover.
Tighten bolts to specification.

Tightening torque
Oil gallery pipe No.1 bolt (b): 30 N·m (3.0 kg-m, 21.5 lb-ft)



I3RM0A140027-

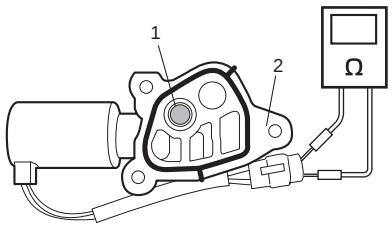
Oil Control Valve Inspection

S4RS0A1406044

Oil Control Valve

1) Inspect strainer (1) and mating surface (2) of oil control valve for clog or damage. Clean oil control valve if clog or foreign matter is present on strainer or mating surface of oil control valve.
   Replace oil control valve if its mating surface is damaged.
2) Check resistance between terminals of oil control valve.

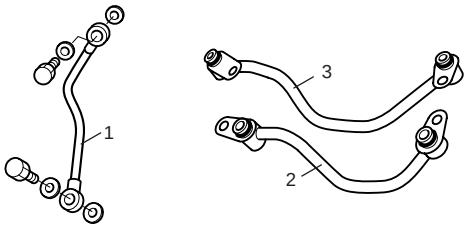
   Oil control valve resistance
   6.7 – 7.7 Ω (at 20 °C (68 °F))



I3RM0A140028-

Oil Gallery Pipe

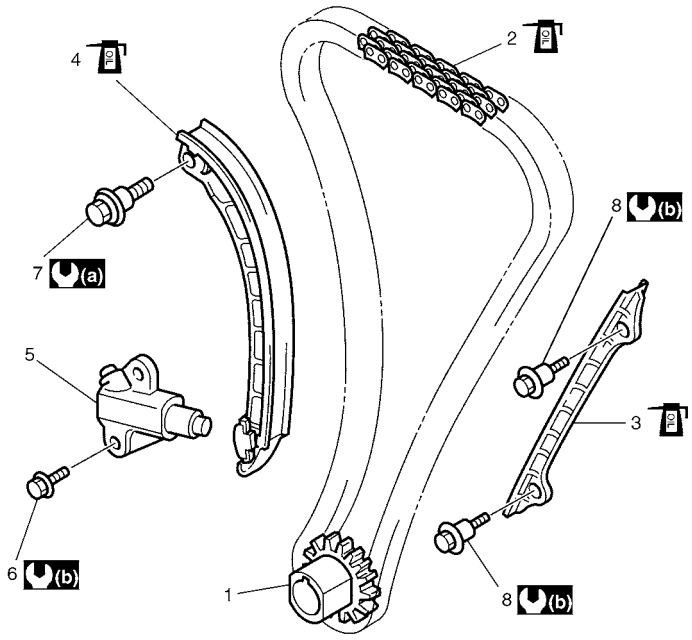
Inspect oil gallery pipes No.1, No.2 (2) and No.3 (3). Replace if crack, deformation or clog exists.



I3RH0B140030-

Timing Chain and Chain Tensioner Components

S4RS0A1406017



I4RS0A140012-

1. Crankshaft timing sprocket	5. Timing chain tensioner adjuster assembly	(a) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
2. Timing chain : Apply engine oil.	6. Chain tensioner adjuster mounting bolt	(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
3. Timing chain No.1 guide : Apply engine oil to sliding surface.	7. Timing chain tensioner bolt	
4. Timing chain tensioner : Apply engine oil to sliding surface.	8. Timing chain No.1 guide bolt	

Timing Chain and Chain Tensioner Removal and Installation

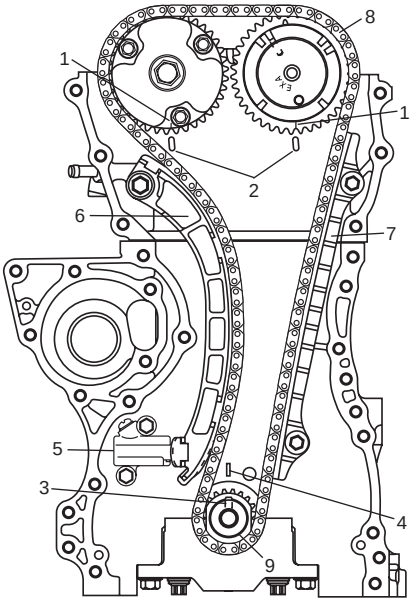
S4RS0A1406018

Removal

CAUTION:

After timing chain is removed, never turn crankshaft and camshafts independently more than its allowable turning range described in “Installation”.
If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

1) Remove timing chain cover referring to “Timing Chain Cover Removal and Installation: ”.
2) By turning crankshaft, align both intake and exhaust camshaft timing sprocket marks (1) with notches (2) of cylinder head respectively and align crankshaft sprocket key (3) with notch of cylinder block (4).
3) Remove timing chain tensioner adjuster assembly (5).
4) Remove timing chain tensioner (6).
5) Remove timing chain No.1 guide (7).
6) Remove timing chain (8) with crankshaft timing sprocket (9).



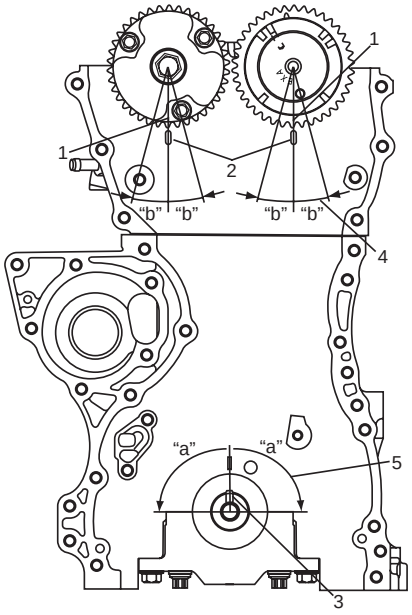
I3RH0B140032-

Installation

CAUTION:

After timing chain is removed, never turn crankshaft and camshafts independently more than such an extent (“a”, “b”) as shown in the figure.
If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

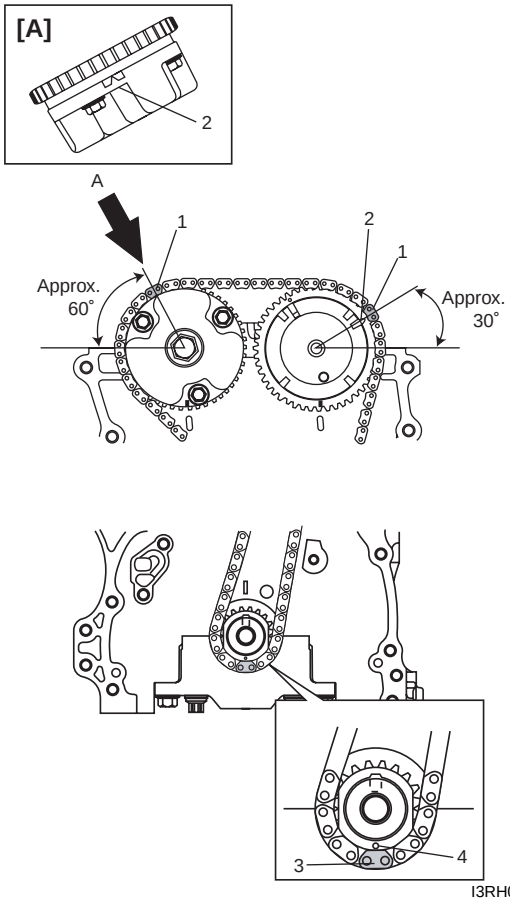
1) Check that match marks (1) on intake and exhaust camshaft timing sprockets are in match with notches (2) on cylinder head as shown in the figure.
2) Set key (3) and turn crankshaft to position key on upside of crankshaft.



I4RS0A140021-

“a”: 90°	4. Camshaft (IN and EX) allowable turning range. By marks on camshaft timing sprocket within 15° from notches on cylinder head on both right and left.
“b”: 15°	5. Crankshaft allowable turning range. By key on crankshaft, within 90° from top on both right and left.

3) Install timing chain by aligning dark blue plate (1) of timing chain and triangle mark (2) on camshaft timing sprocket as shown in the figure.
4) Fit crankshaft timing sprocket to timing chain by aligning gold plate (3) of timing chain and circle mark (4) on crankshaft timing sprocket. Then install crankshaft timing sprocket fitted with chain to crankshaft.

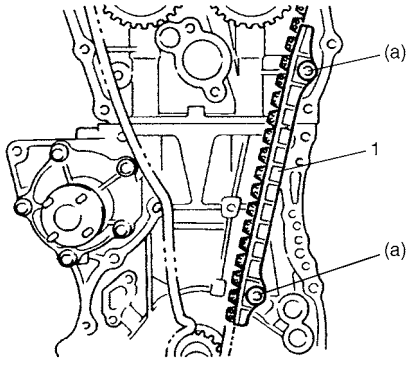


I3RH0B140034-

[A]: View A

5) Apply engine oil to sliding surface of timing chain No.1 guide (1) and install it as shown in the figure. Tighten guide bolts to specified torque.

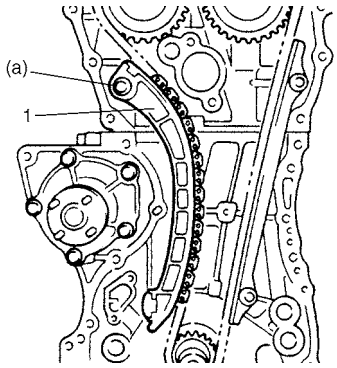
Tightening torque
Timing chain No.1 guide bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B140062-

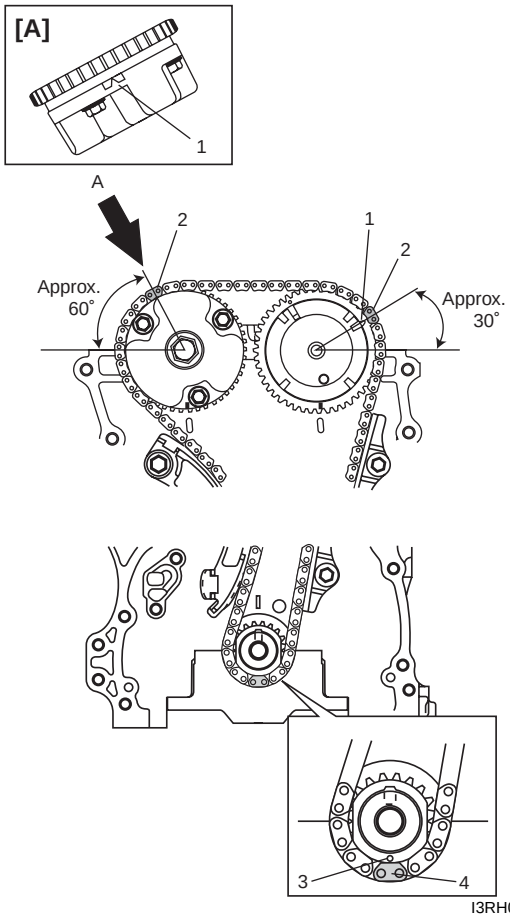
6) Apply engine oil to sliding surface of chain tensioner (1) and install chain tensioner and spacer. Tighten tensioner bolt to specified torque.

Tightening torque
Timing chain tensioner bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I2RH0B140063-

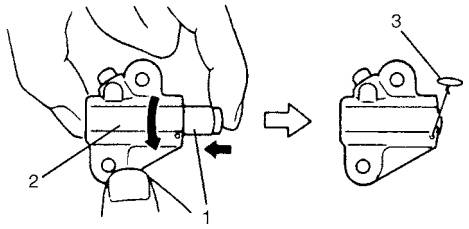
7) Check that match marks (1) on intake and exhaust camshaft timing sprockets are in match with dark blue plates (2) of timing chain and match mark (3) on crankshaft timing sprocket is in match with gold plate (4) of timing chain.



I3RH0B140035-

[A]: View A

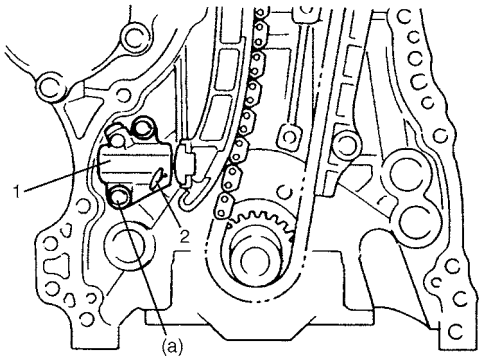
8) Screw in plunger (1) by turning body (2) in arrow direction and install a retainer (3) (wire) to hold plunger in place.



I2RH0B140065-

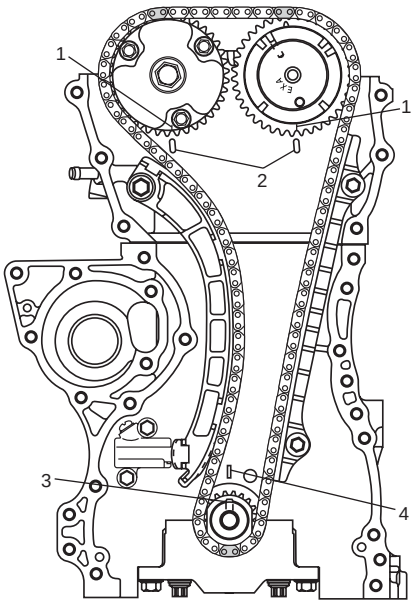
9) Install timing chain tensioner adjuster assembly (1) with a retainer (2).
Tighten adjuster bolts to specified torque and then remove a retainer from chain tensioner adjuster assembly.

Tightening torque
Timing chain tensioner adjuster bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B140066-

10) Apply engine oil to timing chain and then turn crankshaft clockwise by 2 revolutions and check that match marks (1) on intake and exhaust camshaft timing sprockets are in match with notches (2) on cylinder head and key (3) is in match with notch (4) on cylinder black as shown in the figure.
If each marking chain and each match mark are no matches, adjust each sprockets and timing chain.



I3RH0B140036-

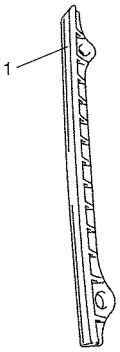
11) Install timing chain cover referring to “Timing Chain Cover Removal and Installation: ”.

12) Perform Steps 3) to 8) of “Installation” of “Timing Chain Cover Removal and Installation: ”.

Timing Chain and Chain Tensioner Inspection

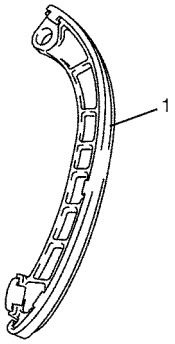
S4RS0A1406019

Timing Chain No.1 Guide
Check shoe (1) for wear or damage.



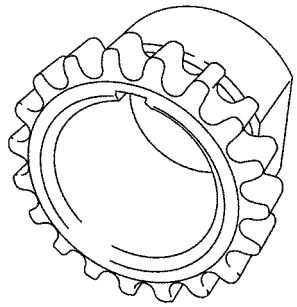
I2RH0B140068-

Timing Chain Tensioner
Check shoe (1) for wear or damage.



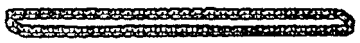
I2RH0B140069-

Crankshaft Timing Sprocket
Check teeth of sprocket for wear or damage.



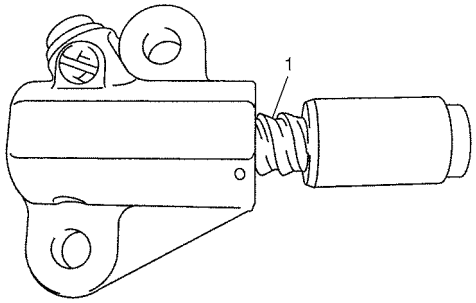
I2RH0B140070-

Timing Chain
Check timing chain for wear or damage.



I2RH01140077-

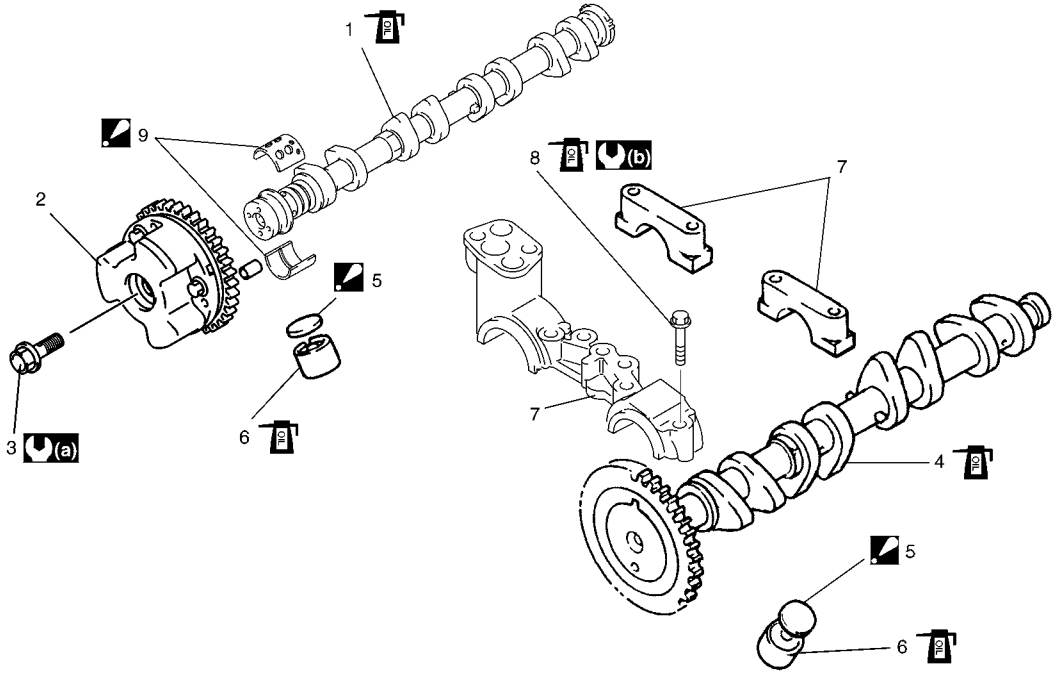
Timing Chain Tensioner Adjuster
Check that tooth surface (1) are free from damage.



I2RH0B140071-

Camshaft, Tappet and Shim Components

S4RS0A1406020



I4RS0A140013-

1. Intake camshaft	5. Shim : Shim No. on it faces tappet side.	9. Upper camshaft bearing : Install a bearing half with some holes to upper side of intake camshaft No.1 bearing.
2. Intake camshaft sprocket assembly	6. Tappet	(a) : 60 N·m (6.0 kg-m, 43.5 lb-ft)
3. Intake camshaft sprocket bolt	7. Camshaft housing	(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
4. Exhaust camshaft	8. Camshaft housing bolt	: Apply engine oil to sliding surface of each part.

Camshaft, Tappet and Shim Removal and Installation

S4RS0A1406021

CAUTION:

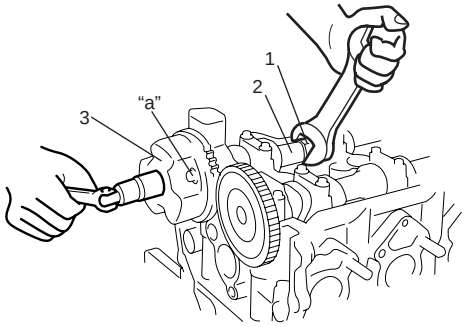
- **Keep working table, tools and hands clean while overhauling.**
- **Use special care to handle aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Keep them always clean.**

Removal

1) Remove timing chain cover referring to “Timing Chain Cover Removal and Installation: ”.
2) Remove timing chain referring to “Timing Chain and Chain Tensioner Removal and Installation: ”.
3) With hexagonal section (1) of intake camshaft (2) held stationary with spanner or the like, loosen mounting bolt of intake cam timing sprocket assembly (3) and remove it.

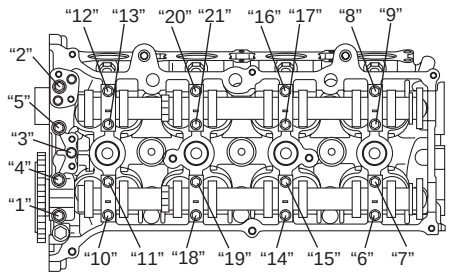
CAUTION:

Never attempt to loosen mounting bolt with intake cam timing sprocket assembly held stationary. Failure to follow this could result in damage to lock pin.
Do not loosen bolt “a” because intake cam timing sprocket assembly is not serviceable.



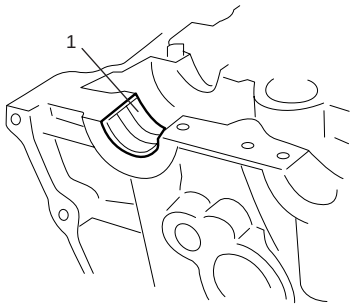
I3RM0A140030-

4) Loosen camshaft housing bolts in such order as indicated in the figure and remove them.



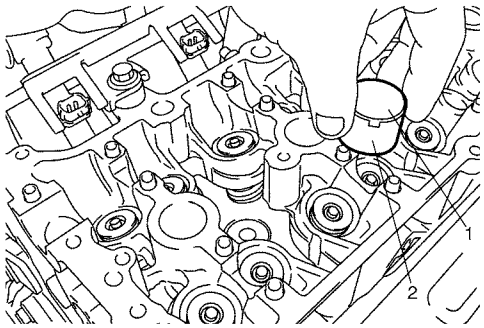
I3RM0A140031-

5) Remove camshaft housings.
6) Remove intake and exhaust camshafts.
7) Remove camshaft bearing (1).



I3RH0B140039-

8) Remove tappets (2) with shims (1).



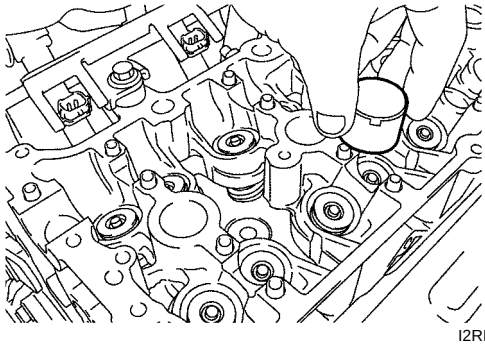
I2RH0B140074-

Installation

1) Install tappets and shims to cylinder head.
Apply engine oil around tappet and then install it to cylinder head.

NOTE:

When installing shim, make sure to direct shim No. side toward tappet.

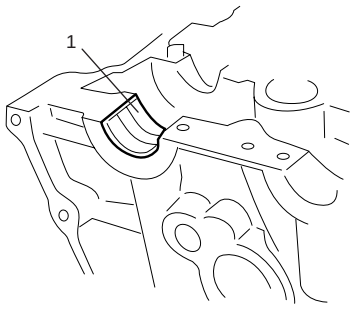


I2RH0B140075-

2) Install camshaft bearing (1) to cylinder head.

CAUTION:

Do not apply engine oil to camshaft bearing back.
Only a upper half bearing of intake camshaft bearing No.1 has some holes. Other bearings.

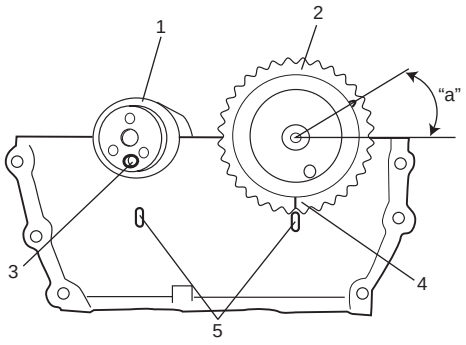


I3RH0B140039-

3) Install intake camshaft (1) and exhaust camshaft (2). Align knock pin (3) and match mark (4) with notches (5) as shown in the figure.

NOTE:

Before installing camshafts, turn crankshaft until key position faces upward.
Refer to "Timing Chain and Chain Tensioner Removal and Installation: ".

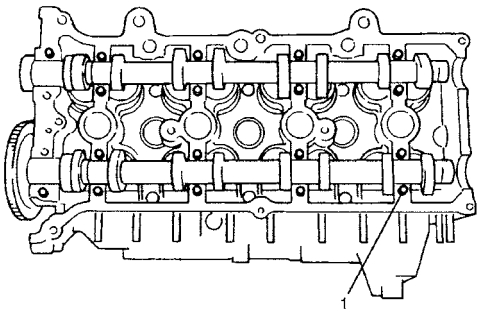


I4RS0A140014-

"a": Approx. 30°

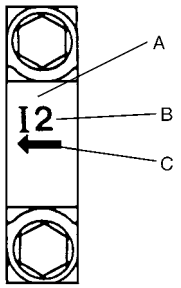
4) Apply engine oil to sliding surface of each camshaft and camshaft journal then install them as shown in the figure.

5) Install camshaft housing pins (1) as shown in the figure.



I3RM0A140033-

6) Check position of camshaft housings.
Embossed marks are provided on each camshaft housing, indicating position and direction for installation. Install housings as indicated by these marks.

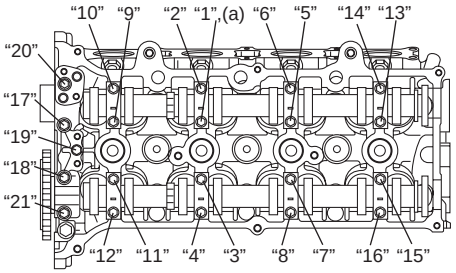


I2RH0B140078-

A: I: Intake side or E: Exhaust side
B: Position from timing chain side
C: Pointing to timing chain side

7) After applying engine oil to housing bolts, tighten them temporarily first. Then tighten them by the numerical order in the figure. Tighten a little at a time and evenly among bolts and repeat tightening sequence two or three times before they are tightened to specified torque.

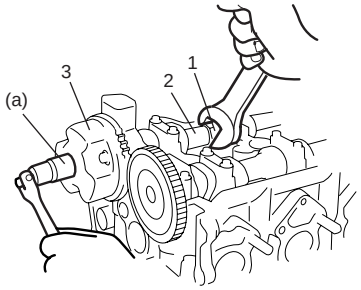
Tightening torque
Camshaft housing bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I3RH0B140041-

8) With hexagonal section (1) of intake camshaft (2) held stationary with spanner or the like, tighten bolt of intake cam timing sprocket assembly (3) to specification.

Tightening torque
Intake cam timing sprocket bolt (a): 60 N·m (6.0 kg-m, 43.5 lb-ft)



I3RH0B140042-

9) Install timing chain with crankshaft sprocket referring to "Timing Chain and Chain Tensioner Removal and Installation: ".

10) Install timing chain cover referring to "Timing Chain Cover Removal and Installation: ".

11) Check valve lashes referring to "Valve Lash (Clearance) Inspection: ".

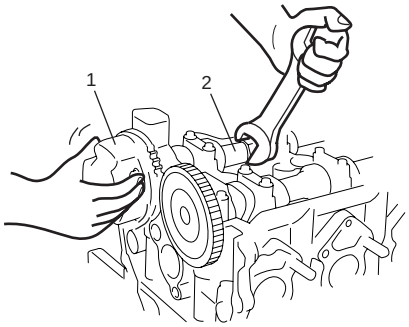
12) Perform Steps 3) to 8) of “Installation” of “Timing Chain Cover Removal and Installation: ”.

Camshaft, Tappet and Shim Inspection

S4RS0A1406022

Intake Cam Timing Sprocket Assembly

Fit intake cam timing sprocket assembly to camshaft (2) and hold hexagonal section of camshaft by using spanner or the like.
Check if sprocket (1) is not turned by hand.
If moved, replace intake cam timing sprocket assembly.



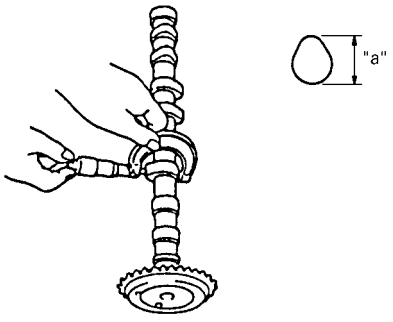
I3RH0B140043-

Cam Wear

Using a micrometer, measure cam height “a”. If measured height underruns its limit, replace camshaft.

Cam height “a”

Cam height	Standard	Limit
Intake cam	44.929 – 45.089 mm (1.769 – 1.775 in.)	44.80 mm (1.764 in.)
Exhaust cam	44.399 – 44.559 mm (1.748 – 1.754 in.)	44.28 mm (1.743 in.)

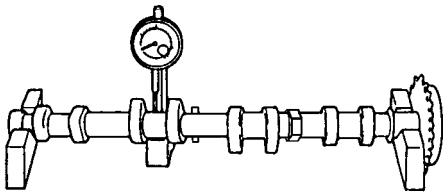


I2RH0B140080-

Camshaft Runout

Set camshaft between two “V” blocks, and measure its runout by using a dial gauge.
If measured runout exceeds limit, replace camshaft.

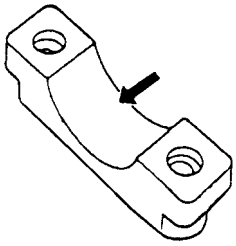
Camshaft runout limit
0.10 mm (0.0039 in.)



I2RH0B140081-

Camshaft Journal Wear

Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.
If any malcondition is found, replace camshaft or cylinder head with housing. Never replace cylinder head without replacing housings.



I2RH0B140082-

Check clearance by using gauging plastic. Checking procedure is as follows.

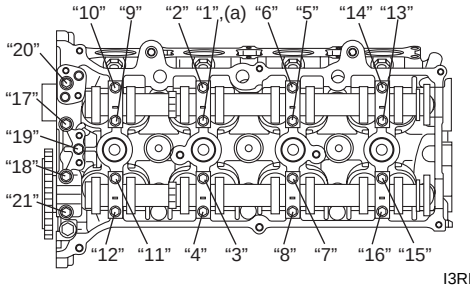
1) Clean housings and camshaft journals.
2) Remove all tappets with shims.
3) Install camshafts to cylinder head.
4) Place a piece of gauging plastic to full width of journal of camshaft (parallel to camshaft).
5) Install camshaft housing.

6) Tighten camshaft housing bolts in such order as indicated in the figure a little at a time till they are tightened to specified torque.

NOTE:

Do not rotate camshaft while gauging plastic is installed.

Tightening torque
Camshaft housing bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

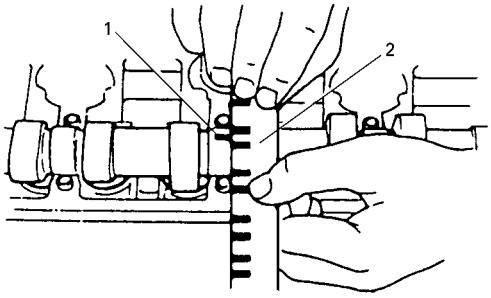


I3RH0B140041-

7) Remove housing, and using scale (2) on gauging plastic envelop, measure gauging plastic (1) width at its widest point.

Camshaft journal clearance

	Standard	Limit
Intake side No.1 housing	0.020 – 0.072 mm (0.0008 – 0.0028 in.)	0.10 mm (0.0039 in.)
Others	0.045 – 0.087 mm (0.0018 – 0.0034 in.)	0.12 mm (0.0047 in.)



I2RH0B140083-

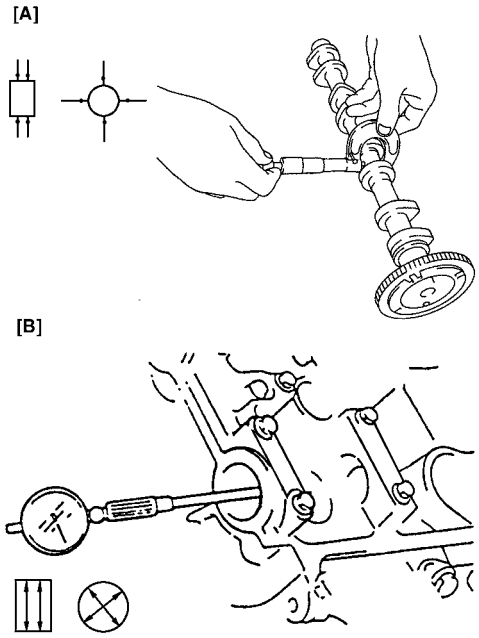
If measured camshaft journal clearance exceeds limit, measure journal (housing) bore and outside diameter of camshaft journal. Replace camshaft or cylinder head assembly whichever the difference from specification is greater.

Camshaft journal diameter [A]

Item	Standard
Intake side No.1 housing	26.940 – 26.955 mm (1.0606 – 1.0612 in.)
Exhaust side No.1 housing	26.934 – 26.955 mm (1.0604 – 1.0612 in.)
Others	22.934 – 22.955 mm (0.9029 – 0.9037 in.)

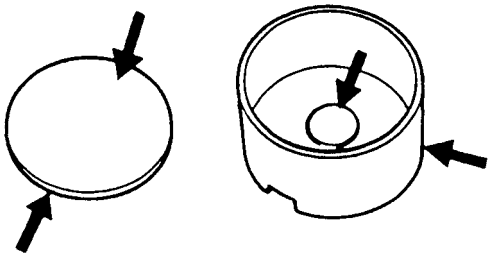
Camshaft journal bearing bore [B]

Item	Standard
Intake side No.1 housing	—
Exhaust side No.1 housing	27.000 – 27.021 mm (1.0630 – 1.0638 in.)
Others	23.000 – 23.021 mm (0.9055 – 0.9063 in.)



I2RH0B140084-

Wear of Tappet and Shim
Check tappet and shim for pitting, scratches, or damage. If any malcondition is found, replace.



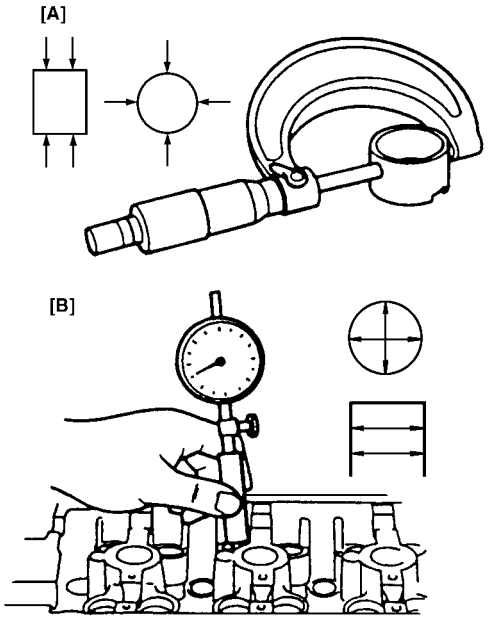
I2RH0B140085-

Measure cylinder head bore and tappet outside diameter to determine cylinder head-to-tappet clearance. If clearance exceeds limit, replace tappet or cylinder head.

Cylinder head to tappet clearance
Standard: 0.025 – 0.066 mm (0.0010 – 0.026 in.)
Limit: 0.15 mm (0.0059 in.)

Tappet outside diameter [A]
Standard: 30.959 – 30.975 mm (1.2189 – 1.2195 in.)

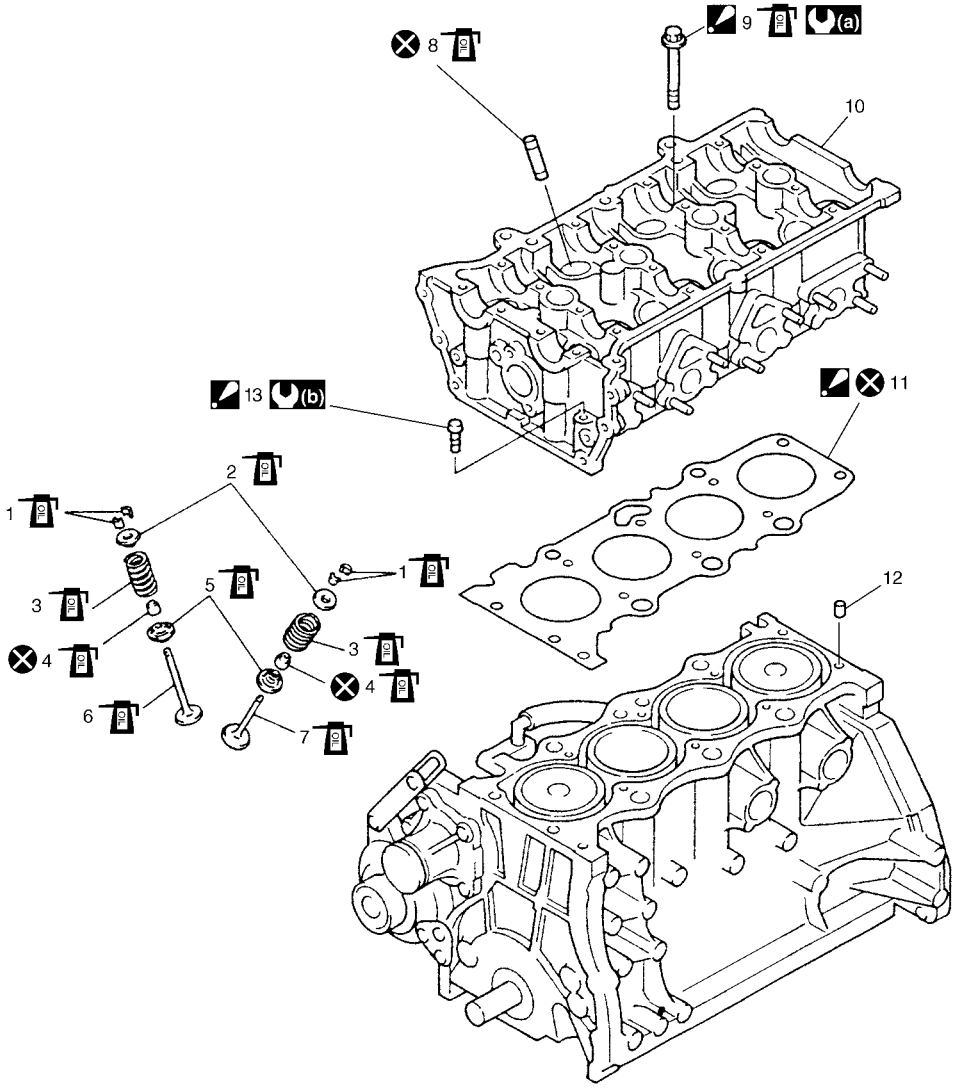
Cylinder head tappet bore [B]
Standard: 31.000 – 31.025 mm (1.2205 – 1.2215 in.)



I2RH0B140086-

Valves and Cylinder Head Components

S4RS0A1406023



I4RS0A140015-

1. Valve cotters	7. Exhaust valve	13. Cylinder head bolt (M8) : Be sure to tighten cylinder head bolt (M8) after securing the other cylinder head bolt (M10).
2. Valve spring retainer	8. Valve guide	(a) : Tighten 20 N·m (2.0 kg-m, 14.5 lb-ft), 40 N·m (4.0 kg-m, 29.0 lb-ft), 60° and 60° by the specified procedure.
3. Valve spring	9. Cylinder head bolt (M10) : Never reuse cylinder head bolts once disassembled it due to plastic deformation tightening. Be sure to use new cylinder head bolts when installing.	(b) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
4. Valve stem seal	10. Cylinder head	: Do not reuse.
5. Valve spring seat	11. Cylinder head gasket : "TOP" mark provided on gasket comes to crankshaft pulley side, facing up.	: Apply engine oil to sliding surface of each part.
6. Intake valve	12. Knock pin	

Valves and Cylinder Head Removal and Installation

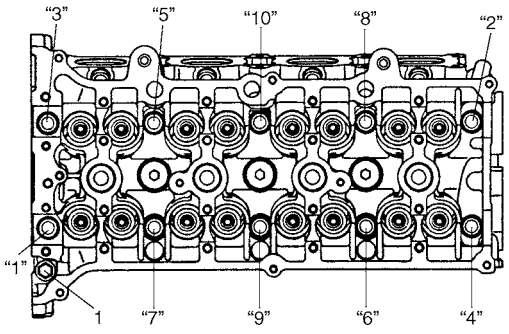
S4RS0A1406024

Removal

1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation: ”.
2) Remove oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E”.
3) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: ”.
4) Remove timing chain cover referring to Steps 2) to 7) of “Removal” in “Timing Chain Cover Removal and Installation: ”.
5) Remove timing chain referring to Steps 2) to 6) of “Removal” in “Timing Chain and Chain Tensioner Removal and Installation: ”.
6) Remove intake and exhaust camshafts referring to Steps 3) to 7) of “Removal” in “Camshaft, Tappet and Shim Removal and Installation: ”.
7) Loosen cylinder head bolts in such order as indicated in the figure by using a 12 corner socket wrenches and remove them.

NOTE:

- **Don’t forget to remove bolt (M8) (1) as shown in the figure.**
- **Never reuse cylinder head bolts once disassembled it due to plastic deformation tightening. Be sure to use new cylinder head bolts when installing.**

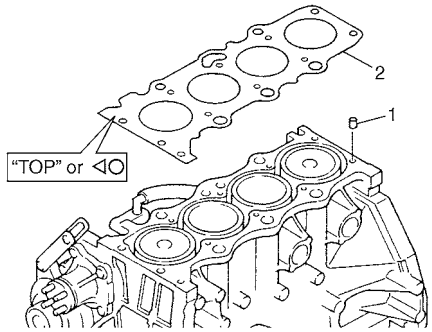


I2RH0B140088-

8) Check all around cylinder head for any other parts required to be removed or disconnected and remove or disconnect whatever necessary.
9) Remove exhaust manifold, if necessary referring to “Exhaust Manifold Removal and Installation: in Section 1K”.
10) Remove cylinder head with intake manifold and exhaust manifold. Use lifting device, if necessary.

Installation

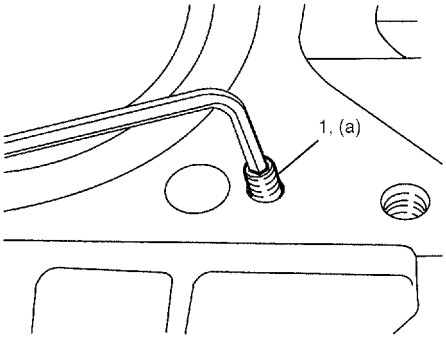
1) Clean mating surface of cylinder head and cylinder block. Remove oil, old gasket and dust from mating surface.
2) Install knock pins (1) to cylinder block.
3) Install new cylinder head gasket (2) to cylinder block. “Top” mark or “Triangle/circle” provided on gasket comes to crankshaft pulley side, facing up (toward cylinder head side).



I4RS0B140018-

4) Make sure that oil jet (venturi plug) (1) is not clogged. If it is not installed, install it as specified torque.

Tightening torque
Venturi plug (a): 5 N·m (0.5 kg-m, 3.5 lb-ft)



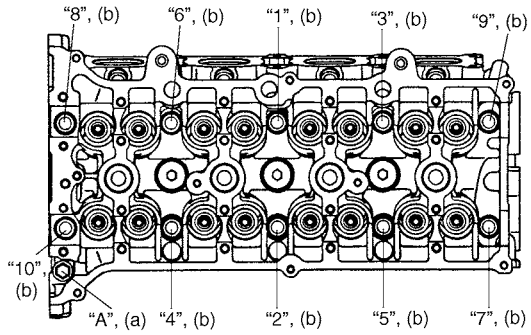
I2RH0B140089-

5) Install cylinder head to cylinder block.
Apply engine oil to new cylinder head bolts and tighten them gradually as follows.
   a) Tighten cylinder head bolts (“1” – “10”) to 20 N·m (2.0 kg-m, 14.5 lb-ft) according to numerical order as shown by using a 12 corner socket wrenches.
   b) In the same manner as in Step a), tighten them to 40 N·m (4.0 kg-m, 29.0 lb-ft).
   c) Turn all bolts 60° according to numerical order in the figure.
   d) Repeat Step c).
   e) Tighten bolt “A” to specified torque.

NOTE:

Be sure to tighten M8 bolt "A" after securing the other bolts.

Tightening torque
Cylinder head bolt for M8 (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
Cylinder head bolt for M10 (b): 20 N·m (2.0 kg-m, 14.5 lb-ft), 40 N·m (4.0 kg-m, 29.0 lb-ft) and then retighten by turning through to 60° twice



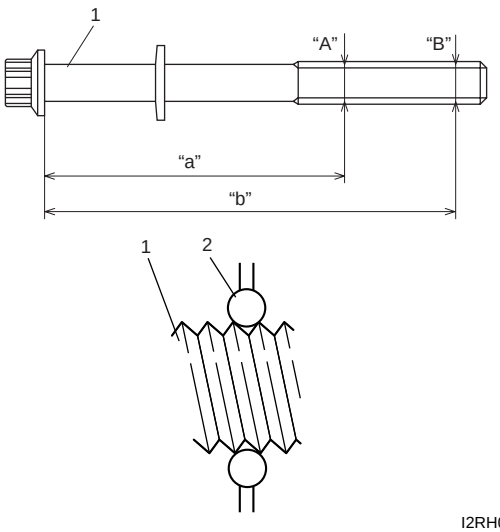
I2RH0B140091-

NOTE:

- **If they are reused, check thread diameters of cylinder head bolt (1) for deformation according to the follows and replace them with new ones if thread diameter difference exceeds limit.**
- **Measure each thread diameter of cylinder head bolt (1) at "A" on 83.5 mm (2.81 in.) from seat side of flange bolt and "B" on 115 mm (4.53 in.) from seat side of flange bolt by using a micrometer (2).**
  Then calculate difference in diameters ("A" – "B"). If it exceeds limit, replace with new one.

Cylinder head bolt diameter measurement points
"a": 83.5 mm (2.81 in.)
"b": 115 mm (4.53 in.)

Cylinder head bolt diameter difference (deformation)
Limit ("A" – "B"): 0.1 mm (0.004 in.)



I2RH0B140092-

6) Install camshafts, tappet and shim referring to "Camshaft, Tappet and Shim Removal and Installation: ".
7) Install timing chain referring to "Timing Chain and Chain Tensioner Removal and Installation: ".
8) Install timing chain cover referring to "Timing Chain Cover Removal and Installation: ".
9) Install cylinder head cover referring to "Cylinder Head Cover Removal and Installation: ".
10) Install oil pan referring to "Oil Pan and Oil Pump Strainer Removal and Installation: in Section 1E".

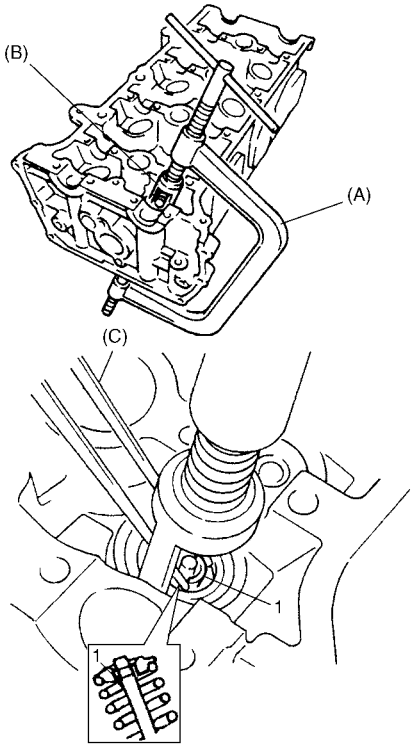
Valves and Cylinder Head Disassembly and Assembly

S4RS0A1406025

Disassembly

1) For ease in servicing cylinder head, remove intake manifold, injectors, exhaust manifold from cylinder head.
2) Using special tools (Valve lifter), compress valve spring and then remove valve cotters (1) also by using special tool (Forceps).

Special tool
(A): 09916–14510
(B): 09916–14521
(C): 09916–84511

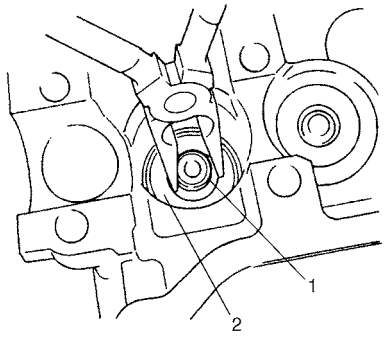


I2RH0B140093-

3) Release special tools (Valve lifter), and remove spring retainer and valve spring.
4) Remove valve from combustion chamber side.
5) Remove valve stem seal (1) from valve guide and valve spring seat (2).

NOTE:

Do not reuse valve stem seal once disassembled. Be sure to use new seal when assembling.



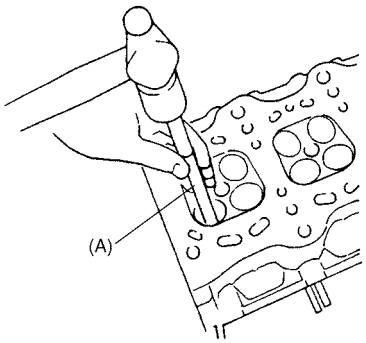
I2RH0B140094-

6) Using special tool (Valve guide remover), drive valve guide out from combustion chamber side to valve spring side.

Special tool
(A): 09916–44910

NOTE:

Do not reuse valve guide once disassembled. Be sure to use new valve guide (oversize) when assembling.



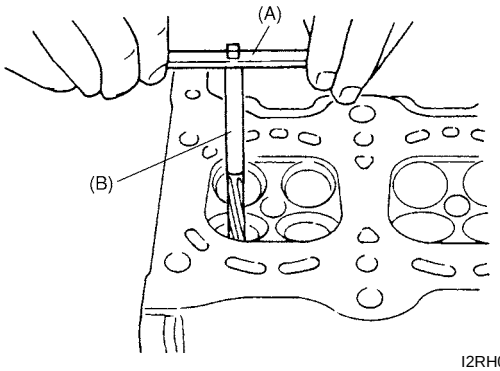
I2RH0B140095-

7) Place disassembled parts except valve stem seal and valve guide in order so that they can be installed in their original position.

Assembly

1) Before installing valve guide into cylinder head, ream guide hole with special tool (10.5 mm reamer) so as to remove burrs and make it truly round.

Special tool
(A): 09916–34542
(B): 09916–37320



I2RH0B140096-

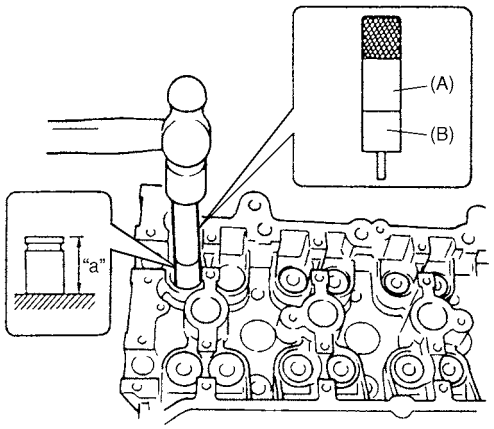
2) Install valve guide to cylinder head.
Heat cylinder head uniformly at a temperature of 80 to 100 °C (176 to 212 °F) so that head will not be distorted, and drive new valve guide into hole with special tools.
Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head.
After installing, make sure that valve guide protrudes by specified dimension “a” from cylinder head.

Special tool
(A): 09916–58210
(B): 09916–56011

NOTE:

- **Never reuse valve guide once disassembled. Make sure to install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

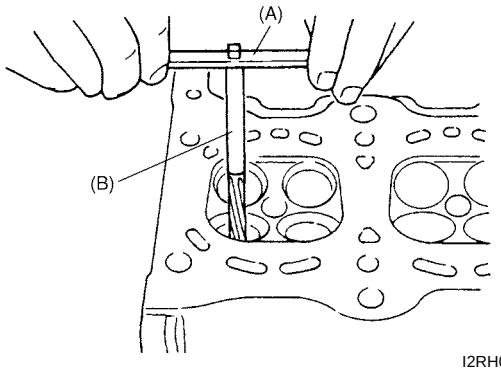
Valve guide protrusion (In and Ex)
“a”: 11.3 mm (0.44 in.)



I2RH0B140097-

3) Ream valve guide bore with special tool (5.5 mm reamer). After reaming, clean bore.

Special tool
(A): 09916–34542
(B): 09916–34550



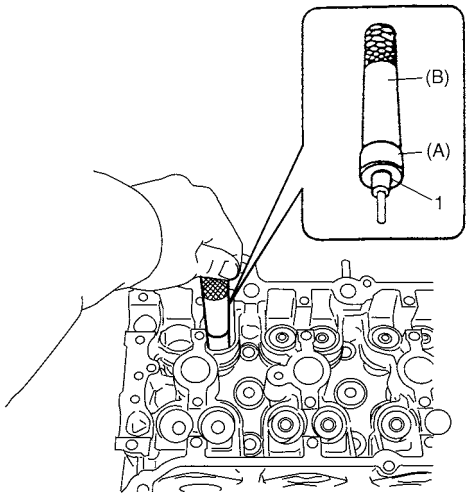
I2RH0B140096-

4) Install valve spring seat to cylinder head.
5) Install new valve stem seal (1) to valve guide.
After applying engine oil to seal and spindle of special tool (Valve guide installer handle), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand.
After installing, check to be sure that seal is properly fixed to valve guide.

Special tool
(A): 09917–98221
(B): 09916–58210

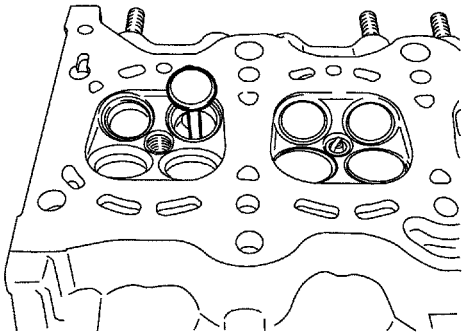
NOTE:

- **Do not reuse seal once disassembled. Be sure to install new seal.**
- **When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool by hand. Tapping or hitting special tool may cause damage to seal.**



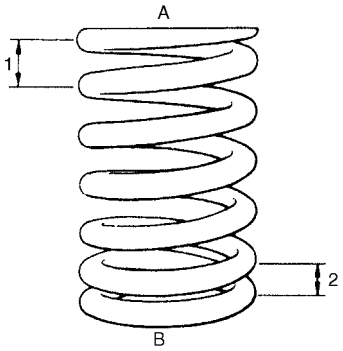
I2RH0B140098-

6) Install valve to valve guide.
Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore and valve stem.



I2RH0B140099-

7) Install valve spring and spring retainer.
Each valve spring has top end (large-pitch end (1)) and bottom end (small-pitch end (2)). Be sure to position spring in place with its bottom end (small-pitch end) facing the bottom (valve spring seat side).



I2RH0B140100-

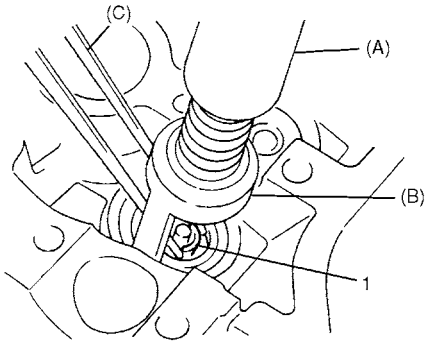
A:	Valve spring retainer side
B:	Valve spring seat side

8) Using special tools (Valve lifter), compress valve spring and fit two valve cotters (1) into groove in valve stem.

NOTE:

When compressing the valve spring, be carefully to free from damage in inside face of tappet installing hole.

Special tool
(A): 09916–14510
(B): 09916–14521
(C): 09916–84511



I2RH0B140101-

9) Install intake manifold referring to “Intake Manifold Removal and Installation: ”.
10) Install fuel injectors referring to “Fuel Injector Removal and Installation: in Section 1G”.
11) Install exhaust manifold referring to “Exhaust Manifold Removal and Installation: in Section 1K”.

Valves and Valve Guides Inspection

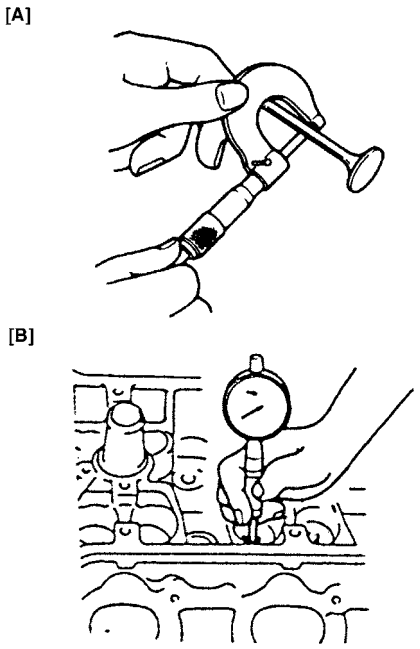
S4RS0A1406026

Valve Guide

Valve stem-to-guide clearance
Using a micrometer and bore gauge, take diameter readings on valve stems and guides to check stem-to-guide clearance.
Be sure to take reading at more than one place along the length of each stem and guide.
If clearance exceeds limit, replace valve and valve guide.

Valve stem and valve guide specification

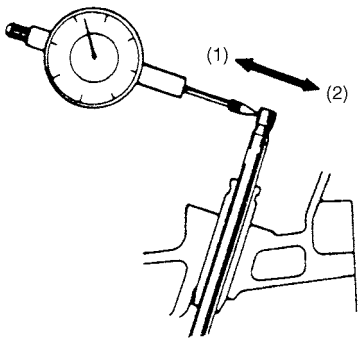
Item		Standard	Limit
Valve stem diameter [A]	In	5.465 – 5.480 mm (0.2150 – 0.2157 in.)	—
	Ex	5.440 – 5.455 mm (0.2142 – 0.2148 in.)	—
Valve guide bore [B]	In & Ex	5.500 – 5.512 mm (0.2165 – 0.2170 in.)	—
Stem-to-guide clearance	In	0.020 – 0.047 mm (0.0008 – 0.0018 in.)	0.070 mm (0.0028 in.)
	Ex	0.045 – 0.072 mm (0.0017 – 0.0028 in.)	0.090 mm (0.0035 in.)



I3RM0A140035-

Valve stem end deflection
If bore gauge is not available, check end deflection of valve stem with a dial gauge instead.
Move stem end in directions (1) and (2) to measure end deflection.
If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit
In: 0.14 mm (0.005 in.)
Ex: 0.18 mm (0.007 in.)

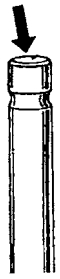


IYSQ01141096-

Valve

Visual inspection

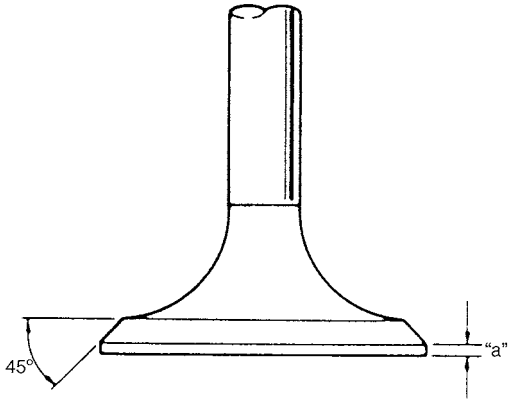
- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem end, as necessary, replace it.
- Inspect valve stem end face for pitting and wear. If pitting or wear is found there, valve stem end may be resurfaced, but not too much to grind off its chamber. When it is worn out too much that its chamber is gone, replace valve.



I2RH01140135-

Valve head thickness
Measure thickness “a” of valve head. If measured thickness exceeds limit, replace valve.

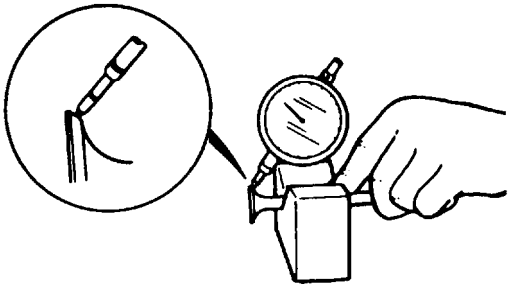
Valve head thickness “a” (In and Ex)
Standard: 1.25 – 1.55 mm (0.049 – 0.061 in.)
Limit: 0.9 mm (0.035 in.)



I2RH0B140102-

Valve head radial runout
Check each valve for radial runout with a dial gauge and "V" block. To check runout, rotate valve slowly. If runout exceeds its limit, replace valve.

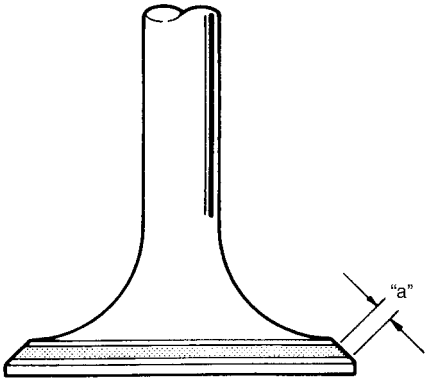
Valve head radial runout
Limit: 0.08 mm (0.003 in.)



I2RH01140136-

Seating contact width
Create contact pattern on each valve in the usual manner, i.e., by giving uniform coat of marking compound to valve seat and by rotatingly tapping seat with valve head. Valve lapper (tool used in valve lapping) must be used.
Pattern produced on seating face of valve must be a continuous ring without any break, and the width of pattern must be within specified range.

Standard seating width "a" revealed by contact pattern on valve face
Intake and Exhaust: 1.0 – 1.4 mm (0.0389 – 0.0551 in.)



I2RH0B140103-

Valve seat repair
A valve seat not producing a uniform contact with its valve or showing width of seating contact that is out of specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

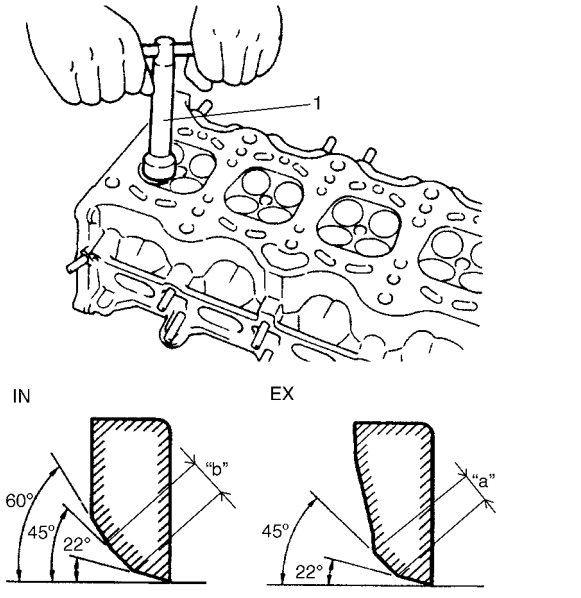
1) **Exhaust valve seat:**
Use valve seat cutters (1) to make two cuts as illustrated in the figure. Two cutters must be used: the first for making 22° angle, and the second for making 45° angle. The second cut must be made to produce desired seat width.

Seat width for exhaust valve seat
"a": 1.0 – 1.4 mm (0.0389 – 0.0551 in.)

2) **Intake valve seat:**
Use valve seat cutters (1) to make three cuts as illustrated in the figure. Three cutters must be used: the 1st for making 22° angle, the 2nd for making 60° angle, and 3rd for making 45° angle. The 3rd cut (45°) must be made to produce desired seat width.

Seat width for intake valve seat
"b": 1.0 – 1.4 mm (0.0389 – 0.0551 in.)

3) **Valve lapping:**
Lap valve on seat in two steps, first with coarse size lapping compound applied to face and the second with fine-size compound, each time using valve lapper according to usual lapping method.



I3RM0A140036-

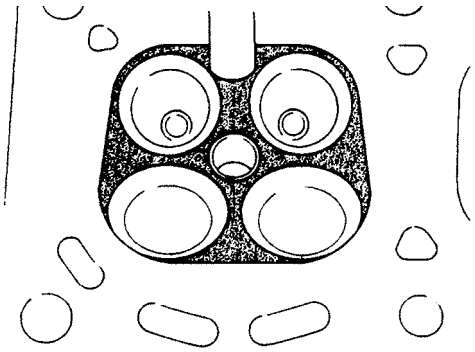
Cylinder Head Inspection

S4RS0A1406027

- Remove all carbon deposits from combustion chambers.

NOTE:

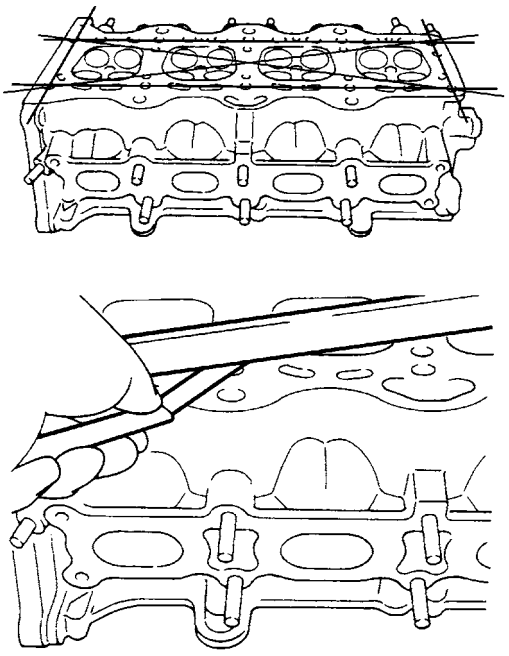
Do not use any sharp-edged tool to scrape off carbon deposits. Be careful not to scuff or nick metal surfaces when decarbonizing. The same applies to valves and valve seats, too.



I2RH0B140105-

- Check cylinder head for cracks on intake and exhaust ports, combustion chambers, and head surface. Using a straightedge and thickness gauge, check flatness of gasketed surface at a total of 6 locations. If distortion limit is exceeded, correct gasketed surface with a surface plate and abrasive paper of about #400 (Waterproof silicon carbide abrasive paper): place abrasive paper on and over surface plate, and rub gasketed surface against paper to grind off high spots. Should this fail to reduce thickness gauge readings to within limit, replace cylinder head.
  Leakage of combustion gases from this gasketed joint is often due to warped gasketed surface: such leakage results in reduced power output.

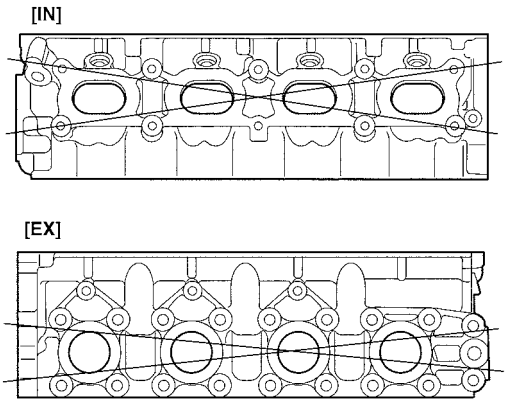
Distortion for cylinder head surface on piston side
Limit: 0.03 mm (0.001 in.)



I2RH0B140106-

- Distortion of manifold seating faces:
  Check seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, in order to determine whether these faces should be corrected or cylinder head replaced.

Distortion for cylinder head surface on intake and exhaust manifold
Limit: 0.05 mm (0.002 in.)



I2RH0B140107-

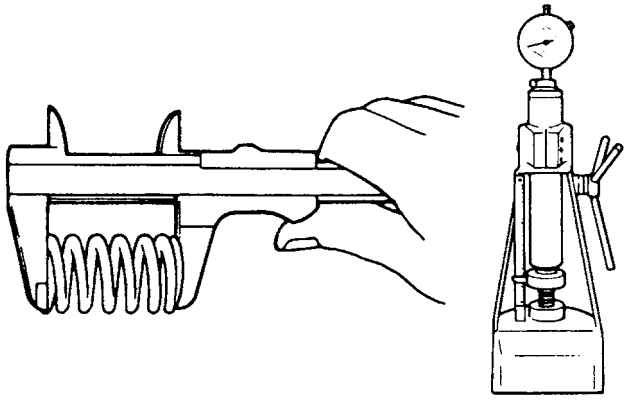
Valve Spring Inspection

S4RS0A1406028

Valve Spring Free Length and Preload
Referring to data, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Valve spring free length
Standard: 36.83 mm (1.450 in.)
Limit: 35.83 mm (1.411 in.)

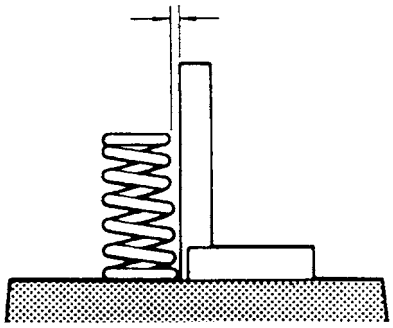
Valve spring preload
Standard: 107 – 125 N (10.7 – 12.5 kg) for 31.50 mm (23.6 – 27.6 lb/1.240 in.)
Limit: 102 N (10.2 kg) for 31.50 mm (22.5 lb/1.240 in.)



I2RH01140143-

Spring Squareness
Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve springs found to exhibit a larger clearance than limit must be replaced.

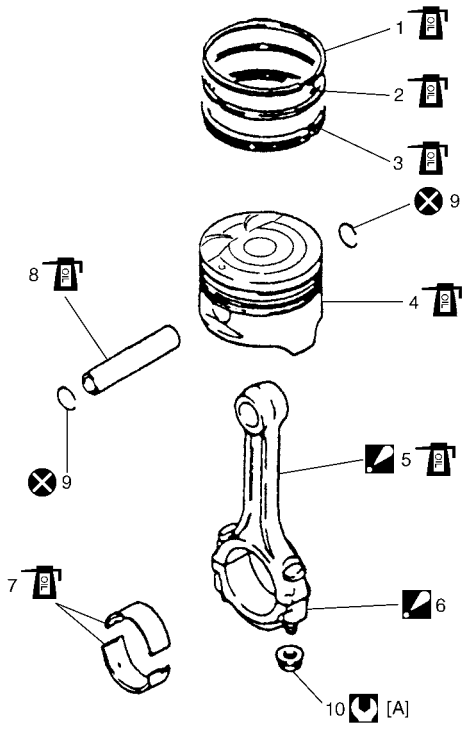
Valve spring squareness
Limit: 1.6 mm (0.063 in.)



I2RH01140144-

Pistons, Piston Rings, Connecting Rods and Cylinders Components

S4RS0A1406029



I2RH0B140108-

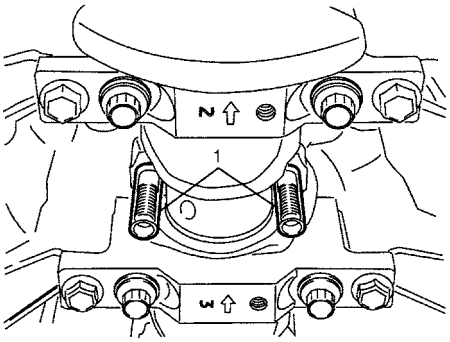
[A]: 1) Tighten all nuts to 15 N·m (1.5 kg-m). 2) Then retighten all nuts by turning through 45°. 3) Repeat Step 2) again.	7. Connecting rod bearing
1. Top ring	8. Piston pin
2. 2nd ring	9. Piston pin circlip
3. Oil ring	10. Bearing cap nut
4. Piston	: Tightening torque
5. Connecting rod : See “A”	: Apply engine oil to sliding surface of each part.
6. Connecting rod bearing cap : See “B”	: Do not reuse.
“A”: Apply engine oil to sliding surface except inner surface of big end, and rod bolts. Make sure rod bolt diameter when reuse it due to plastic deformation tightening. Refer to “Piston Pins and Connecting Rods Inspection: ”.	
“B”: Point arrow mark on cap to crankshaft pulley side.	

Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation

S4RS0A1406030

Removal

1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation: ”.
2) Remove cylinder head referring to “Valves and Cylinder Head Removal and Installation: ”.
3) Mark cylinder number on all pistons, connecting rods and connecting rod caps using silver pencil or quick drying paint.
4) Remove rod bearing caps.
5) Install guide hose (1) over threads of rod bolts. This prevents damage to bearing journal and rod bolt threads when removing connecting rod.



I2RH0B140109-

6) Decarbonize top of cylinder bore before removing piston from cylinder.
7) Push piston and connecting rod assembly out through the top of cylinder bore.

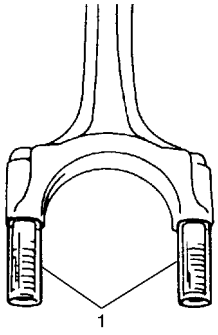
Installation

1) Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crank pins.

NOTE:

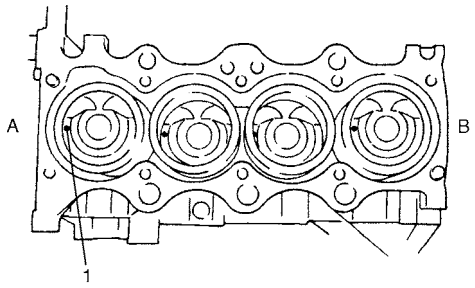
Do not apply oil between connecting rod and bearing or between bearing cap and bearing.

2) Install guide hoses (1) over connecting rod bolts. These guide hoses protect crank pin and threads of rod bolt from damage during installation of connecting rod and piston assembly.



I2RH01140147-

3) When installing piston and connecting rod assembly into cylinder bore, point front mark (1) on piston head to crankshaft pulley side.

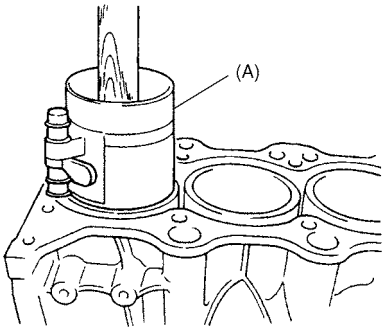


I2RH0B140110-

A: Crankshaft pulley side
B: Flywheel side

4) Install piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft.
Using a hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

Special tool
(A): 09916–77310



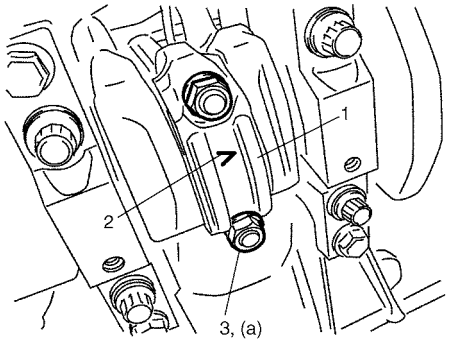
I2RH0B140111-

5) Install bearing cap (1):
Point arrow mark (2) on cap to crankshaft pulley side.
After applying engine oil to rod bolts and tighten cap nuts (3) gradually as follows.
   a) Tighten all cap nuts to 15 N·m (1.5 kg-m, 11.0 lb-ft).
   b) Retighten them to 45°
   c) Repeat Step b) once again.

NOTE:

Before installing bearing cap, make sure that checking for connecting rod bolt deformation. Refer to "Piston Pins and Connecting Rods Inspection: ".

Tightening torque
Connecting rod bearing cap nut (a): 15 N·m (1.5 kg-m, 11.0 lb-ft) and then retighten by turning through 45° twice



I2RH0B140112-

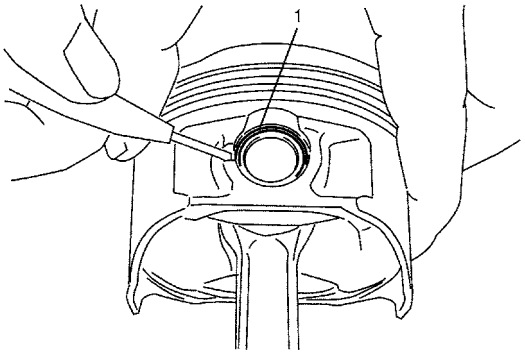
6) Install cylinder head referring to "Valves and Cylinder Head Removal and Installation: ".

Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly

S4RS0A1406031

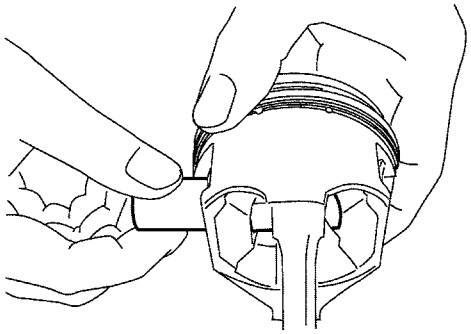
Disassembly

1) Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.
2) Remove piston pin from connecting rod as follows.
   a) Ease out piston pin circlips (1), as shown.



I2RH0B140113-

   b) Force piston pin out.



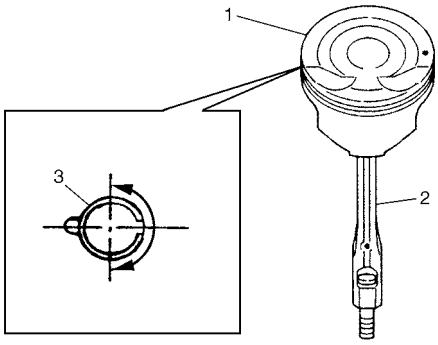
I2RH0B140114-

Assembly

1) Decarbonize piston head and ring grooves using a suitable tool.
2) Install piston pin to piston (1) and connecting rod (2):
   a) After applying engine oil to piston pin and piston pin holes in piston and connecting rod.
   b) Fit connecting rod as shown in the figure.
   c) Insert piston pin to piston and connecting rod.
   d) Install piston pin circlips (3).

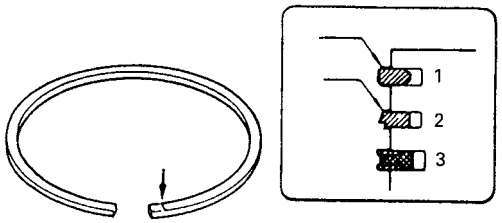
NOTE:

Circlip should be installed with its cut part facing as shown in the figure. Install so that circlip end gap comes within such range as indicated by arrow.



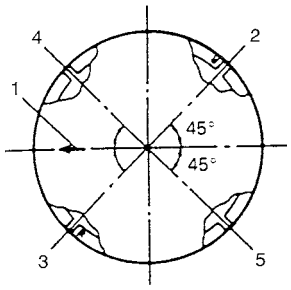
I2RH0B140115-

3) Install piston rings to piston:
   - As indicated in the figure, 1st and 2nd rings have "T" mark respectively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
   - 1st ring (1) differs from 2nd ring (2) in thickness, shape and color of surface contacting cylinder wall.
     Distinguish 1st ring from 2nd ring by referring to the figure.
   - When installing oil ring (3), install spacer first and then two rails.



I2RH0B140116-

4) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in the figure.



IYSQ01142102-

1. Arrow mark	4. Oil ring upper rail gap
2. 1st ring end gap	5. Oil ring lower rail gap
3. 2nd ring end gap and oil ring spacer gap	

Cylinders, Pistons and Piston Rings Inspection

S4RS0A1406032

Cylinder

Visual inspection

Inspect cylinder walls for scratches, roughness or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, rebore cylinder and use over size piston.

Cylinder bore diameter, taper and out-of-round

Using a cylinder gauge (1), measure cylinder bore in thrust and axial directions at two positions (“a” and “b”) as shown in the figure.
If any of the following conditions is noted, rebore cylinder.

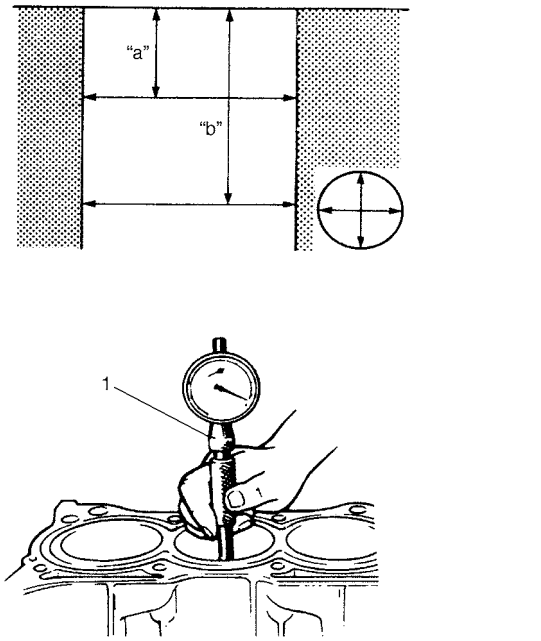
1) Cylinder bore dia. exceeds limit.
2) Difference of measurements at two positions exceeds taper limit.
3) Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore diameter
Standard: 78.00 – 78.014 mm (3.0709 – 3.0714 in.)
Limit: 78.050 mm (3.073 in.)

Cylinder taper and out-of-round
Limit: 0.10 mm (0.004 in.)

NOTE:

If any one of four cylinders has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.



I2RH0B140117-

“a”: 50 mm (1.96 in.)
“b”: 100 mm (3.94 in.)

Piston

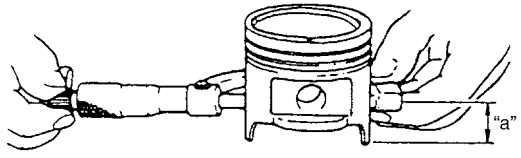
Visual inspection

Inspect piston for faults, cracks or other damages. Damaged or faulty piston should be replaced.

Piston diameter

As indicated in the figure, piston diameter should be measured at a position 19.5 mm (0.77 in.) (“a”) from piston skirt end in the direction perpendicular to piston pin.

Piston diameter specification
Standard size: 77.953 – 77.968 mm (3.0690 – 3.0696 in.)
Standard size (new one (with coating)): 77.969 – 77.984 mm (3.0696 – 3.0702 in.)
Oversize (0.50 mm (0.0196 in.)): 78.453 – 78.468 mm (3.0887 – 3.0893 in.)



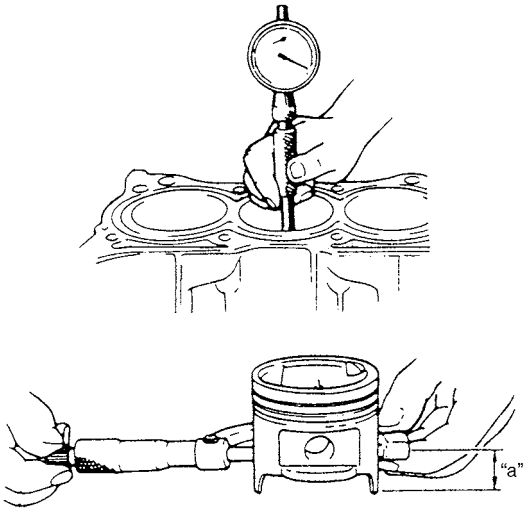
I2RH01140157-

Piston clearance
Measure cylinder bore diameter and piston diameter to find their difference which is piston clearance. Piston clearance should be within specification as follows. If it is out of specification, rebore cylinder and use oversize piston.

NOTE:

Cylinder bore diameters used here are measured in thrust direction at two positions.

Piston clearance
Standard: 0.032 – 0.061 mm (0.0013 – 0.0024 in.)
Standard (piston with coating (new one)): 0.016 – 0.045 mm (0.0006 – 0.0018 in.)
Limit: 0.161 mm (0.0065 in.)



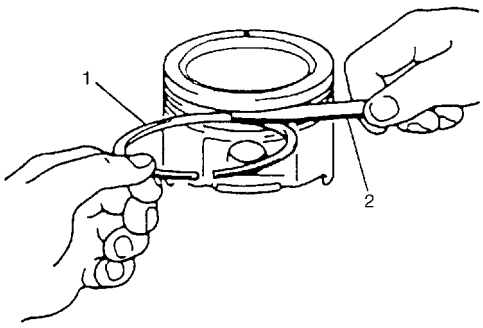
I4RS0A140022-

"a": 19.5 mm (0.77 in.)

Ring groove clearance
Before checking, piston grooves must be clean, dry and free of carbon deposits.
Fit new piston ring (1) into piston groove, and measure clearance between ring and ring land by using thickness gauge (2). If clearance is out of specification, replace piston.

Ring groove clearance

	Standard	Limit
Top ring	0.03 – 0.07 mm (0.0012 – 0.0028 in.)	0.12 mm (0.0047 in.)
2nd ring	0.02 – 0.06 mm (0.0008 – 0.0024 in.)	0.10 mm (0.0039 in.)
Oil ring	0.03 – 0.17 mm (0.0012 – 0.0067 in.)	—



I2RH01140159-

Piston Ring

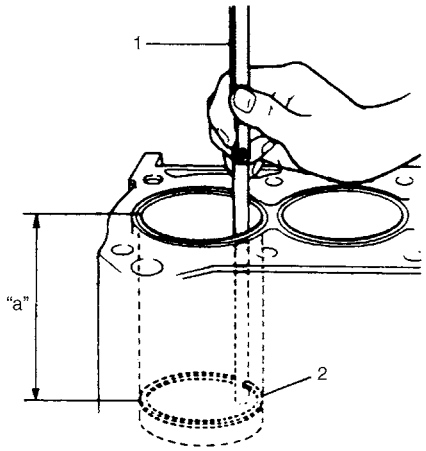
Piston ring end gap
To measure end gap, insert piston ring (2) into cylinder bore and then measure the gap by using thickness gauge (1).
If measured gap exceeds limit, replace ring.

NOTE:

Decarbonize and clean top of cylinder bore before inserting piston ring.

Piston ring end gap

Item	Standard	Limit
Top ring	0.20 – 0.35 mm (0.0079 – 0.0138 in.)	0.7 mm (0.0276 in.)
2nd ring	0.35 – 0.50 mm (0.0138 – 0.0197 in.)	1.0 mm (0.0394 in.)
Oil ring	0.20 – 0.70 mm (0.0079 – 0.0276 in.)	1.2 mm (0.0472 in.)



I2RH01140161-

"a": 120 mm (4.72 in.)

Piston Pins and Connecting Rods Inspection

S4RS0A1406033

Piston Pin

Visual inspection

Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod and/or piston.

Piston pin clearance

Check piston pin clearance in small end and piston. Replace connecting rod and/or piston if its small end is badly worn or damaged or if measured clearance exceeds limit.

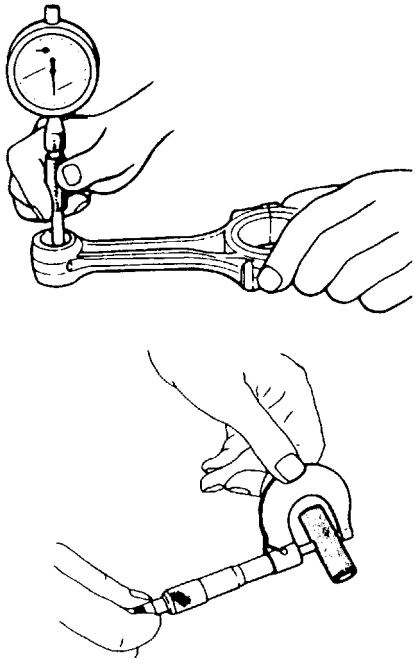
Piston pin clearance in connecting rod small end
Standard: 0.003 – 0.014 mm (0.0001 – 0.0006 in.)
Limit: 0.05 mm (0.00020 in.)

Piston pin clearance in piston
Standard: 0.006 – 0.017 mm (0.00024 – 0.00067 in.)
Limit: 0.05 mm (0.0020 in.)

Small-end bore
20.003 – 20.011 mm (0.7875 – 0.7878 in.)

Piston pin dia.
19.997 – 20.000 mm (0.7873 – 0.7874 in.)

Piston bore
20.006 – 20.014 mm (0.7876 – 0.7880 in.)



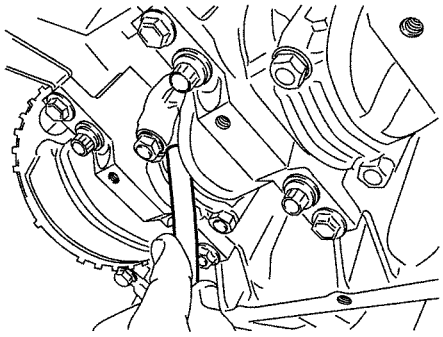
I4RS0A140023-

Connecting Rod

Big-end side clearance

Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

Big-end side clearance
Standard: 0.25 – 0.40 mm (0.0098 – 0.0157 in.)
Limit: 0.55 mm (0.0217 in.)

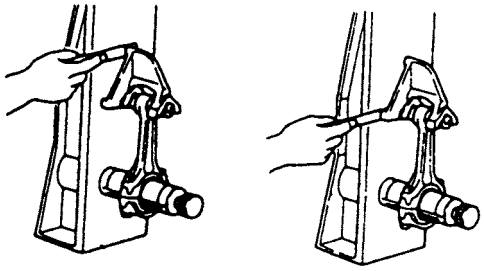


I2RH0B140148-

Connecting rod alignment

Mount connecting rod on aligner to check it for bow and twist. If measured value exceeds the limit, replace it.

Connecting rod alignment
Limit on bow: 0.05 mm (0.0020 in.)
Limit on twist: 0.10 mm (0.0039 in.)

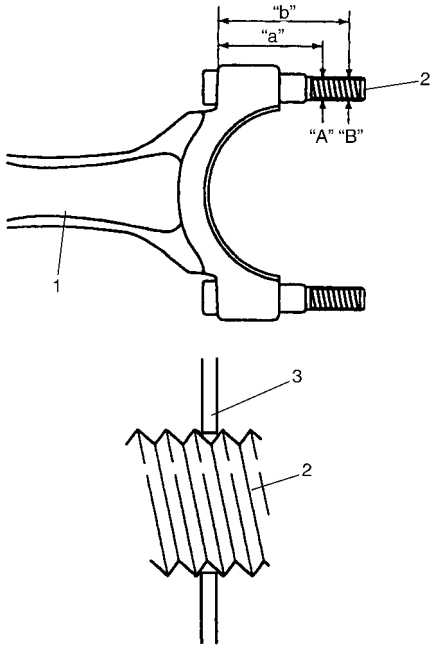


I4RH01140053-

Connecting rod bolt deformation (Plastic deformation tightening bolt)
Measure each thread diameter of connecting rod bolt (2) at “A” on 32 mm (1.25 in.) from bolt mounting surface and “B” on 40 mm (1.57 in.) from bolt mounting surface by using a micrometer (3).
Calculate difference in diameters (“A” – “B”). If it is exceeds limit, replace connected rod (1).

Connecting rod bolt measurement points
“a”: 32 mm (1.25 in.)
“b”: 40 mm (1.57 in.)

Connecting rod bolt diameter difference
Limit (“A” – “B”): 0.1 mm (0.004 in.)



I2RH0B140119-

Crank Pin and Connecting Rod Bearings Inspection

S4RS0A1406034

Crank Pin Diameter
Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged or out-of round or taper is out of limit, replace crankshaft or regrind crank pin to undersize and use undersize bearing.

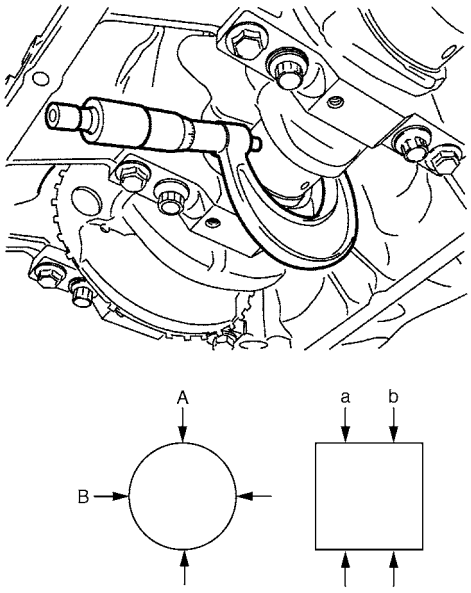
Crank pin diameter

Connecting rod bearing size	Crank pin diameter
Standard	41.982 – 42.000 mm (1.6528 – 1.6535 in.)
0.25 mm (0.0098 in.) undersize	41.732 – 41.750 mm (1.6430 – 1.6437 in.)

Out-of-round
A – B

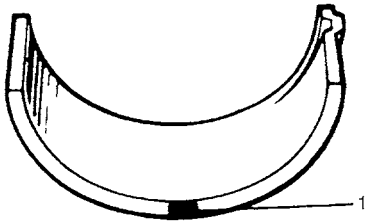
Taper
a – b

Crank pin taper and out-of-round
Limit: 0.01 mm (0.0004 in.)



I2RH0B140120-

Connecting Rod Bearing General Information
Service connecting rod bearings are available in standard size and 0.25 mm (0.0098 in.) undersize bearing, and standard size bearing has 5 kinds of bearings differing in tolerance.
For identification of undersize bearing, it is painted red at the position as indicated in the figure, undersize bearing thickness is 1.605 – 1.615 mm (0.0632 – 0.0635 in.) at the center of it.



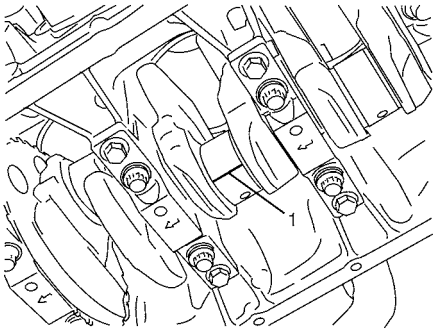
I2RH01140164-

1. Red paint

Connecting Rod Bearing Visual Inspection
Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.

Connecting Rod Bearing Clearance

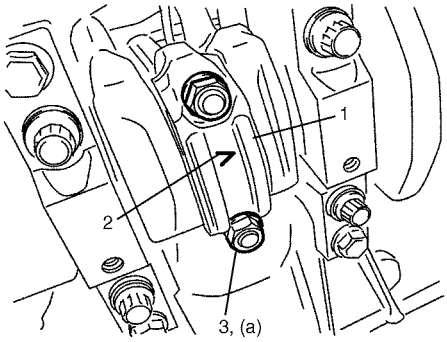
1) Before checking bearing clearance, clean bearing and crank pin.
2) Install bearing in connecting rod and bearing cap.
3) Place a piece of gauging plastic (1) to full width of crank pin as contacted by bearing (parallel to crankshaft), avoiding oil hole.



I2RH0B140121-

4) Install rod bearing cap (1) to connecting rod.
When installing cap, be sure to point arrow mark (2) on cap to crankshaft pulley side, as shown in the figure. After applying engine oil to rod bolts, tighten cap nuts (3) gradually as follows.
   a) Tighten all cap nuts to 15 N·m (1.5 kg-m, 11.0 lb-ft)
   b) Retighten them to 45°
   c) Repeat Step b) once again.

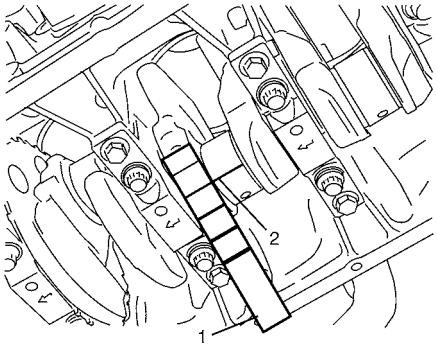
   Tightening torque
   Connecting rod bearing cap nut (a): 15 N·m (1.5 kg-m, 11.0 lb-ft) and then retighten by turning through 45° twice



I2RH0B140122-

5) Remove cap and using a scale (1) on gauging plastic envelope (2), measure gauging plastic (2) width at the widest point (clearance).
If clearance exceed its limit, use a new standard size bearing referring to “Selection of Connecting Rod Bearings: ”.
After selecting new bearing, recheck clearance.

   Connecting rod bearing clearance
   Standard: 0.029 – 0.047 mm (0.0011 – 0.0018 in.)
   Limit: 0.065 mm (0.0026 in.)



I2RH0B140123-

6) If clearance can not be brought to its limit even by using a new standard size bearing, use next thicker bearing and recheck clearance or regrind crank pin to undersize and use 0.25 mm undersize bearing.

Selection of Connecting Rod Bearings

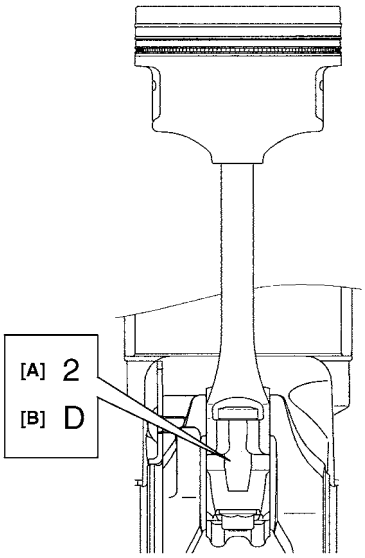
NOTE:

- **If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.**
- **When replacing crankshaft or connecting rod and its bearing due to any reason, select new standard bearings to be installed by referring to numbers stamped on connecting rod and its cap and/or alphabets stamped on crank web of No.3 cylinder.**

1) Check stamped numbers on connecting rod and its cap as shown.
Three kinds of numbers (“1”, “2” and “3”) represent the following connecting rod big end inside diameters.
For example, stamped number “1” indicates that corresponding connecting rod big end inside diameter is 45.000 – 45.006 mm (1.7717 – 1.7718 in.).

Connecting rod big end inside diameter

Stamped numbers	Connecting rod big end inside diameter
1	45.0000 – 45.0060 mm (1.7717 – 1.7718 in.)
2	45.0061 – 45.0120 mm (1.7719 – 1.7721 in.)
3	45.0121 – 45.0180 mm (1.7722 – 1.7723 in.)



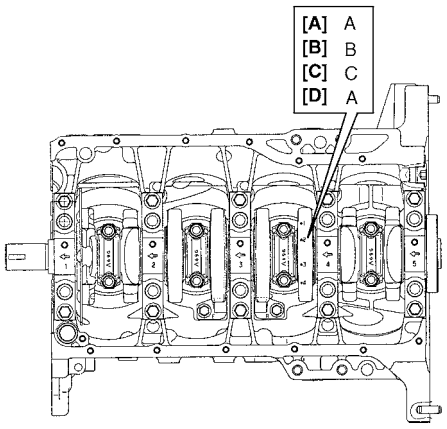
I3RH0A140017-

[A]: Connecting rod big end inside diameter number
[B]: Weight indication mark

2) Next, check crankshaft pin diameter. On crank web No.3, four alphabets are stamped as shown in the figure.
Three kinds of alphabet (“A”, “B” and “C”) represent the following crankshaft pin diameter respectively.
For example, stamped “A” indicates that corresponding crankshaft pin diameter is 41.994 – 42.000 mm (1.6533 – 1.6534 in.).

Crankshaft pin outer diameter

Stamped alphabet	Crankshaft pin diameter
A	41.9940 – 42.0000 mm (1.6533 – 1.6534 in.)
B	41.9880 – 41.9939 mm (1.6531 – 1.6532 in.)
C	41.9820 – 41.9879 mm (1.6529 – 1.6530 in.)



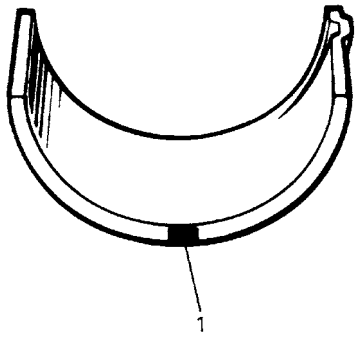
I3RH0A140018-

[A]: Crankshaft pin diameter for No.1 cylinder
[B]: Crankshaft pin diameter for No.2 cylinder
[C]: Crankshaft pin diameter for No.3 cylinder
[D]: Crankshaft pin diameter for No.4 cylinder

3) There are five kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in the figure.
Each color indicated the following thickness at the center of bearing.

Standard size of connecting rod bearing thickness

Color painted	Bearing thickness
Blue	1.4991 – 1.5020 mm (0.05902 – 0.05913 in.)
Yellow	1.4961 – 1.4990 mm (0.05890 – 0.05901 in.)
Nothing	1.4931 – 1.4960 mm (0.05878 – 0.05889 in.)
Black	1.4901 – 1.4930 mm (0.05867 – 0.05877 in.)
Green	1.4870 – 1.4900 mm (0.05855 – 0.05866 in.)



I3RH0A140019-

1. Paint

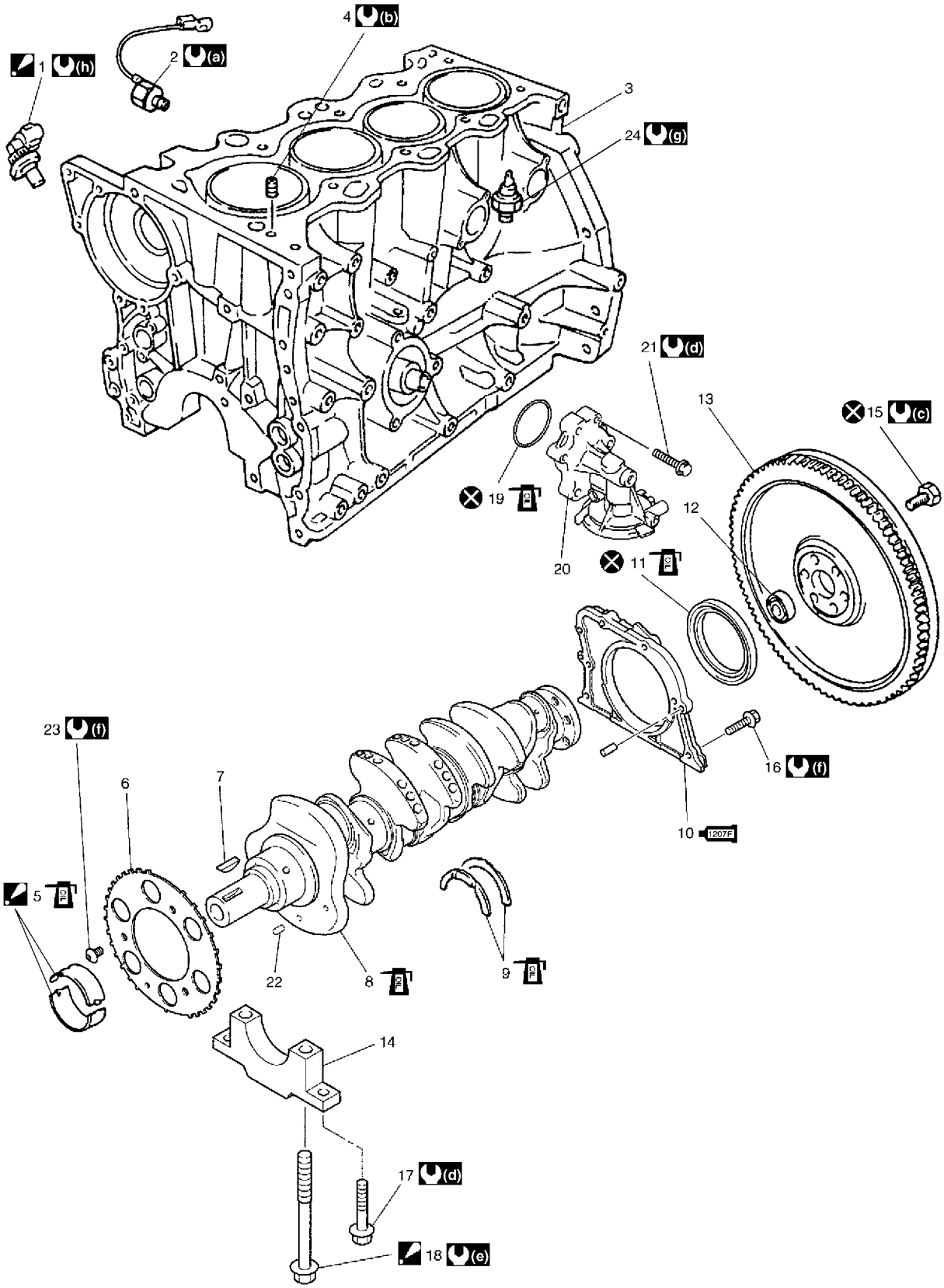
4) From number stamped on connecting rod and its cap and alphabets stamped on crank web No.3, determine new standard bearing to be installed to connecting rod big end inside, by referring to the table.
For example, if number stamped on connecting rod and its cap is “1” and alphabet stamped on crank web No.3 is “B”, install a new standard bearing painted in “Black” to its connecting rod big end inside.

Specification of new standard connecting rod bearing size

		Number stamped on connecting rod and its cap (connecting rod big end inside diameter)		
		1	2	3
Alphabet stamped on crank web No.3 (Crankshaft pin diameter)	A	Green	Black	Nothing
	B	Black	Nothing	Yellow
	C	Nothing	Yellow	Blue
		New standard bearing to be installed.		

Main Bearings, Crankshaft and Cylinder Block Components

S4RS0A1406035



I4RS0A140016-

1. CKP sensor (if equipped) : See “A”	11. Rear oil seal	21. Oil filter adapter bolt
2. Knock sensor	12. Input shaft bearing	22. Spring pin
3. Cylinder block	13. Flywheel	23. Sensor plate bolt
4. Venturi plug	14. Main bearing cap	24. Oil pressure switch
5. Main bearing : See “B”	15. Flywheel mounting bolt	(a) : 22 N·m (2.2 kg-m, 16.0 lb-ft)
6. Sensor plate	16. Rear oil seal housing mounting bolt	(b) : 5 N·m (0.5 kg-m, 4.0 lb-ft)
7. Crankshaft timing sprocket key	17. Main bearing cap No.2 bolt	(c) : 70 N·m (7.0 kg-m, 51.0 lb-ft)
8. Crankshaft	18. Main bearing cap No.1 bolt : See “D”	(d) : Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft) by the specified procedure.
9. Thrust bearing	19. O-ring	(e) : Tighten 30 N·m (3.0 kg-m, 22.0 lb-ft), 50 N·m (5.0 kg-m, 36.5 lb-ft) and 60° by the specified procedure.
1207F 10. Rear oil seal housing : See “C”	20. Oil filter adapter case	(f) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
“A”: When installing CKP sensor, use new sensor mounting bolt.		(g) : 13 N·m (1.3 kg-m, 9.5 lb-ft)
“B”: Upper half of bearing has an oil groove.		(h) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
“C”: Apply sealant 99000-31250 to mating surface.		: Do not reuse.
“D”: Make sure main bearing cap No.1 bolt deformation when reuse it due to plastic deformation tightening referring to “Main Bearings Inspection: ”.		: Apply engine oil to inside / sliding surface.

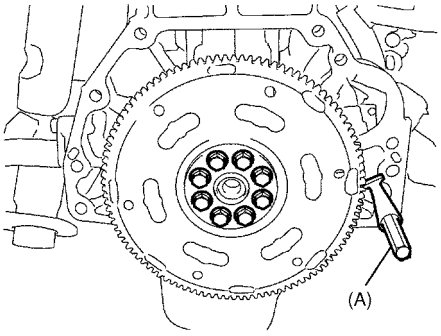
Main Bearings, Crankshaft and Cylinder Block Removal and Installation

S4RS0A1406036

Removal

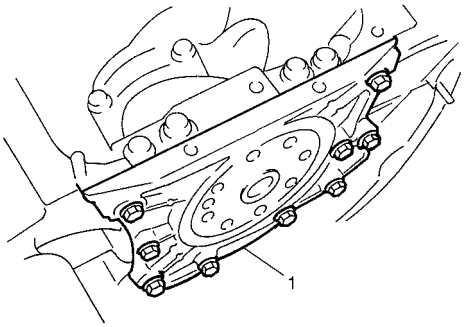
1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation: ”.
2) Remove clutch cover, clutch disc and flywheel (drive plate for A/T) by using special tool.

Special tool
(A): 09924–17810



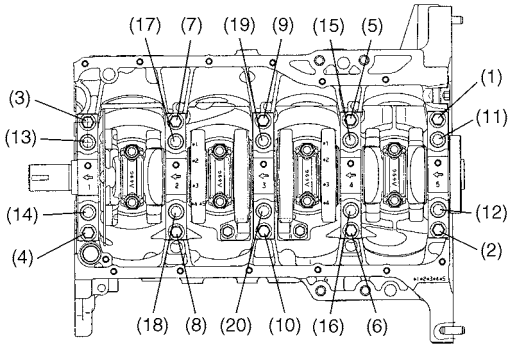
I2RH0B140125-

3) Remove piston and connecting rod referring to “Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: ”.
4) Remove rear oil seal housing (1).



I2RH0B140126-

5) Loosen main bearing cap No.1 and No.2 bolts in such order as indicated in the figure and remove them.



I2RH0B140127-

6) Remove crankshaft from cylinder block.

Installation

NOTE:

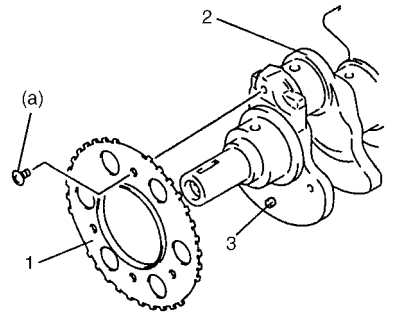
- **Use new bearing cap No.1 bolts. They are deformed once they are used because they are plastic deformation tightening bolts.**
- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb such combination and make sure that each part goes back to where it came from, when installing.**

1) Install sensor plate (1) to crankshaft (2) and tighten bolts to specified torque.

NOTE:

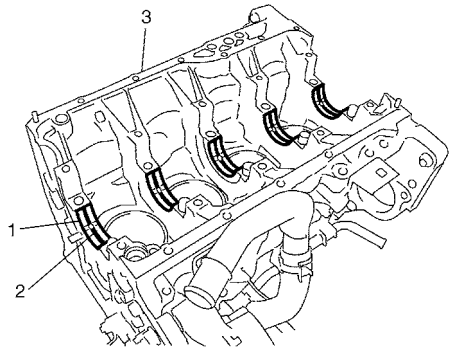
When installing sensor plate, align spring pin (3) on crankshaft and hole of sensor plate.

Tightening torque
Sensor plate bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B140128-

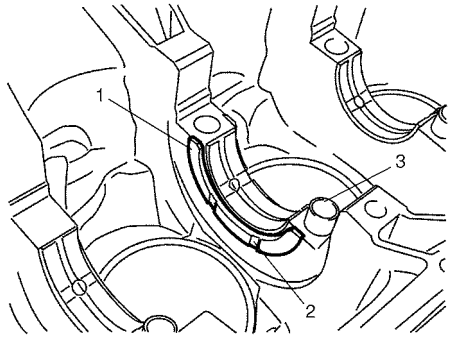
2) Install main bearings to cylinder block.
Upper half of bearing (1), has an oil groove (2). Install it to cylinder block (3), and the other half without oil groove to bearing cap.
Make sure that two halves are painted in the same color.



I2RH0B140129-

3) Install thrust bearings (1) to cylinder block between No.2 and No.3 cylinders. Face oil groove (2) sides to crank webs.

4) Confirm that dowel pins (3) are installed to intake side of each journal.



I2RH0B140130-

5) Install crankshaft to cylinder block.

6) Install bearing cap to cylinder block, making sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side.
After applying engine oil to main bearing cap No.1 bolts ((1) – (10)) and main bearing cap No.2 bolts ((11) – (20)), tighten them gradually as follows.

a) Tighten bolts ((1) – (10)) to 30 N·m (3.0 kg-m, 22.0 lb-ft) according to numerical order as shown by using a 12 corner socket wrenches.

b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kg-m, 36.5 lb-ft).

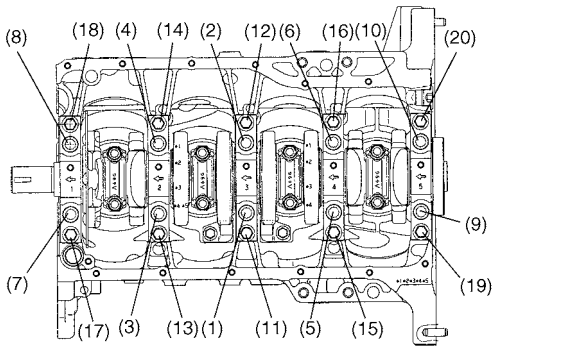
c) In the same manner as in Step a), retighten them to 60°.

d) Tighten bolts ((11) – (20)) to 25 N·m (2.5 kg-m, 18.0 lb-ft) according to numerical order as shown.

Tightening torque
Main bearing cap No.1 bolt ((1) – (10)): 30 N·m (3.0 kg-m, 22.0 lb-ft), 50 N·m (5.0 kg-m, 36.5 lb-ft) and then retighten by turning through 60°
Main bearing cap No.2 bolt ((11) – (20)): 25 N·m (2.5 kg-m, 18.0 lb-ft)

CAUTION:

After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turning it by 12 N·m (1.2 kg-m, 9.0 lb-ft) torque or below.

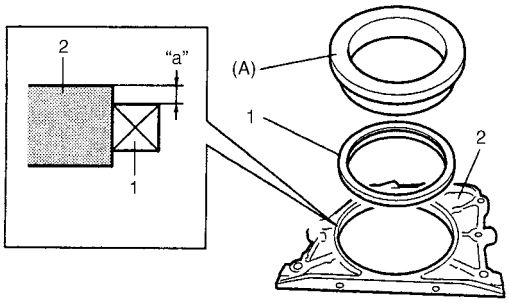


I2RH0B140131-

7) If necessary, press-fit rear oil seal (1) to oil seal housing (2) by using special tool as shown in the figure.

Special tool
(A): 09911–97820

Crank rear oil seal installing position (dimension)
"a": 2 mm (0.08 in.)

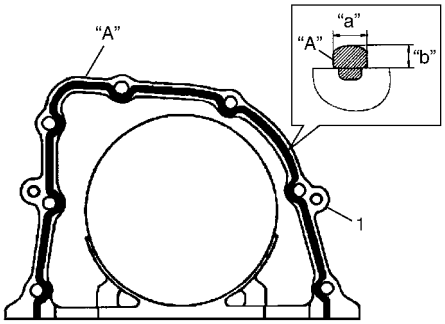


I4RS0A140017-

8) Apply sealant to mating surface of rear oil seal housing (1).

"A": Water tight sealant 99000–31250

Sealant amount for rear oil seal housing
Width: "a": 3 mm (0.12 in.)
Height "b": 2 mm (0.08 in.)

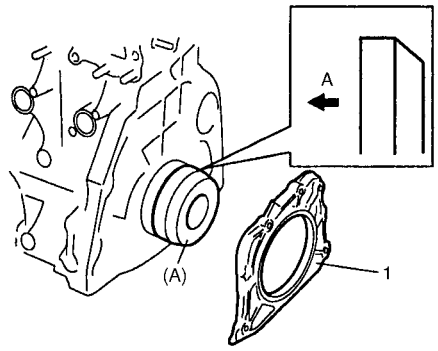


I4RS0A140018-

9) Install rear oil seal housing (1) and tighten bolts to specified torque by using special tool.

Special tool
(A): 09911–97720

Tightening torque
Rear oil seal housing bolt: 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A140019-

A: Crankshaft side

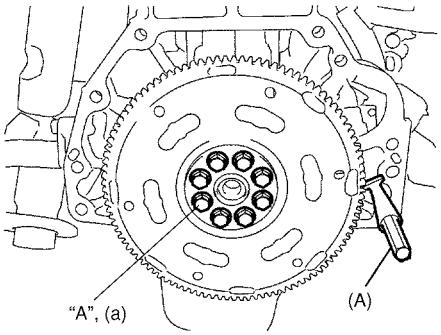
10) Install flywheel (for M/T).
Using special tool, lock flywheel, and tighten flywheel bolts to specified torque.

NOTE:

Use new flywheel bolts.

Special tool
(A): 09924–17810

Tightening torque
Flywheel bolt (a): 70 N·m (7.0 kg-m, 51.0 lb-ft)



I2RH0B140134-

11) Install piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: ".

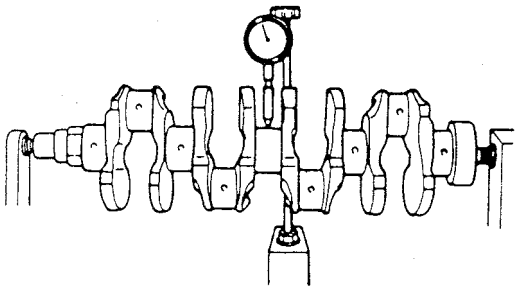
12) Install engine assembly to vehicle referring to "Engine Assembly Removal and Installation: ".

Crankshaft Inspection

S4RS0A1406037

Crankshaft Runout
Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

Crankshaft runout
Limit: 0.02 mm (0.0008 in.)

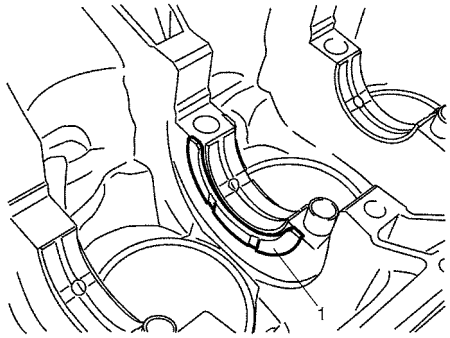


I2RH0B140135-

Crankshaft Thrust Play

1) Measure this play with crankshaft set in cylinder block in the normal manner, that is with thrust bearing (1) and journal bearing caps installed.

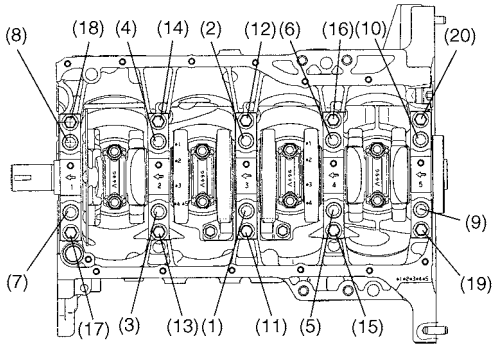
Thickness of crankshaft thrust bearing
Standard: 2.500 mm (0.0984 in.)
Oversize (0.125 mm (0.0049 in.)): 2.563 mm (0.1009 in.)



I2RH0B140136-

2) Tighten main bearing cap No.1 bolts (1) – (10) and main bearing cap No.2 bolts (11) – (20) gradually as follows.
   a) Tighten bolts (1) – (10) to 30 N·m (3.0 kg-m, 22.0 lb-ft) according to numerical order in the figure.
   b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kg-m, 36.5 lb-ft).
   c) In the same manner as in Step a), retighten them to 60°.
   d) Tighten bolts (11) – (20) to 25 N·m (2.5 kg-m, 18.0 lb-ft) according to numerical order in the figure.

Tightening torque
Main bearing cap No.1 bolt ((1) – (10)): 30 N·m (3.0 kg-m, 22.0 lb-ft), 50 N·m (5.0 kg-m, 36.5 lb-ft) and then retighten by turning through 60°
Main bearing cap No.2 bolt ((11) – (20)): 25 N·m (2.5 kg-m, 18.0 lb-ft)



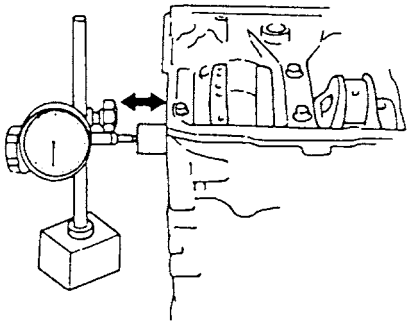
I2RH0B140137-

3) Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.
If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

Crankshaft thrust play
Standard: 0.11 – 0.31 mm (0.0043 – 0.0122 in.)
Limit: 0.35 mm (0.0138 in.)

NOTE:

After checking the thrust play, make sure that thread deformation of each bearing cap No.1 bolt referring to "Main Bearing Cap No.1 Bolt" in "Main Bearings Inspection: ".



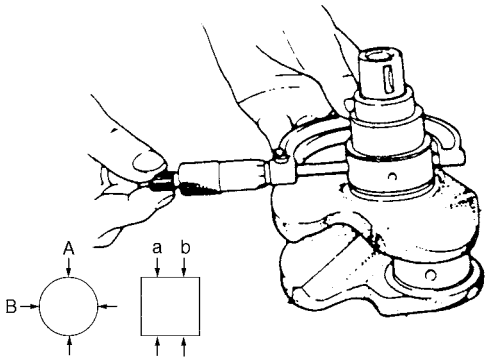
I2RH01140183-

Out-of-Round and Taper (Uneven Wear) of Journals
An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings. If any one of journals is badly damaged or if amount of uneven wear in the sense exceeds its limit, regrind or replace crankshaft.

Crankshaft out-of-round and taper
Limit: 0.01 mm (0.0004 in.)

Out-of-round
A – B

Taper
a – b



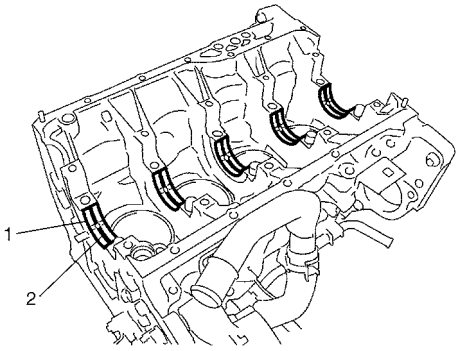
I2RH0B140138-

Main Bearings Inspection

S4RS0A1406038

General Information

- Service main bearings are available in standard size and 0.25 mm (0.0098 in.) undersize, and each of them has 5 kinds of bearings differing in tolerance.
- Upper half of bearing (1) has oil groove (2) as shown in the figure.
  Install this half with oil groove to cylinder block.
- Lower half of bearing does not have an oil groove.



I2RH0B140139-

Visual Inspection

Check bearings for pitting, scratches, wear or damage. If any malcondition is found, replace both upper and lower halves. Never replace either half without replacing the other half.

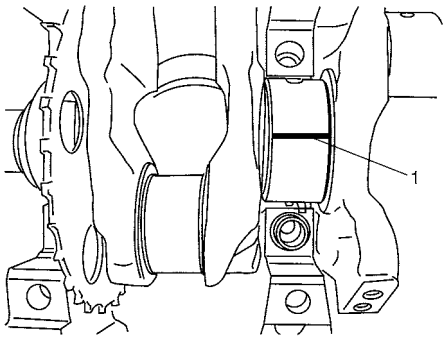
Main Bearing Clearance

NOTE:

Do not rotate crankshaft while gauging plastic is installed.

Check clearance by using gauging plastic according to the following procedure.

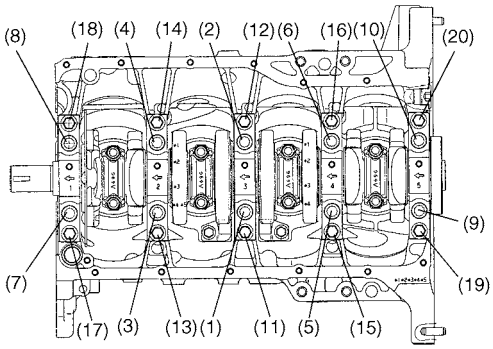
1) Remove bearing caps.
2) Clean bearings and main journals.
3) Place a piece of gauging plastic (1) the full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.



I2RH0B140140-

4) Tighten main bearing cap No.1 bolts (1) – (10) and main bearing cap No.2 bolts (11) – (20) gradually as follows.
   a) Tighten bolts (1) – (10) to 30 N·m (3.0 kg-m, 22.0 lb-ft) according to numerical order in the figure.
   b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kg-m, 36.5 lb-ft).
   c) In the same manner as in Step a), retighten them to 60°.
   d) Tighten bolts (11) – (20) to 25 N·m (2.5 kg-m, 18.0 lb-ft) according to numerical order in the figure.

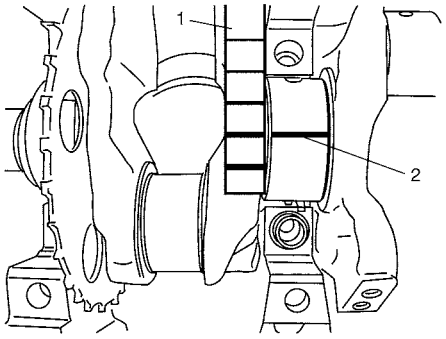
   Tightening torque
   Main bearing cap No.1 bolt ((1) – (10)): 30 Nm (3.0 kg-m, 22.0 lb-ft), 50 Nm (5.0 kg-m, 36.5 lb-ft) and then retighten by turning through 60°
   Main bearing cap No.2 bolt ((11) – (20)): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I2RH0B140137-

5) Remove bearing caps and using scale (1) on gauging plastic envelop (2), measure gauging plastic width at its widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.
   A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.
   After selecting new bearing, recheck clearance.

   Main bearing clearance
   Standard: 0.021 – 0.041 mm (0.0008 – 0.0016 in.)
   Limit: 0.054 mm (0.0021 in.)



I2RH0B140141-

Selection of Main Bearings

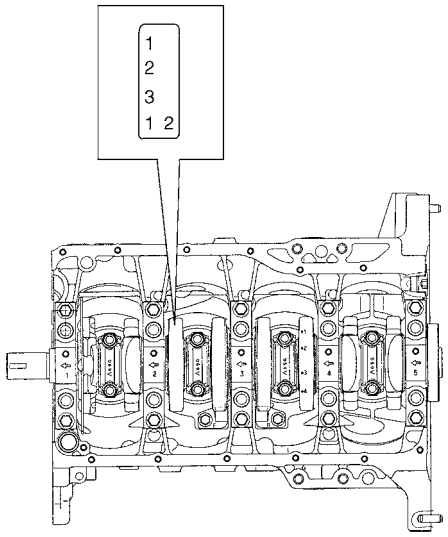
Standard bearing

If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.

1) First check journal diameter. As shown in the figure, crank web No.2 has stamped numbers.
   Three kinds of numbers (“1”, “2” and “3”) represent the following journal diameters.
   Stamped numbers on crank web No.2 represent journal diameters marked with an arrow in the figure respectively. For example, stamped number “1” indicates that corresponding journal diameter is 51.9940 – 52.0000 mm (2.0471 – 2.0472 in.).

Crankshaft journal diameter

Stamped numbers	Journal diameter
1	51.9940 – 52.0000 mm (2.0471 – 2.0472 in.)
2	51.9880 – 51.9939 mm (2.0468 – 2.0470 in.)
3	51.9820 – 51.9879 mm (2.0465 – 2.0467 in.)

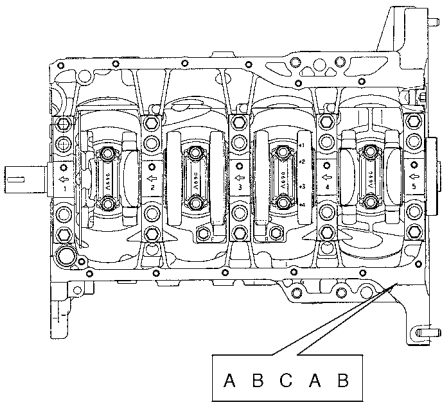


I2RH0B140142-

2) Next, check bearing cap bore diameter without bearing. On mating surface of cylinder block, five alphabets are stamped as shown in the figure.
   Three kinds of alphabets (“A”, “B” and “C”) or numbers (“1”, “2” and “3”) represent the following cap bore diameters.
   Stamped alphabets or numbers on cylinder block represent bearing cap bore diameter marked with an arrow in the figure respectively.
   For example, stamped “A” or “1” indicates that corresponding bearing cap bore diameter is 56.0000 – 56.0060 mm (2.2048 – 2.2049 in.).

Crankshaft bearing cap bore

Stamped alphabet (number)	Bearing cap bore diameter (without bearing)
A (1)	56.0000 – 56.0060 mm (2.2048 – 2.2049 in.)
B (2)	56.0061 – 56.0120 mm (2.2050 – 2.2051 in.)
C (3)	56.0121 – 56.0180 mm (2.2052 – 2.2054 in.)

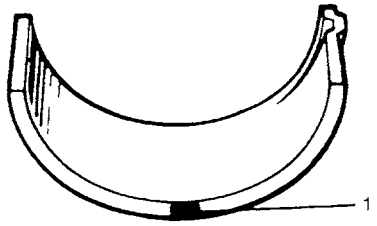


I2RH0B140143-

3) There are 5 kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in the figure.
   Each color indicated the following thickness at the center of bearing.

Standard size of crankshaft main bearing thickness

Color painted	Bearing thickness
Purple	1.992 – 1.996 mm (0.07843 – 0.07858 in.)
Brown	1.995 – 1.999 mm (0.07855 – 0.07870 in.)
Green	1.998 – 2.002 mm (0.07867 – 0.07882 in.)
Black	2.001 – 2.005 mm (0.07878 – 0.07893 in.)
Colorless (no paint)	2.004 – 2.008 mm (0.07890 – 0.07906 in.)



I2RH01140191-

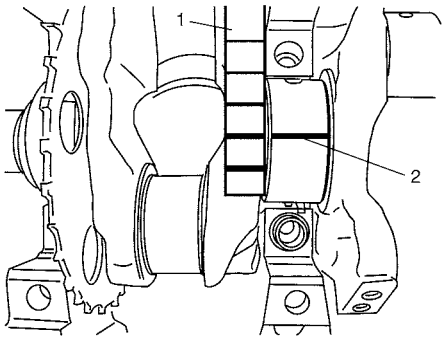
1. Paint

4) From number stamped on crank web No.2 and alphabets stamped on cylinder block, determine new standard bearing to be installed to journal, by referring to the table shown.
For example, if number stamped on crank web No.2 is “1” and alphabet stamped on cylinder block is “B”, install a new standard bearing painted in “Brown” to its journal.

New standard size crankshaft main bearing specification

		Number stamped on crank web No.2 (Journal diameter)		
		1	2	3
Alphabet stamped on cylinder block (Cap bore dia.)	A (1)	Purple	Brown	Green
	B (2)	Brown	Green	Black
	C (3)	Green	Black	Colorless
		New standard bearing to be installed		

5) Using scale (1) on gauging plastic (2), check bearing clearance with newly selected standard bearing.
If clearance still exceeds its limit, use next thicker bearing and recheck clearance.



I2RH0B140141-

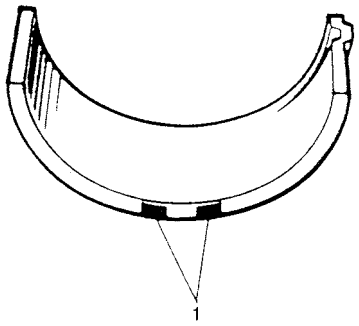
6) When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to number stamped on new crankshaft or alphabets stamped on new cylinder block.

Undersize bearing (0.25 mm (0.0098 in.))

- 0.25 mm (0.0098 in.) undersize bearing is available, in five kinds varying in thickness.
  To distinguish them, each bearing is painted in the following colors at such position as indicated in the figure.
  Each color represents the following thickness at the center of bearing.

Undersize of crankshaft main bearing thickness

Color painted	Bearing thickness
Red and Purple	2.117 – 2.121 mm (0.08335 – 0.08350 in.)
Red and Brown	2.120 – 2.124 mm (0.08347 – 0.08362 in.)
Red and Green	2.123 – 2.127 mm (0.08359 – 0.08374 in.)
Red and Black	2.126 – 2.130 mm (0.08371 – 0.08385 in.)
Red only	2.129 – 2.133 mm (0.08382 – 0.08397 in.)



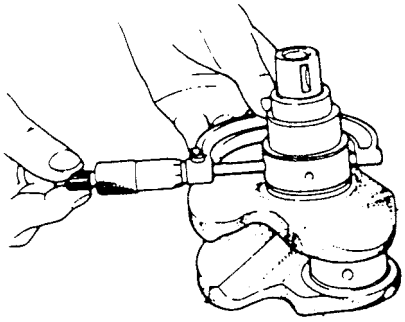
I2RH01140192-

1. Paint

- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.
  a. Regrind journal to the following finished diameter.

     Finished journal diameter
     51.732 – 51.750 mm (2.0367 – 2.0374 in.)

  b. Using micrometer, measure regrind journal diameter.
     Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
  c. Using journal diameter measured above and alphabets stamped on cylinder block, select an undersize bearing by referring to the following table.
     Check bearing clearance with newly selected undersize bearing.



I2RH0B140144-

New undersize crankshaft main bearing specification

		Measured journal diameter		
		51.7320 – 51.7379 mm (2.0367 – 2.0369 in.)	51.7380 – 51.7439 mm (2.0370 – 2.0371 in.)	51.7440 – 51.7500 mm (2.0372 – 2.0373 in.)
Alphabets stamped on cylinder block	A (1)	Red and Green	Red and Brown	Red and Purple
	B (2)	Red and Black	Red and Green	Red and Brown
	C (3)	Red only	Red and Black	Red and Green
		Undersize bearing to be installed		

Main Bearing Cap No.1 Bolt

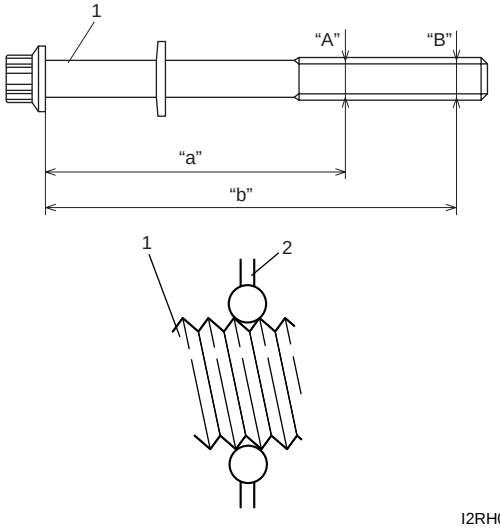
Measure each thread diameter main bearing cap No.1 bolts (1) at “A” on 60 mm (2.36 in.) from seat side of flange bolt and “B” on 90 mm (3.54 in.) from seat side of flange bolt by using a micrometer (2).
Calculate difference in diameters (“A” – “B”).
If it exceeds limit, replace with new one.

Main bearing cap No.1 bolt diameter measurement points

“a”: 60 mm (2.36 in.)
“b”: 90 mm (3.54 in.)

Main bearing cap No.1 bolt diameter difference

Limit (“A” – “B”): 0.2 mm (0.008 in.)

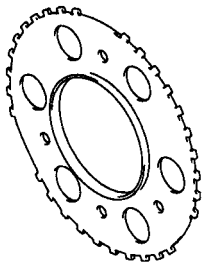


I2RH0B140145-

Sensor Plate Inspection

S4RS0A1406039

Check sensor plate for crack damage.
If malcondition is found, replace it.

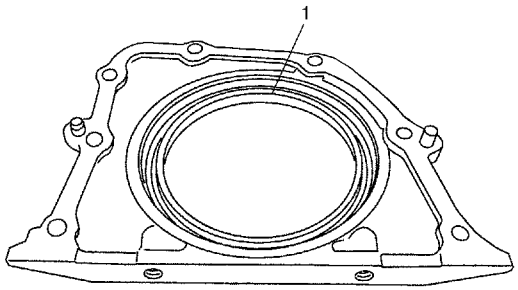


I2RH0B140151-

Rear Oil Seal Inspection

S4RS0A1406040

Carefully inspect oil seal (1) for wear or damage. If its lip is worn or damaged, replace it.



I4RS0A140020-

Flywheel Inspection

S4RS0A1406041

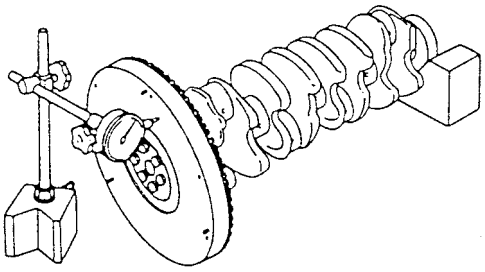
Visual Inspection

- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.

Flywheel Face Runout

Check flywheel face runout with a dial gauge.
If runout exceeds its limit, replace flywheel.

Flywheel face runout
Limit: 0.2 mm (0.0079 in.)



I2RH01140198-

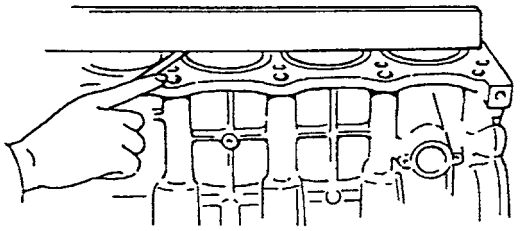
Cylinder Block Inspection

S4RS0A1406042

Distortion of Gasketed Surface

Using straightedge and thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct It.

Cylinder block flatness
Limit: 0.03 mm (0.0012 in.)



I2RH01140199-

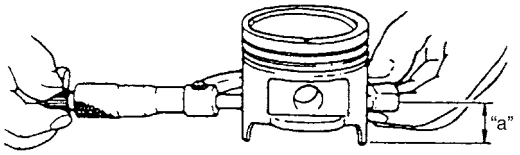
Honing or Reboring Cylinders

1) When any cylinder needs reboring, all other cylinders must also be rebored at the same time.
2) Select oversized piston according to amount of cylinder wear.

   Oversize piston specification
   Oversize 0.50: 78.453 – 78.468 mm (3.0887 – 3.0893 in.)

3) Using micrometer, measure piston diameter.

   Measurement position for piston diameter
   "a": 19.5 mm (0.77 in.)



I2RH01140157-

4) Rebore and hone cylinder to the following dimension.

   NOTE:

   Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

   Cylinder bore diameter to be rebored
   Oversize 0.50: 78.500 – 78.514 mm (3.0906 – 3.0911 in.)

5) Measure piston clearance after honing.

   Piston clearance
   0.032 – 0.061 mm (0.0013 – 0.0024 in.)

Specifications

Tightening Torque Specifications

S4RS0A1407001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Camshaft housing bolts	8	0.8	6.0	(for tightening of special tool) ☞
Camshaft housing bolt	11	1.1	8.0	☞ / ☞ / ☞
Cylinder head cover bolt	8	0.8	6.0	☞
Accelerator cable locking nut	12	1.2	9.0	☞
EVAP canister purge valve bracket bolt	5	0.5	4.0	☞
Engine left mounting bracket nut	55	5.5	40.0	☞
Engine right mounting nut	65	6.5	47.0	☞
Engine rear mounting bush bolt	55	5.5	40.0	☞
Starting motor terminal nut	11	1.1	8.0	☞
Generator terminal nut	6	0.6	4.5	☞
Timing chain cover bolt	25	2.5	18.0	☞
Timing chain cover nut	25	2.5	18.0	☞
Cap bolt	25	2.5	18.0	☞
Oil gallery pipe No.2 and No.3 bolt	11	1.1	8.0	☞
Crankshaft pulley bolt	150	15.0	108.5	☞
Oil control valve mounting nut	11	1.1	8.0	☞
Oil gallery pipe No.1 bolt	30	3.0	21.5	☞
Timing chain No.1 guide bolt	11	1.1	8.0	☞
Timing chain tensioner bolt	25	2.5	18.0	☞
Timing chain tensioner adjuster bolt	11	1.1	8.0	☞
Intake cam timing sprocket bolt	60	6.0	43.5	☞
Venturi plug	5	0.5	3.5	☞
Cylinder head bolt for M8	25	2.5	18.0	☞
Cylinder head bolt for M10	20 N·m (2.0 kg-m, 14.5 lb-ft), 40 N·m (4.0 kg-m, 29.0 lb-ft) and then retighten by turning through to 60° twice			☞
Connecting rod bearing cap nut	15 N·m (1.5 kg-m, 11.0 lb-ft) and then retighten by turning through 45° twice			☞ / ☞
Sensor plate bolt	11	1.1	8.0	☞
Main bearing cap No.1 bolt ((1) – (10))	30 N·m (3.0 kg-m, 22.0 lb-ft), 50 N·m (5.0 kg-m, 36.5 lb-ft) and then retighten by turning through 60°			☞ / ☞ / ☞
Main bearing cap No.2 bolt ((11) – (20))	25	2.5	18.0	☞ / ☞ / ☞
Rear oil seal housing bolt	11	1.1	8.0	☞
Flywheel bolt	70	7.0	51.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Throttle Body Components: ”
“Throttle Body and Intake Manifold Components: ”
“Engine Mountings Components: ”
“Timing Chain Cover Components: ”
“Timing Chain and Chain Tensioner Components: ”
“Camshaft, Tappet and Shim Components: ”
“Valves and Cylinder Head Components: ”
“Pistons, Piston Rings, Connecting Rods and Cylinders Components: ”
“Main Bearings, Crankshaft and Cylinder Block Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A1408001

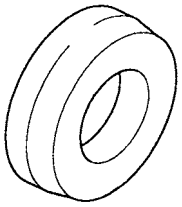
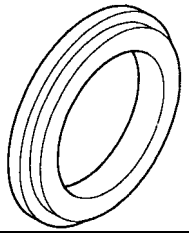
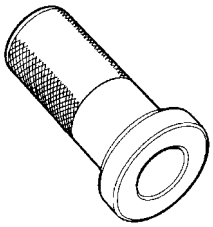
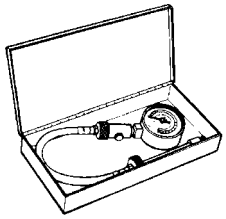
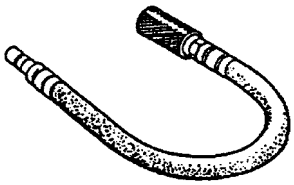
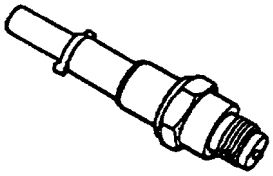
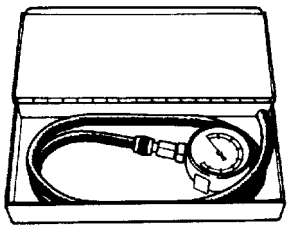
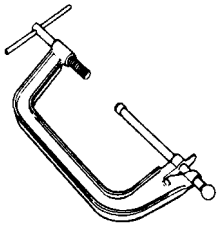
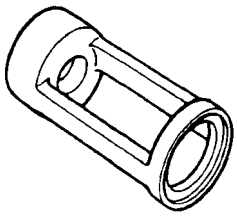
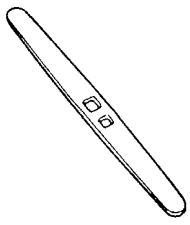
Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1207B	P/No.: 99000–31140	☞
	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞
Water tight sealant	SUZUKI Bond No.1207F	P/No.: 99000–31250	☞ / ☞ / ☞

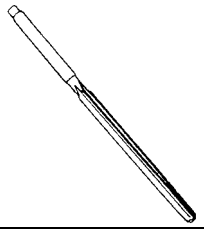
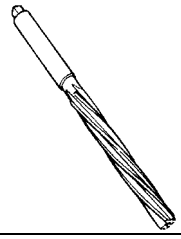
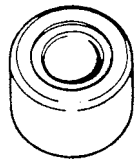
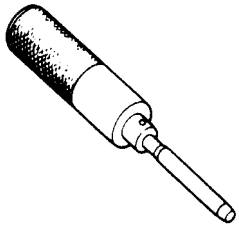
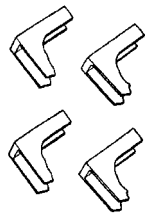
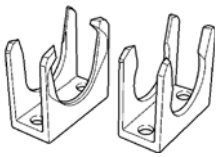
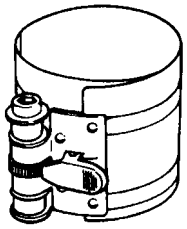
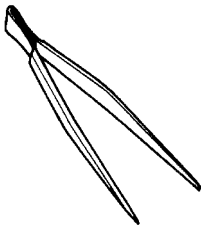
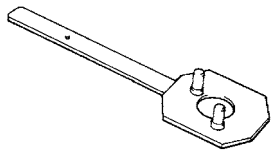
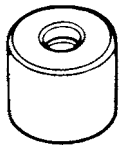
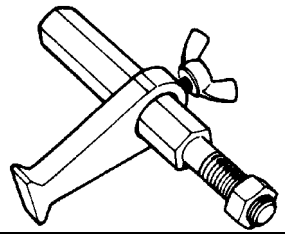
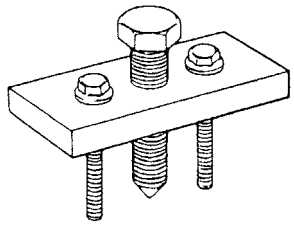
NOTE:

Required service material is also described in the following.
“Timing Chain Cover Components: ”
“Timing Chain and Chain Tensioner Components: ”
“Camshaft, Tappet and Shim Components: ”
“Valves and Cylinder Head Components: ”
“Pistons, Piston Rings, Connecting Rods and Cylinders Components: ”
“Main Bearings, Crankshaft and Cylinder Block Components: ”

Special Tool

S4RS0A1408002

09911–97720 Oil seal installer ☞ 	09911–97820 Oil seal installer ☞ 
09913–75810 Bearing installer ☞ 	09915–64512 Compression gauge ☞ 
09915–64530 Compression gauge hose ☞ 	09915–67010 Compression gauge attachment (C) ☞ 
09915–67311 Vacuum gauge ☞ 	09916–14510 Valve lifter ☞ / ☞ 
09916–14521 Valve spring compressor attachment ☞ / ☞ 	09916–34542 Reamer handle ☞ / ☞ 

09916–34550 Reamer handle ☞ 	09916–37320 Valve guide outer reamer (10.5 mm) ☞ 
09916–44910 Valve guide installer & remover ☞ 	09916–56011 Valve guide installer attachment (protrusion: 11.5 mm) ☞ 
09916–58210 Valve guide installer handle ☞ / ☞ 	09916–67020 Tappet holder (Overseas) ☞ / ☞ 
09916–67021 Tappet holder ☞ / ☞ 	09916–77310 Piston ring compressor (50-125 mm) ☞ 
09916–84511 Forceps ☞ / ☞ 	09917–68221 Camshaft pulley holder ☞ / ☞ 
09917–98221 Valve guide stem attachment ☞ 	09924–17810 Flywheel holder (drive plate stopper) ☞ / ☞ 
09926–58010 Bearing remover attachment ☞ 	09944–36011 Steering wheel remover ☞ 

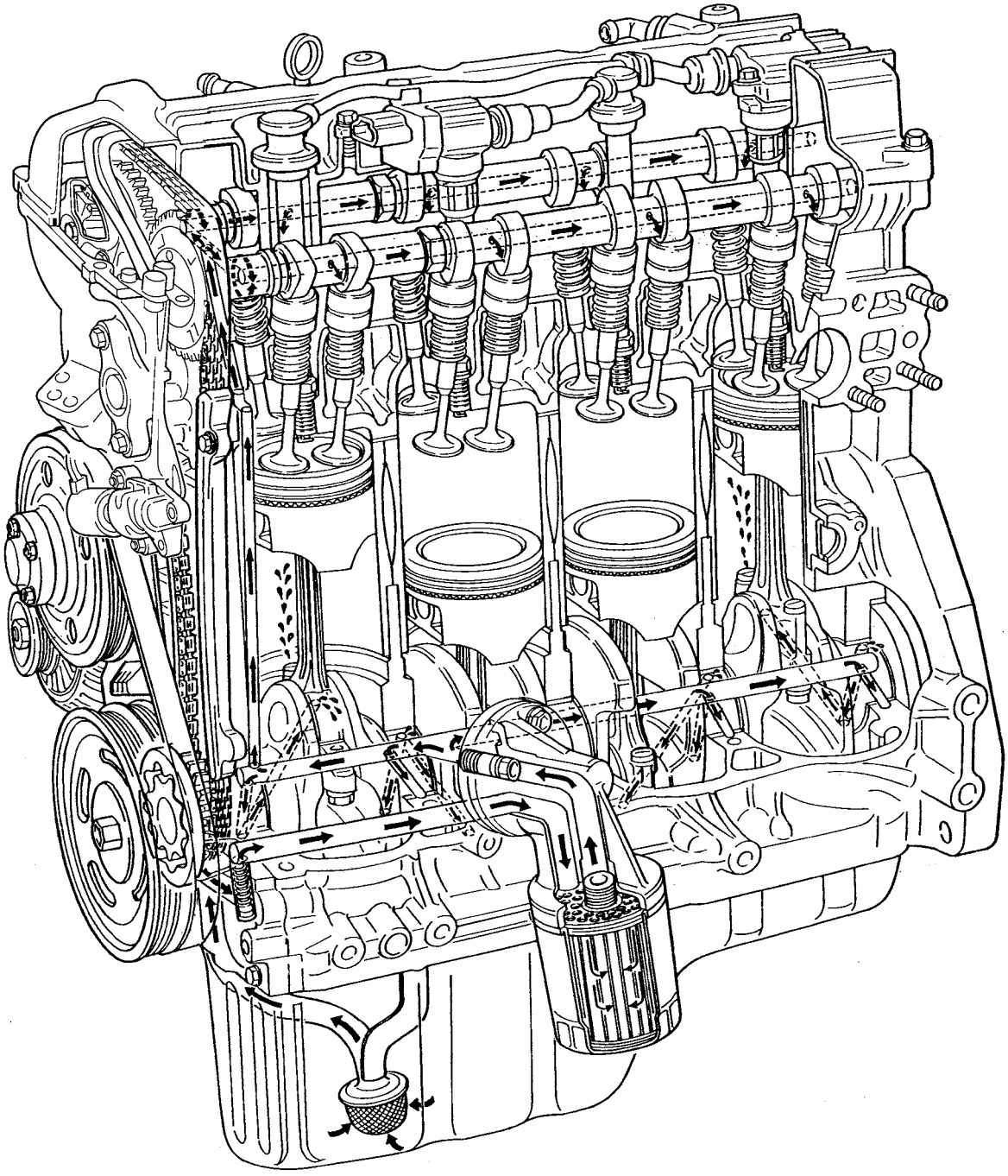
Engine Lubrication System

General Description

Engine Lubrication Description

S4RS0A1501001

The oil pump is of a trochoid type, and mounted on the crankshaft. Oil is drawn up through the oil pump strainer and passed through the pump to the oil filter.
The filtered oil flows into two paths in cylinder block.
In one path, oil reaches the crankshaft journal bearings. Oil from the crankshaft journal bearings is supplied to the connecting rod bearings by means of intersecting passages drilled in the crankshaft, and then injected from the big end of connecting rod to lubricate piston, rings and cylinder wall.
In the other path oil goes up to the cylinder head and lubricates valves and camshafts, etc., after passing through the internal oilway of camshafts.
An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure exceeds about 350 kPa (3.5 kg/cm^2, 49.8 psi).



I3RH0B150001-

Diagnostic Information and Procedures

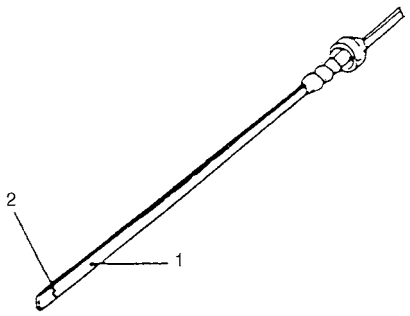
Oil Pressure Check

S4RS0A1504001

NOTE:

Prior to checking oil pressure, check the following.

- **Oil level in oil pan**
  If oil level is low, add oil up to Full level mark (hole) (1) on oil level gauge referring to "Engine Oil and Filter Change: in Section 0B".

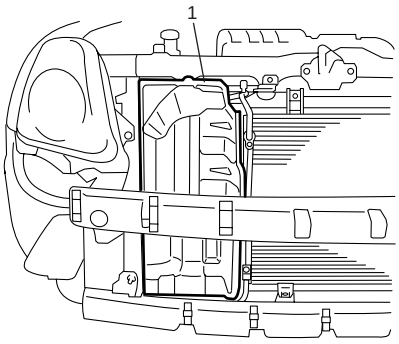


I2RH0B150002-

2. Low level mark (hole)

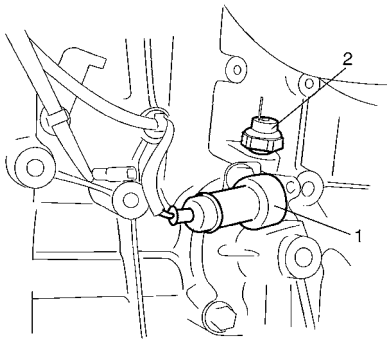
- **Oil quality**
  If oil is discolored or deteriorated, change it. For particular oil to be used, refer to "Engine Oil and Filter Change: in Section 0B".
- **Oil leaks**
  If leak is found, repair it.

1) Remove front bumper referring to "Front Bumper and Rear Bumper Components: in Section 9K".
2) Remove engine front cover (1).



I4RS0A150001-

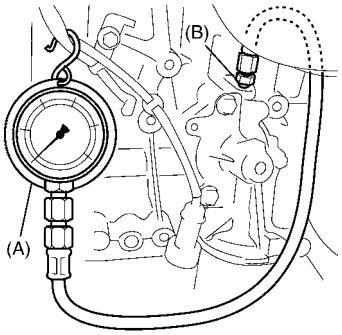
3) Disconnect oil pressure switch coupler (1).
4) Remove oil pressure switch (2) from cylinder block.



I2RH0B150003-

5) Install special tools (oil pressure gauge) to vacated threaded hole of oil pressure switch.

Special tool
(A): 09915–77310
(B): 09915–78211



I2RH0B150004-

6) Start engine and warm engine up to normal operating temperature.

NOTE:

Be sure to shift transaxle gear shift lever in "Neutral" (shift select lever in "P" range for A/T vehicle), set parking brake and block drive wheels.

7) After warming up, raise engine speed to 4,000 r/min. and measure oil pressure.

Oil pressure specification
More than 270 kPa (2.7 kg/cm^2, 39.8 psi) at 4,000 r/min. (rpm)

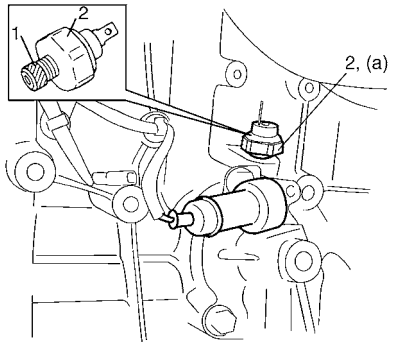
8) After checking oil pressure, stop engine and remove oil pressure gauge and attachment.

9) Before reinstalling oil pressure switch (2), be sure to wrap its screw threads with sealing tape (1) and tighten switch to specified torque.

NOTE:

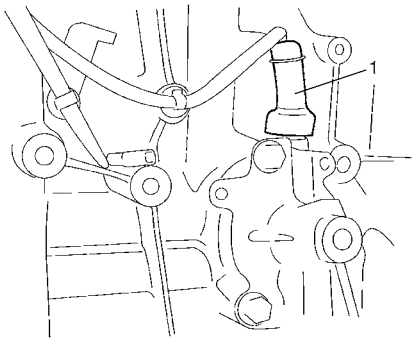
If sealing tape edge is bulged out from screw threads of switch, cut it off.

Tightening torque
Oil pressure switch (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I2RH0B150005-

10) Start engine and check oil pressure switch for oil leakage. If oil leakage is found, repair it.
11) Connect oil pressure switch coupler (1).

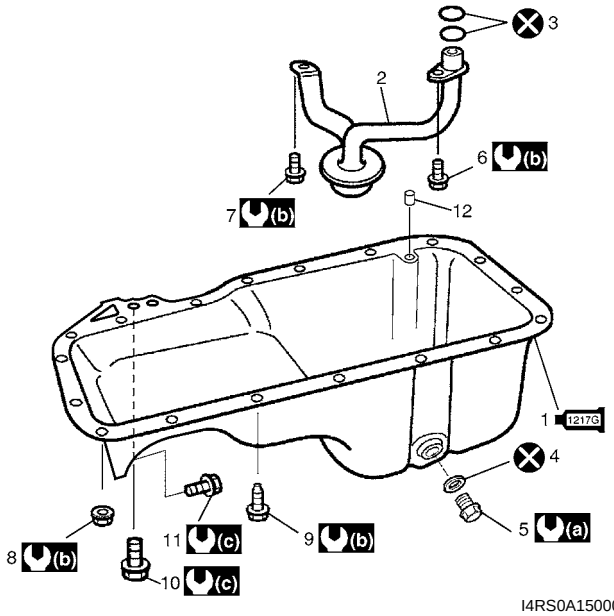


I2RH0B150006-

Repair Instructions

Oil Pan and Oil Pump Strainer Components

S4RS0A1506001



I4RS0A150002-

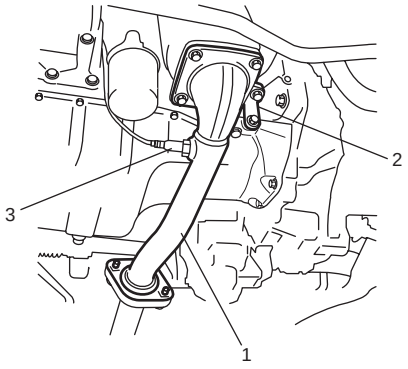
1217G 1. Oil pan : Apply sealant 99000-31260 to mating surface.	6. Strainer bolt	11. Transaxle stiffener bolt
2. Strainer	7. Bracket bolt	(a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
3. O-ring	8. Oil pan nut	(b) : Tighten 11 N·m (1.1 kg-m, 8.0 lb-ft) by the specified procedure.
4. Gasket	9. Oil pan bolt (M6)	(c) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
5. Drain plug	10. Oil pan bolt (M10)	: Do not reuse.

Oil Pan and Oil Pump Strainer Removal and Installation

S4RS0A1506002

Removal

1) Remove oil level gauge.
2) Drain engine oil by removing drain plug.
3) Remove exhaust No.1 pipe (1), exhaust manifold stiffener (2) and heated oxygen sensor No.1 (connector color: green) (3) referring to “Exhaust System Components: in Section 1K”.

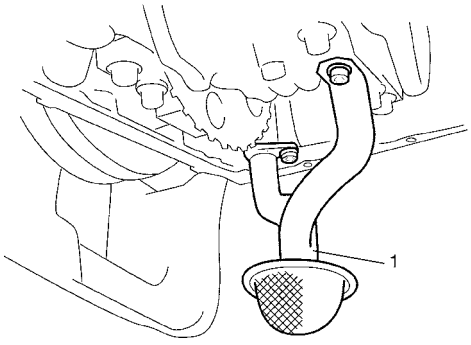


I4RS0A150003-

4) Remove clutch housing lower plate (1).

I4RS0A150004-

5) Remove oil pan and then oil pump strainer (1) from cylinder block.

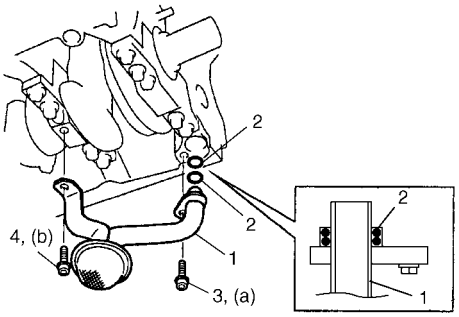


I2RH0B150010-

Installation

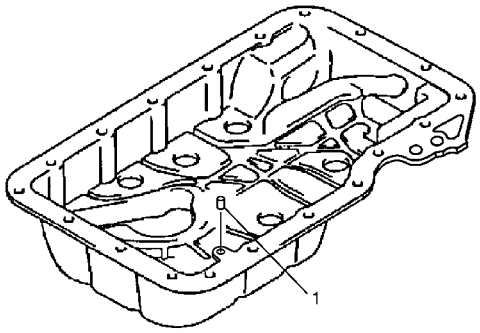
1) Install new O-rings (2) in the position as shown in the figure and install oil pump strainer (1).
Tighten strainer bolt (3) first and then bracket bolt (4) to specified torque.

Tightening torque
Oil pump strainer bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)
Oil pump strainer bracket bolt (b): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I2RH0B150012-

2) Install dowel pin (1) to oil pan.

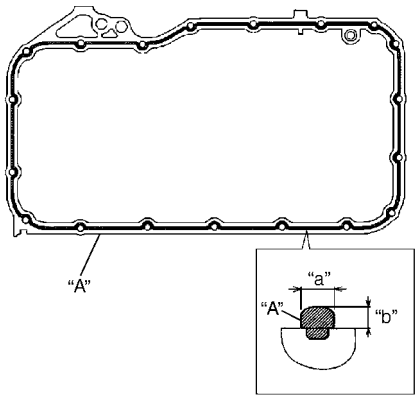


I4RS0A150005-

3) Apply sealant continuously to oil pan mating surface as shown in the figure.

“A”: Sealant 99000–31260

Sealant amount for oil pan
Width “a”: 3 mm (0.12 in.)
Height “b”: 2 mm (0.08 in.)

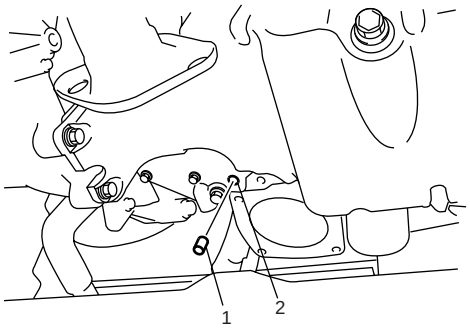


I4RS0A150006-

4) Install oil pan to cylinder block temporarily.
5) Insert knock pin (1) in hole (2) of oil pan in order to locate oil pan precisely.

NOTE:

Knock pin is available as a spare part (part number: 04211–13189).



I4RS0A150007-

6) After fitting oil pan to cylinder block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time. Tighten bolts and nuts to specified torque.

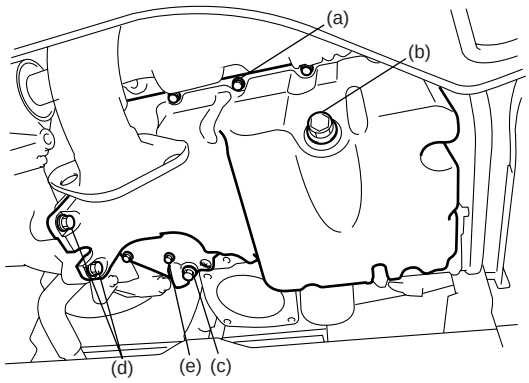
Tightening torque
Oil pan bolt (M6) (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)
Oil pan bolt (M10) (c): 55 N·m (5.5 kg-m, 40.0 lb-ft)
Oil pan nut (e): 11 N·m (1.1 kg-m, 8.0 lb-ft)

7) Install new gasket and drain plug to oil pan. Tighten drain plug to specified torque.

Tightening torque
Oil pan drain plug (b): 35 N·m (3.5 kg-m, 25.5 lb-ft)

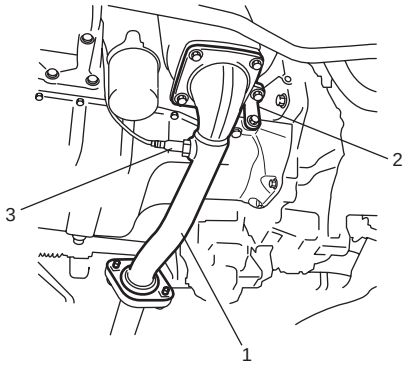
8) Tighten transaxle stiffener bolts to specified torque.

Tightening torque
Transaxle stiffener bolt (d): 55 N·m (5.5 kg-m, 40.0 lb-ft)



I4RS0A150008-

9) Install exhaust manifold stiffener (2) and exhaust No.1 pipe (1) and heated oxygen sensor No.1 (connector color: green) (3) referring to “Exhaust System Components: in Section 1K”.



I4RS0A150003-

10) Install clutch housing lower plate (1).

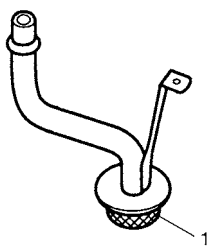
I4RS0A150004-

11) Install oil level gauge.
12) Refill engine with engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
13) Verify that there is no engine oil leakage and exhaust gas leakage at each connection.

Oil Pan and Oil Pump Strainer Cleaning

S4RS0A1506003

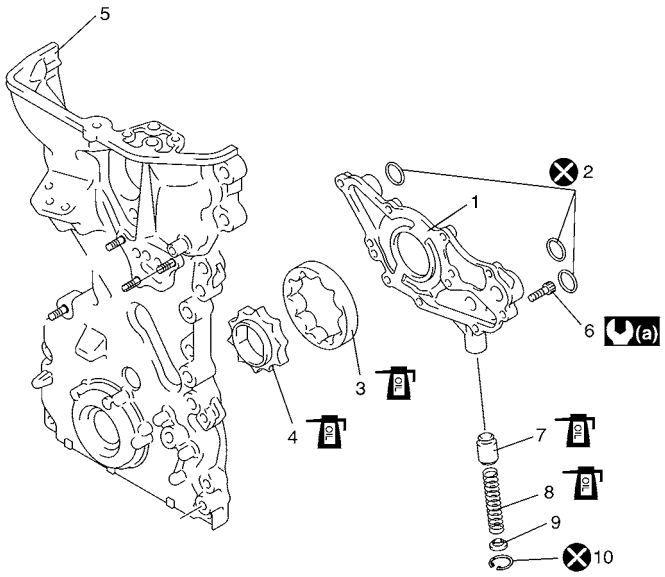
- Clean sealing surface between oil pan and cylinder block.
  Remove oil, old sealant, and dust from sealing surface.
- Clean oil pump strainer screen (1).



I2RH0B150016-

Oil Pump Components

S4RS0A1506004



I4RS0A150010-

1. Rotor plate	6. Rotor plate bolt	10. Circlip
2. O-ring	7. Relief valve	(a) : 11 N·m (1.1 kg-mm 8.0 lb-ft)
3. Outer rotor	8. Spring	: Do not reuse.
4. Inner rotor	9. Retainer	: Apply thin coat of engine oil to sliding surface.
5. Timing chain cover	10. Circlip	

Oil Pump Removal and Installation

S4RS0A1506005

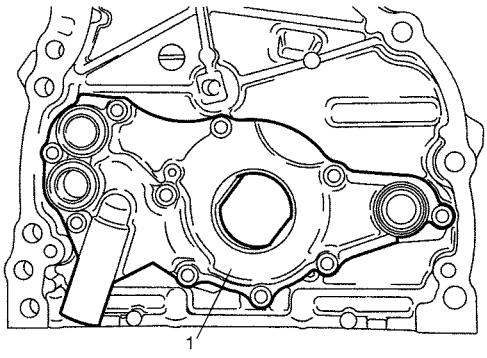
Oil pump is incorporated with timing chain cover.
For removal and installation, refer to “Timing Chain Cover Removal and Installation: in Section 1D”.

Oil Pump Disassembly and Reassembly

S4RS0A1506006

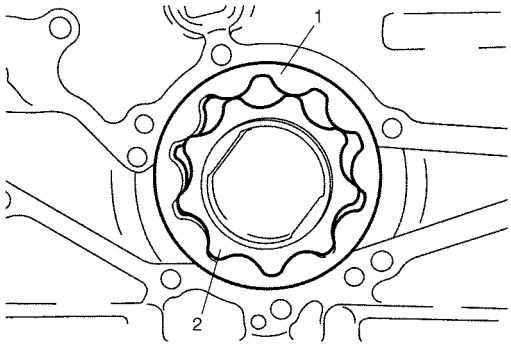
Disassembly

1) Remove rotor plate (1) by removing its mounting bolts.



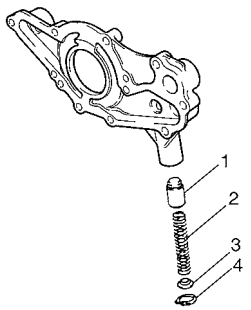
I2RH0B150018-

2) Remove outer rotor (1) and inner rotor (2).



I2RH0B150019-

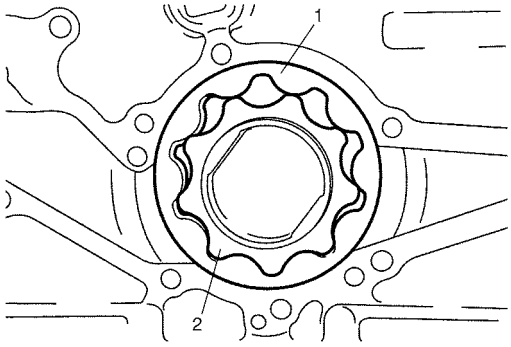
3) Remove relief valve (1), spring (2) and retainer (3) by removing circlip (4).



I2RH0B150020-

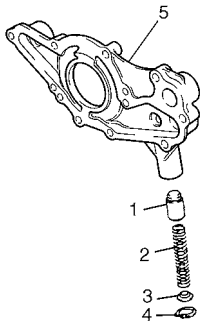
Reassembly

1) Wash, clean and then dry all disassembled parts.
2) Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, inside surfaces of oil pump case and plate.
3) Install outer (1) and inner rotors (2) to oil pump case.



I2RH0B150019-

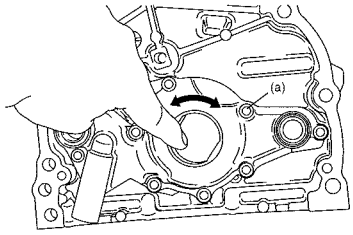
4) Apply engine oil to relief valve (1) and spring (2), and install them with retainer (3) and new circlip (4) to rotor plate (5).



I3RM0A150005-

5) Install rotor plate and tighten all bolts to specified torque. After installing plate, check to be sure that rotors turn smoothly by hand (0.3 N·m (0.03 kg-m, 0.25 lb-ft) torque or below).

Tightening torque
Oil pump rotor plate bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



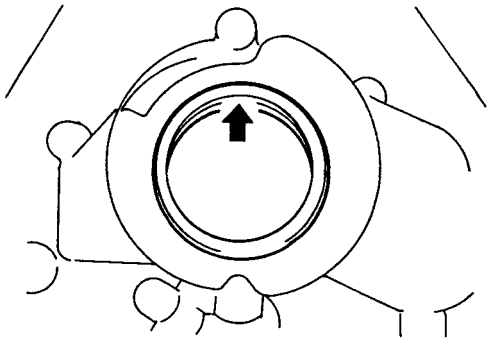
I2RH0B150022-

Oil Pump Inspection

S4RS0A1506007

Oil Seal

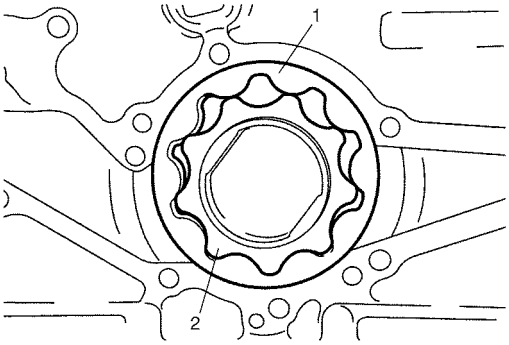
Check oil seal lip for fault or other damage. Replace as necessary.



I2RH0B150023-

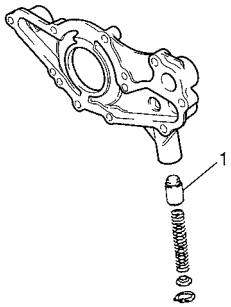
Oil Pump

- Check outer (1) and inner rotors (2), rotor plate, and oil pump case for excessive wear or damage.



I2RH0B150019-

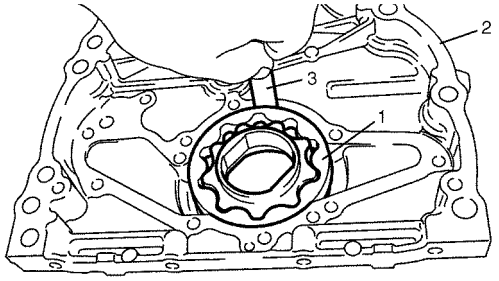
- Check relief valve (1) for excessive wear or damage and operates smoothly.



I2RH0B150025-

Radial clearance
Check radial clearance between outer rotor (1) and case (2) using thickness gauge (3).
If clearance exceeds its limit, replace outer rotor or case.

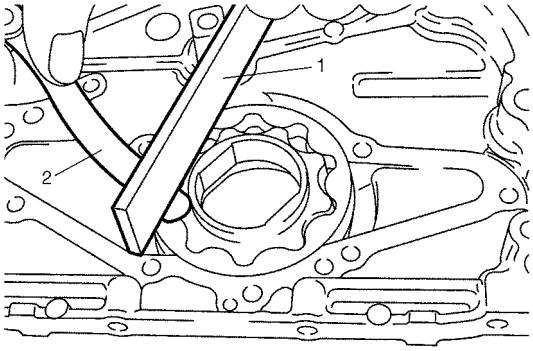
Radial clearance between outer rotor and case for oil pump
Limit: 0.310 mm (0.0122 in.)



I2RH0B150026-

Side clearance
Using straightedge (1) and thickness gauge (2), measure side clearance.
If side clearance exceeds its limit, replace oil pump assembly.

Side clearance for oil pump inner rotor
Limit: 0.15 mm (0.0059 in.)

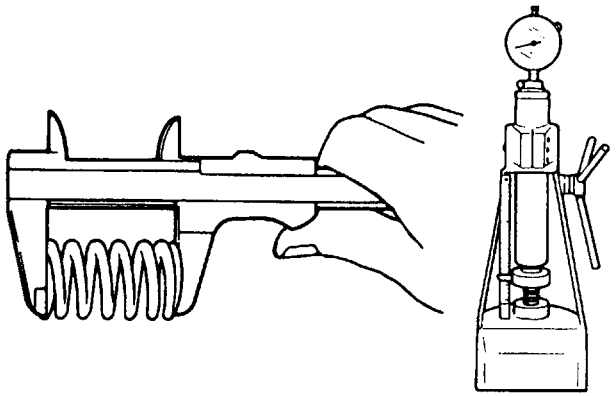


I2RH0B150027-

Relief valve spring free length and load
Check relief valve spring free length and load as shown in the figure. If the measured valve spring length is lower than the specification, replace relief valve spring.

Relief valve spring free length and load

	Standard	Limit
Free length	52.4 mm (2.06 in.)	—
Load at spring length 38.5 mm (1.52 in.)	77 N (7.7 kgf, 17.0 lb)	69 N (6.9 kgf, 15.0 lb)



I2RH01150023-

Specifications

Tightening Torque Specifications

S4RS0A1507001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Oil pressure switch	13	1.3	9.5	☞
Oil pump strainer bolt	11	1.1	8.0	☞
Oil pump strainer bracket bolt	11	1.1	8.0	☞
Oil pan bolt (M6)	11	1.1	8.0	☞
Oil pan bolt (M10)	55	5.5	40.0	☞
Oil pan nut	11	1.1	8.0	☞
Oil pan drain plug	35	3.5	25.5	☞
Transaxle stiffener bolt	55	5.5	40.0	☞
Oil pump rotor plate bolt	11	1.1	8.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Oil Pan and Oil Pump Strainer Components: ”
“Oil Pump Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A1508001

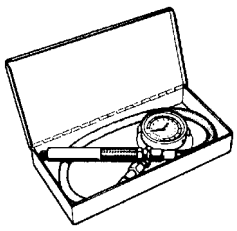
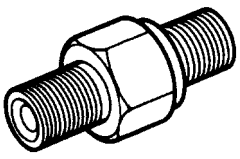
Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞

NOTE:

Required service material is also described in the following.
“Oil Pan and Oil Pump Strainer Components: ”
“Oil Pump Components: ”

Special Tool

S4RS0A1508002

09915–77310 Oil pressure gauge (0-10kg/cm2) ☞		09915–78211 Oil pressure gauge attachment ☞	

Engine Cooling System

General Description

Cooling System Description

S4RS0A1601001

The cooling system consists of the radiator cap, radiator, coolant reservoir, hoses, water pump, cooling fan and thermostat. The radiator is of tube-and-fin type.

Coolant Description

S4RS0A1601002

WARNING:

- **Do not remove radiator cap to check engine coolant level; check coolant visually at the see-through coolant reservoir. Coolant should be added only to reservoir as necessary.**
- **As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.**
- **Check to make sure that engine coolant temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cable from battery terminal before removing any part.**

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the coolant is overflowed to the reservoir.
When the system cools down, the coolant is drawn back into the radiator.
The cooling system has been filled with a quality coolant that is a 50/50 mixture of water and ethylene glycol antifreeze.
This 50/50 mixture coolant solution provides freezing protection to –36 °C (–33 °F).

- Maintain cooling system freeze protection at –36 °C (–33 °F) to ensure protection against corrosion and loss of coolant from boiling. This should be done even if freezing temperatures are not expected.
- Add ethylene glycol base coolant when coolant has to be added because of coolant loss or to provide added protection against freezing at temperature lower than –36 °C (–33 °F).

NOTE:

- **Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Coolant must be mixed with deminerated water or distilled water.**

Anti-freeze proportioning table

		For M/T vehicle	For A/T vehicle
Freezing temperature	°C	–36	–36
	°F	–33	–33
Anti-freeze / Anti-corrosion coolant concentration	%	50	50
Ratio of compound to cooling water	ltr.	3.10/3.10	3.05/3.05
	US pt.	6.55/6.55	6.44/6.44
	Imp pt.	5.46/5.46	5.37/5.37

Coolant capacity

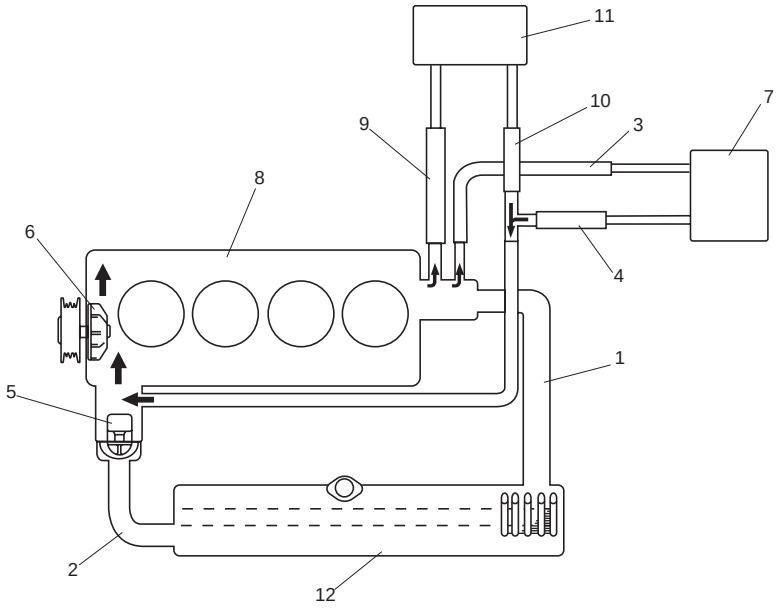
- **For M/T vehicle**
  Engine, radiator and heater: 5.5 liters (11.62/9.68 US/Imp pt.)
  Reservoir: 0.7 liters (1.48/1.23 US/Imp pt.)
  Total: 6.2 liters (13.10/10.91 US/Imp pt.)
- **For A/T vehicle**
  Engine, radiator and heater: 5.4 liters (11.41/9.50 US/Imp pt.)
  Reservoir: 0.7 liters (1.48/1.23 US/Imp pt.)
  Total: 6.1 liters (12.89/10.74 US/Imp pt.)

Schematic and Routing Diagram

Coolant Circulation

S4RS0A1602001

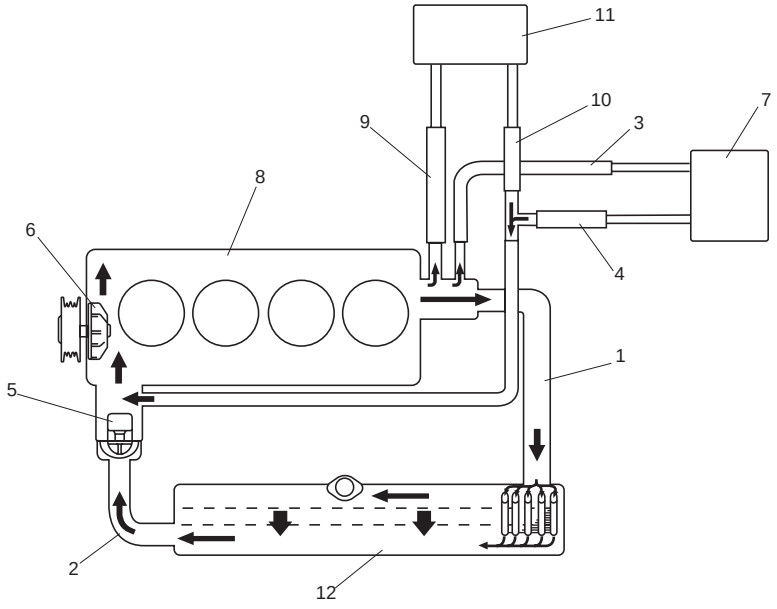
While the engine is warmed up (thermostat closed), coolant circulates as follows.



I3RM0A160001-

1. Radiator inlet hose	5. Thermostat	9. Heater core inlet hose
2. Radiator outlet hose	6. Water pump	10. Heater core outlet hose
3. Throttle body inlet hose	7. Throttle body	11. Heater core
4. Throttle body outlet hose	8. Engine	12. Radiator

When coolant is warmed up to normal temperature and the thermostat opens, coolant passes through the radiator core to be cooled as follows.



I3RM0A160002-

1. Radiator inlet hose	5. Thermostat	9. Heater core inlet hose
2. Radiator outlet hose	6. Water pump	10. Heater core outlet hose
3. Throttle body inlet hose	7. Throttle body	11. Heater core
4. Throttle body outlet hose	8. Engine	12. Radiator

Diagnostic Information and Procedures

Engine Cooling Symptom Diagnosis

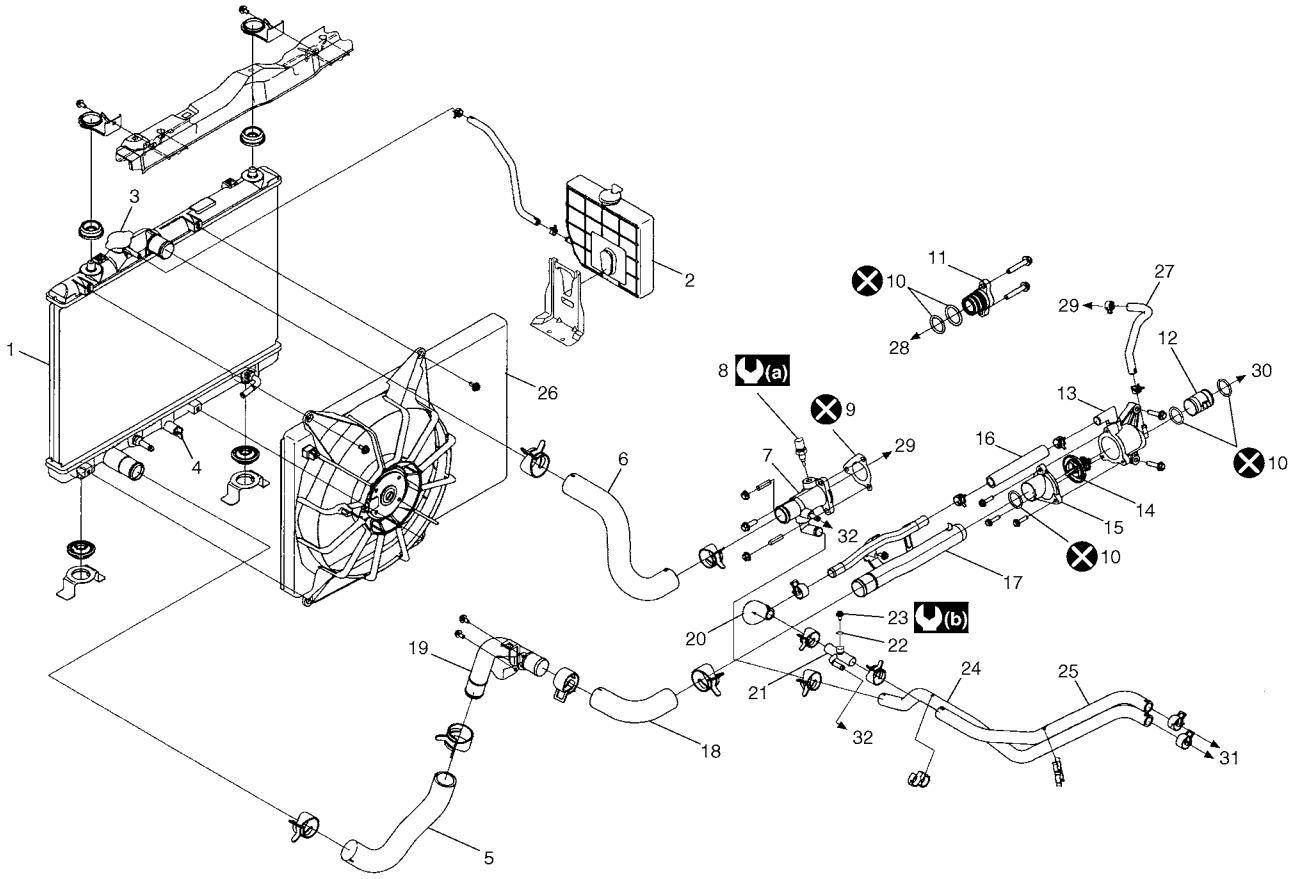
S4RS0A1604001

Condition	Possible cause	Correction / Reference Item
Engine overheats (Radiator fan operates)	Loose or broken water pump belt	*Adjust or replace.*
	Not enough coolant	*Check coolant level and add as necessary.*
	Faulty thermostat	*Replace.*
	Faulty water pump	*Replace.*
	Dirty or bent radiator fins	*Clean or remedy.*
	Coolant leakage on cooling system	*Repair.*
	Clogged radiator	*Check and replace radiator as necessary.*
	Faulty radiator cap	*Replace.*
	Improper ignition timing	*Adjust.*
	Dragging brakes	*Adjust brake.*
	Slipping clutch	*Adjust or replace.*
	Poor charge battery	*Check and replace as necessary.*
	Poor generation generator	*Check and repair.*
	ECT sensor faulty	*Check and replace as necessary.*
	Radiator cooling fan relay No.2 and/or No.3 faulty	*Check and replace as necessary.*
	Radiator fan motor faulty	*Check and replace as necessary.*
	ECM faulty	*Check and replace as necessary.*
	Wiring or grounding faulty	*Repair as necessary.*
	Equipped with too much electric load part(s)	*Dismount.*
Engine overheats (Radiator fan does not operate)	Fuse blown	*Check 30 A fuse of relay/fuse box and check for short circuit to ground.*
	Radiator cooling fan relay No.1 faulty	*Check and replace as necessary.*
	ECT sensor faulty	*Check and replace as necessary.*
	Radiator cooling fan motor faulty	*Check and replace as necessary.*
	Wiring or grounding faulty	*Repair as necessary.*
	ECM faulty	*Check and replace as necessary.*

Repair Instructions

Cooling System Components

S4RS0A1606001



I4RS0A160001-

1. Radiator	13. Thermostat case	25. Heater outlet No.1 hose
2. Reservoir	14. Thermostat	26. Engine cooling fan assembly
3. Radiator cap	15. Thermostat cap	27. Water bypass No.2 hose
4. Drain plug	16. Water bypass No.1 hose	28. To timing chain cover
5. Radiator outlet hose	17. Water inlet No.1 pipe	29. To cylinder head
6. Radiator inlet hose	18. Water inlet hose	30. To water pump
7. Water outlet cap	19. Water inlet No.2 pipe	31. To heater core
8. ECT sensor	20. Heater outlet No.2 hose	32. To throttle body
9. Water outlet cap gasket	21. Heater union	(a) : 15 N·m (1.5 kg-m, 11.0 lb-ft)
10. O-ring	22. Heater union gasket	(b) : 4.5 N·m (0.45 kg-m, 3.5 lb-ft)
11. Water outlet plug	23. Air ventilation bolt	: Do not reuse.
12. Thermostat case water outlet pipe	24. Heater inlet hose	

Coolant Level Check

S4RS0A1606002

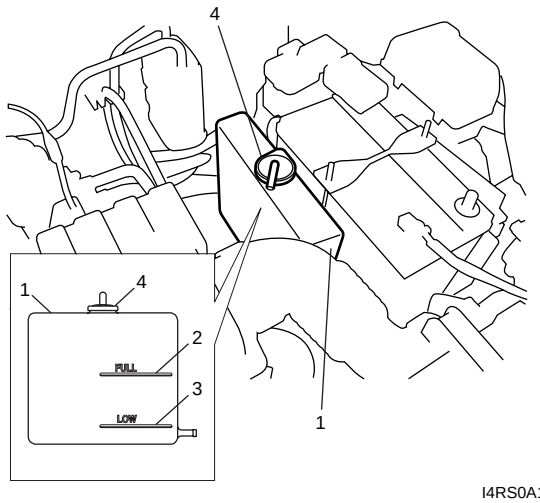
WARNING:

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if radiator cap is taken off too soon.

To check level, lift hood and look at “see-through” coolant reservoir.
It is not necessary to remove radiator cap to check coolant level.
When engine is cool, check coolant level in reservoir (1). A normal coolant level should be between FULL mark (2) and LOW mark (3) on reservoir (1).
If coolant level is below LOW mark (3), remove reservoir cap (4) and add proper coolant to reservoir to bring coolant level up to FULL mark (2).

NOTE:

If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.



I4RS0A160002-

Engine Cooling System Inspection and Cleaning

S4RS0A1606003

WARNING:

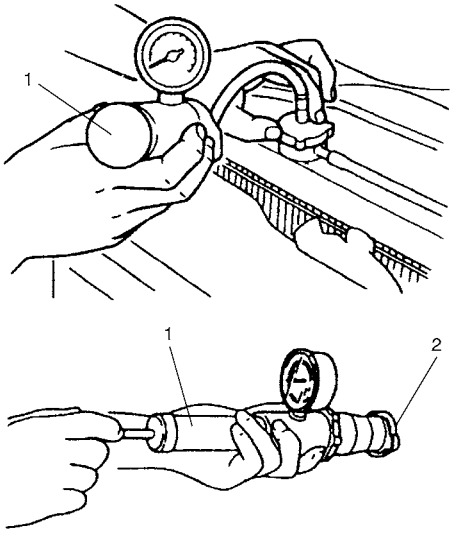
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

1) Check cooling system for leakage or damage.
2) Wash radiator cap and filler neck with clean water by removing radiator cap when engine is cold.
3) Check coolant for proper level and freeze protection.
4) Using a pressure tester (1), check system and radiator cap (2) for proper pressure holding capacity. If replacement of cap is required, use a proper cap for this vehicle.

NOTE:

After installing radiator cap to radiator, make sure that the ear of cap lines is parallel to radiator.

Cooling system and radiator cap holding pressure (for inspection)
110 kPa (1.1 kg/cm^2, 15.6 psi)



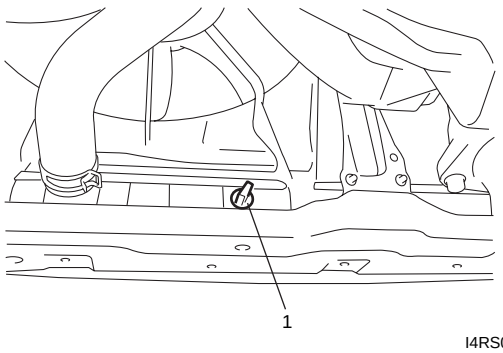
I5RH01160001-

5) Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
6) Clean frontal area of radiator core.

Cooling System Draining

S4RS0A1606019

1) Remove radiator cap.
2) Drain coolant from radiator drain plug (1).
3) After draining coolant, be sure to tighten drain plug (1) securely.



I4RS0A160003-

Cooling System Flush and Refill

S4RS0A1606004

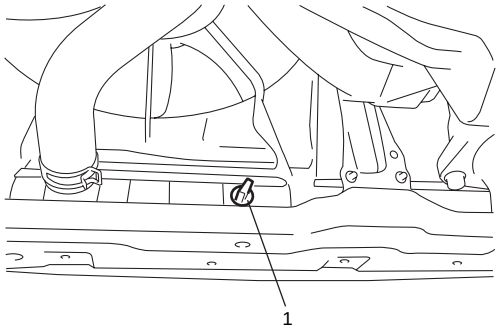
WARNING:

To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

NOTE:

For detail of coolant specification, refer to "Coolant Description: ".

1) Remove radiator cap when engine is cool as follows.
   a) Turn cap counterclockwise slowly until it reaches a "stop" (Do not press down while turning it).
   b) Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it counterclockwise.
2) With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).
3) Stop engine and drain coolant from radiator drain plug (1).
4) Close radiator drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
5) Repeat Steps 3) and 4) several times until drained liquid is nearly colorless.
6) Close radiator drain plug (1) tightly.



I4RS0A160003-

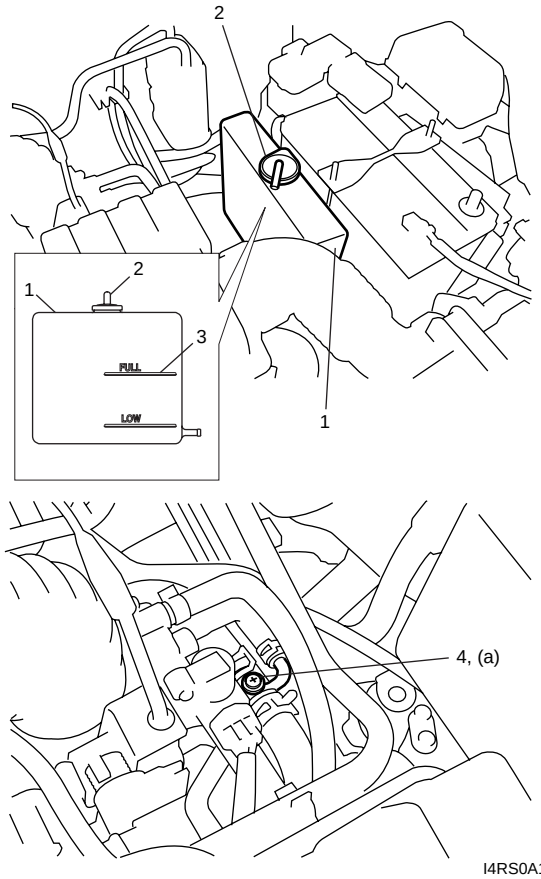
7) Remove reservoir (1) and remove cap (2) from reservoir (1).
8) Pour out any fluid, scrub and clean inside of reservoir with soap and water.
   Flush it well with clean water and drain, Reinstall reservoir.
9) Fill reservoir with coolant up to "Full" level mark (3).
10) Install reservoir cap (2) on reservoir.
11) Loosen air ventilation bolt (4) one and a half turns.
12) Fill radiator with coolant up to spilling coolant from air ventilation bolt (4).
13) Tighten air ventilation bolt (4) to specified torque.

    Tightening torque
    Air ventilation bolt (a): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

14) Fill radiator with coolant up to bottom of radiator filler neck and install radiator cap, making sure that the ear of cap lines is parallel to radiator.
15) Run engine at idle speed.
16) Loosen air ventilation bolt (4) one and a half turns.
17) Run engine at 2000 – 3000 rpm, and tighten air ventilation bolt (4) to specified torque after spilling coolant from air ventilation bolt (4).

    Tightening torque
    Air ventilation bolt (a): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

18) Run engine until radiator fan motor is operated.
19) Stop engine and wait until engine comes cooled down to help avoid danger of being burned.
20) Add coolant to radiator up to bottom of radiator filler neck, and install radiator cap, making sure that the ear of cap lines is parallel to radiator.
21) Repeat Step 15) through 20).
22) Confirm that reservoir coolant level is "Full" level mark (3). If coolant is insufficient, repeat Step 9) and 10).



I4RS0A160004-

Cooling Water Pipes or Hoses Removal and Installation

S4RS0A1606005

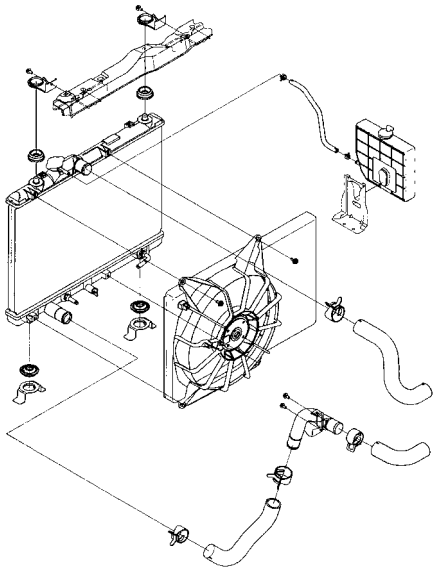
Removal

1) Drain coolant referring to “Cooling System Draining: ”.
2) To remove these pipes or hoses, loosen clamp on each hose and pull hose end off.

Installation

Install removed parts in reverse order of removal procedure, noting the following.

- Tighten each clamp securely.
- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.



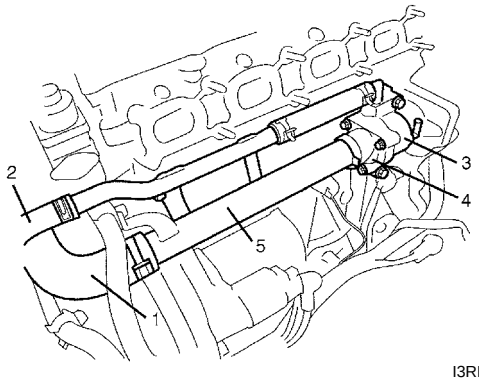
I4RS0A160005-

Thermostat Removal and Installation

S4RS0A1606006

Removal

1) Drain coolant referring to “Cooling System Draining: ”.
2) Remove intake manifold referring to “Intake Manifold Removal and Installation: in Section 1D”.
3) Remove generator referring to “Generator Dismounting and Remounting: in Section 1J”.
4) Disconnect water hose (1) and heater hose (2) from each pipe.
5) Remove thermostat case (3) with thermostat cap (4) and water inlet pipe (5).
6) Remove water inlet pipe with thermostat cap from thermostat case.
7) Remove thermostat from thermostat case (3).

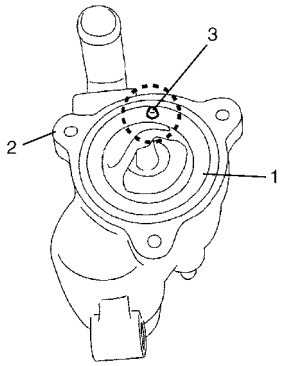


I3RM0A160007-

Installation

Reverse removal procedure for installation noting the following points.

- When positioning thermostat (1) on thermostat case (2), be sure to position it so that air bleed valve (3) comes at position as shown in the figure.



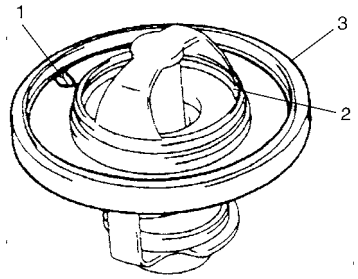
I2RH0B160006-

- Use new O-rings when installing.
- Adjust water pump belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: ”.
- Adjust A/C compressor belt tension referring to “Compressor Drive Belt Inspection and Adjustment: in Section 7B”.
- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.
- Verify that there is no coolant leakage at each connection.

Thermostat Inspection

S4RS0A1606007

- Make sure that air bleed valve (1) of thermostat is clean.
  Should this valve be clogged, engine would tend to overheat.
- Check to make sure that valve seat (2) is free from foreign matters which would prevent valve from seating tight.
- Check thermostat seal (3) for breakage, deterioration or any other damage.



I3RM0A160008-

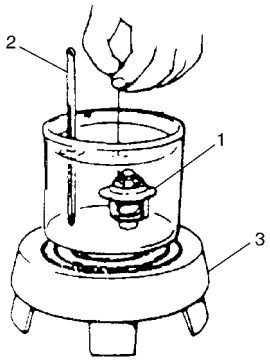
- Check thermostatic movement of wax pellet as follows:
  a. Immerse thermostat (1) in water, and heat water gradually.
  b. Check that valve starts to open at specific temperature.

  Temperature at which valve begins to open
  80 – 84 °C (176 – 183 °F)

  Temperature at which valve become fully open
  95 – 97 °C (203 °F)

  Valve lift
  More than 8 mm at 95 °C (203 °F)

If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if reused, will bring about overcooling or overheating tendency.



I2RH01160012-

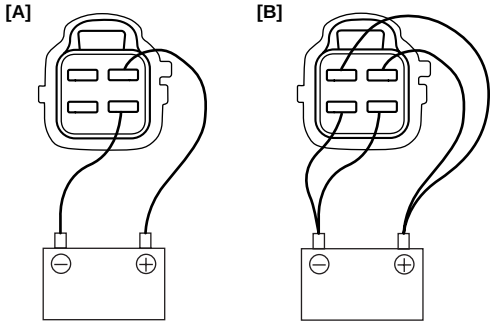
2. Thermometer	3. Heater

Radiator Cooling Fan Motor On-Vehicle Inspection

S4RS0A1606010

1) Check low speed operation of radiator cooling fan as follows.
   a) Connect battery to fan motor coupler as shown in figure.
   b) Check that radiator cooling fan rotates smoothly. If any abnormality is found, replace fan motor.
2) Check high speed operation of radiator cooling fan as follows.
   a) Connect battery to fan motor coupler as shown in figure.
   b) Check that radiator cooling fan rotates smoothly and its rotational speed is faster than low speed operation.
   If any abnormality is found, replace fan motor.

   Reference: Fan motor specified current at 12 V
   Low speed operation: 14.0 A maximum
   High speed operation: 18.0 A maximum



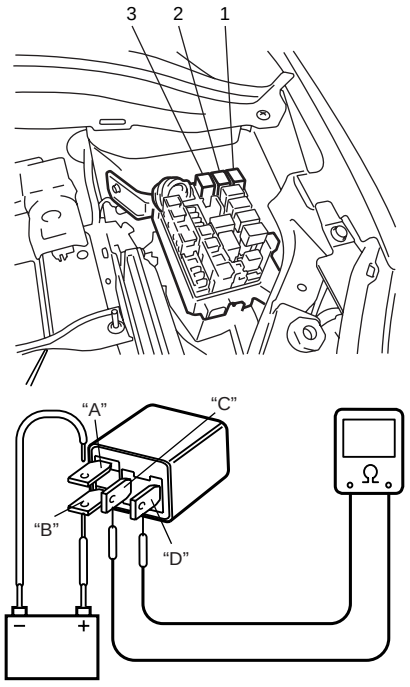
I4RS0A160006-

[A]: Low speed operation
[B]: High speed operation

Radiator Cooling Fan Relay Inspection

S4RS0A1606020

1) Disconnect negative (–) cable at battery.
2) Remove radiator cooling fan relay No.1 (1), No.2 (2) and/or No.3 (3) from relay box.
3) Check that there is no continuity between terminal “C” and “B”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “B” of relay.
5) Connect battery negative (–) terminal “A” of relay.
6) Check continuity between terminal “C” and “D”. If there is no continuity when relay is connected to the battery, replace relay.



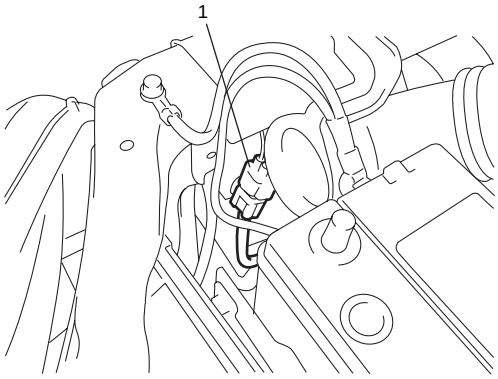
I4RS0A160007-

Radiator Cooling Fan Removal and Installation

S4RS0A1606021

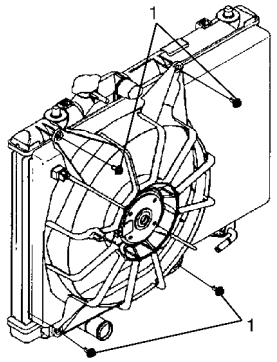
Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect connector (1) of cooling fan motor.



I4RS0A160008-

3) Drain coolant.
4) Remove front bumper, front bumper upper absorber and upper member referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
5) Remove radiator inlet hose and reservoir hose.
6) Remove cooling fan mounting bolts (1).



I4RS0A160009-

7) Slide condenser with radiator, and then remove radiator cooling fan.

CAUTION:

Be sure not to damage condenser outlet pipe.

Installation

Reverse removal procedure for installation noting the following.

- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.
- After installation, verify there is no coolant leakage at each connection.

Radiator On-Vehicle Inspection and Cleaning

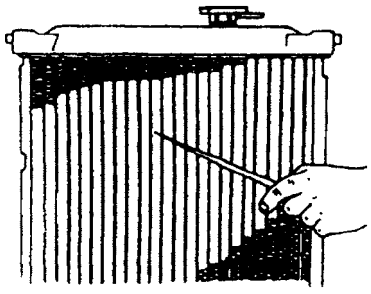
S4RS0A1606013

Inspection

Check radiator for leakage or damage. Straighten bent fins, if any.

Cleaning

Clean frontal area of radiator cores.



I2RH01160014-

Radiator Removal and Installation

S4RS0A1606014

Removal

1) Disconnect negative cable at battery.
2) Drain A/T fluid.
3) Drain coolant.
4) Remove cooling fan assembly referring to “Radiator Cooling Fan Removal and Installation: ”.
5) Remove A/T fluid cooler inlet and outlet hoses.
6) Remove radiator outlet hose from radiator.
7) Remove radiator from vehicle.

Installation

Reverse removal procedures, noting the following.

- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.
- After installation, verify there is no coolant leakage each connection.
- Refill A/T fluid referring to “A/T Fluid Change: in Section 5A”.

Water Pump / Generator Drive Belt Tension Inspection and Adjustment

S4RS0A1606015

WARNING:

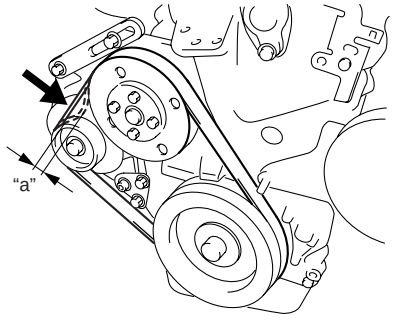
- **Disconnect negative cable at battery before checking and adjusting belt tension.**
- **To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to “Water Pump / Generator Drive Belt Removal and Installation: ”.
2) Check belt for tension. Belt is in proper tension when it deflects the following specification under thumb pressure (about 10 kg or 22 lb.).

   Water pump / generator drive belt tension
   “a”: 4.5 – 5.5 mm (0.18 – 0.22 in.) as deflection / 10 kg (22 lbs)

NOTE:

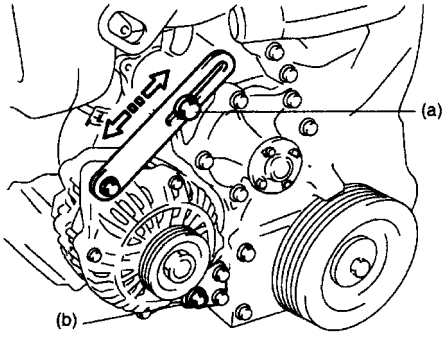
When replacing belt with a new one, adjust belt tension to 3 – 4 mm (0.12 – 0.16 in.).



I2RH0B160012-

3) If belt is too tight or too loose, adjust it to proper tension by displacing generator position.
4) Tighten generator adjusting bolt and pivot bolts as specified torque.

   Tightening torque
   Generator adjusting bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)
   Generator pivot bolt (b): 50 N·m (5.0 kg-m, 36.0 lb-ft)



I2RH0B160013-

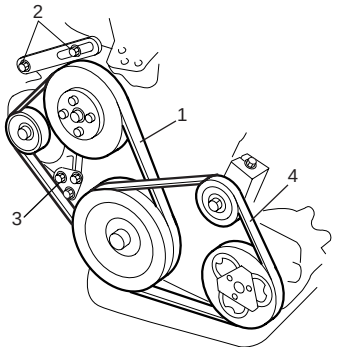
5) Connect negative cable at battery.

Water Pump / Generator Drive Belt Removal and Installation

S4RS0A1606016

Removal

1) Disconnect negative cable at battery.
2) If vehicle equipped with A/C, remove compressor drive belt (4) before removing water pump belt (1). Refer to “Compressor Drive Belt Removal and Installation: in Section 7B”.
3) Loosen drive belt adjusting bolt (2) and generator pivot bolt (3).

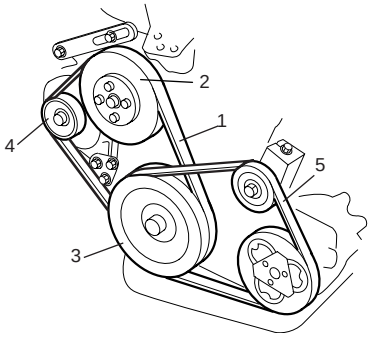


I3RM0A160014-

4) Slacken belt by displacing generator and then remove it.

Installation

1) Install belt (1) to water pump pulley (2), crankshaft pulley (3) and generator pulley (4).
2) Adjust belt tension by referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: ”.
3) If vehicle equipped with A/C, install compressor drive belt (5) referring to “Compressor Drive Belt Removal and Installation: in Section 7B”.



I3RM0A160015-

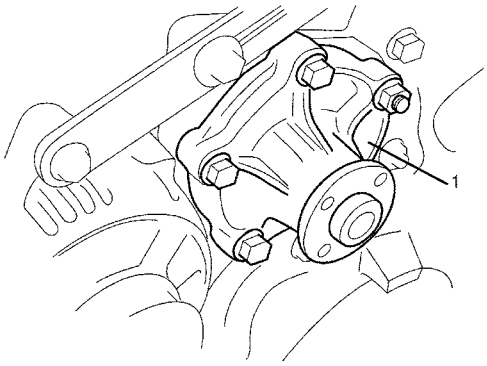
4) Connect negative cable at battery.

Water Pump Removal and Installation

S4RS0A1606017

Removal

1) Disconnect negative cable at battery.
2) Drain coolant.
3) Remove water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: ”.
4) Remove water pump assembly (1).



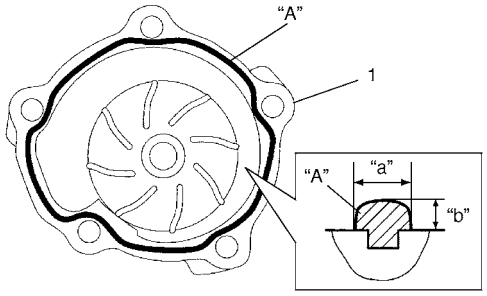
I2RH0B160016-

Installation

1) Apply sealant to mating surface of water pump (1) as shown in the figure.

“A”: Water tight sealant 99000–31250

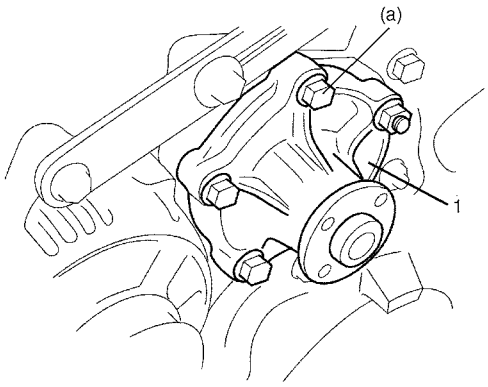
Sealant quantity (to mating surface of water pump)
Width “a”: 3 mm (0.12 in.)
Height “b”: 2 mm (0.08 in.)



I3RM0A160016-

2) Install water pump assembly (1) to cylinder block and tighten bolts and nut to specified torque.

Tightening torque
Water pump bolt and nut (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I2RH0B160018-

3) Install water pump pulley.
4) Install water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: ”.
5) Install A/C compressor belt (if equipped) referring to “Compressor Drive Belt Removal and Installation: in Section 7B”.
6) Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: ”.
7) Connect negative cable at battery.
8) Check each part for leakage.

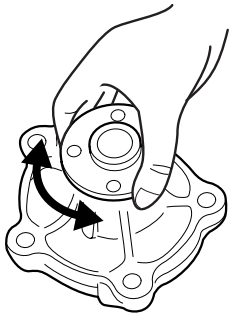
Water Pump Inspection

S4RS0A1606018

CAUTION:

Do not disassemble water pump.
If any repair is required on pump, replace it as assembly.

Rotate water pump by hand to check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.



I2RH0B160019-

Specifications

Tightening Torque Specifications

S4RS0A1607001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Air ventilation bolt	4.5	0.45	3.5	☞ / ☞
Generator adjusting bolt	23	2.3	17.0	☞
Generator pivot bolt	50	5.0	36.0	☞
Water pump bolt and nut	25	2.5	18.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Cooling System Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A1608001

Material	SUZUKI recommended product or Specification		Note
Water tight sealant	SUZUKI Bond No.1207F	P/No.: 99000–31250	☞

Fuel System

Precautions

Precautions on Fuel System Service

S4RS0A1700001

WARNING:

Before attempting service of any type on fuel system, the following should be always observed in order to reduce the risk or fire and personal injury.

- **Disconnect negative cable at battery.**
- **Do not smoke, and place no smoking signs near work area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).**
- **Wear safety glasses.**
- **To relieve fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.**
- **As fuel feed line is still under high fuel pressure even after stopping engine, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel. Before loosening or disconnecting fuel feed line, make sure to relieve fuel pressure referring to "Fuel Pressure Relief Procedure: ".**
- **A small amount of fuel may be released when the fuel line is disconnected. In order to reduce the risk of personal injury, cover a shop cloth to the fitting to be disconnected. Be sure to put that cloth in an approved container after disconnecting.**
- **Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.**
- **Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to "Fuel Hose Disconnecting and Reconnecting: ".**
  After connecting, make sure that it has no twist or kink.
- **When installing injector or fuel feed pipe, lubricate its O-ring with gasoline.**

General Description

Fuel System Description

S4RS0A1701001

CAUTION:

This engine requires the unleaded fuel only. The leaded and/or low lead fuel can result in engine damage and reduce the effectiveness of the emission control system.

The main components of the fuel system are fuel tank, fuel pump assembly (with fuel filter, fuel level gauge, fuel pressure regulator, fuel feed line and fuel vapor line.
For the details of fuel flow, refer to "Fuel Delivery System Diagram: ".

Fuel Delivery System Description

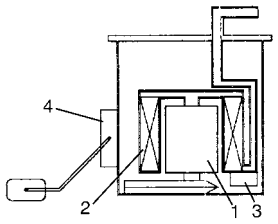
S4RS0A1701002

The fuel delivery system consists of the fuel tank, fuel pump assembly (with built-in fuel filter and fuel pressure regulator), delivery pipe, injectors and fuel feed line.
The fuel in the fuel tank is pumped up by the fuel pump, sent into delivery pipe and injected by the injectors.
As the fuel pump assembly is equipped with built-in fuel filter and fuel pressure regulator, the fuel is filtered and its pressure is regulated before being sent to the feed pipe.
The excess fuel at fuel pressure regulation process is returned back into the fuel tank.
Also, fuel vapor generated in fuel tank is led through the fuel vapor line into the EVAP canister.
For system diagram, refer to "Fuel Delivery System Diagram: ".

Fuel Pump Description

S4RS0A1701003

The fuel pump (1) is an in-tank type electric pump. Incorporated in the pump assembly are;
a fuel filter (2) and a fuel pressure regulator (3) are included and a fuel level gauge (4) is attached.
Addition of the fuel pressure regulator to the fuel pump makes it possible to maintain the fuel pressure at constant level and ECM controls compensation for variation in the intake manifold pressure.

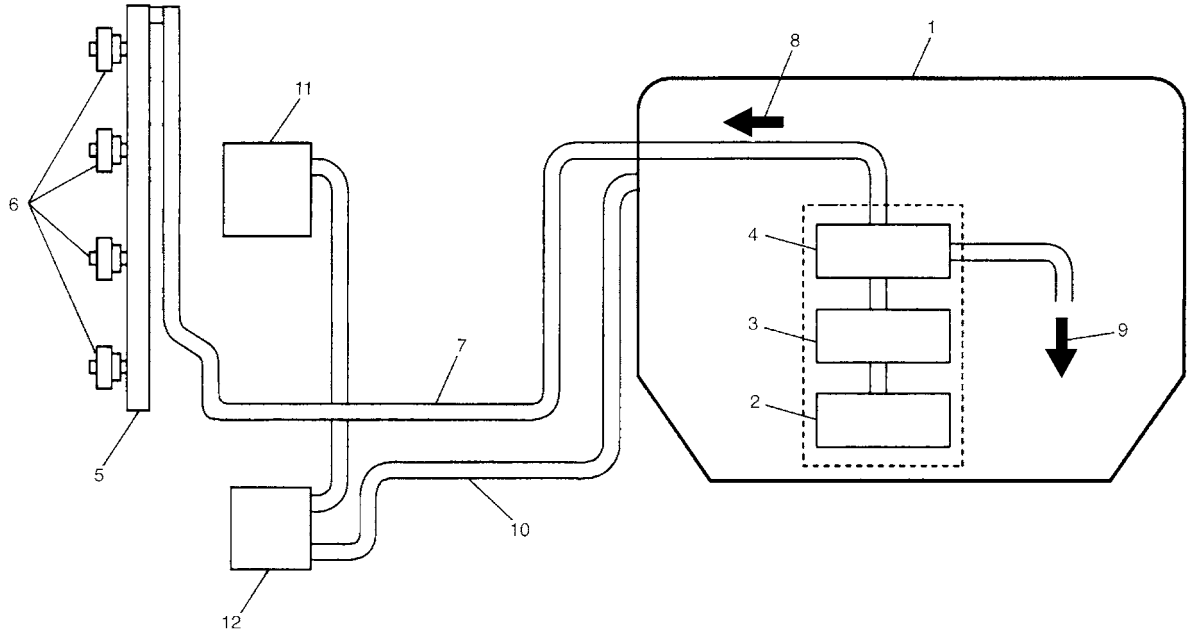


I4RS0A170001-

Schematic and Routing Diagram

Fuel Delivery System Diagram

S4RS0A1702001



I4RS0A170002-

1. Fuel tank	6. Fuel injector	11. Intake manifold
2. Fuel pump	7. Fuel feed line	12. EVAP canister
3. Fuel filter	8. Fuel	
4. Fuel pressure regulator	9. Returned back fuel	
5. Delivery pipe	10. Fuel vapor line	

Diagnostic Information and Procedures

Fuel Pressure Inspection

S4RS0A1704001

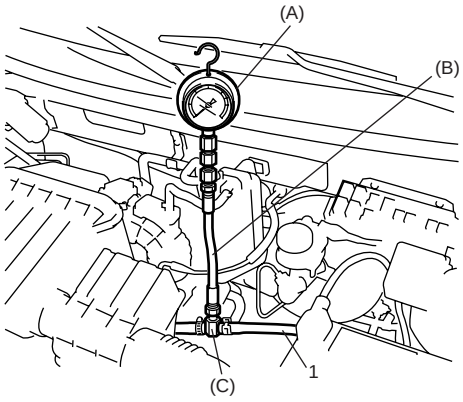
WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

1) Relieve fuel pressure in fuel feed line referring to “Fuel Pressure Relief Procedure: ”.
2) Disconnect fuel feed hose from fuel delivery pipe.

3) Connect special tools and hose between fuel feed hose (1) and fuel delivery pipe as shown in the figure, and clamp hoses securely in order to ensure that no leaks occur during checking.

Special tool
(A): 09912–58442
(B): 09912–58432
(C): 09912–58490



I3RM0A170004-

4) Check that battery voltage is 11 V or more.
5) Measure fuel pressure at each condition.
If measured pressure is out of specification, refer to "Fuel Pressure Check: in Section 1A" and check each possibly defective part. Replace if found defective.
   a) Turn ignition switch ON to operate fuel pump and after 2 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.

      Fuel pressure specification
      With fuel pump operating and engine stopped: 270 – 310 kPa (2.7 – 3.1 kg/cm^2, 38.4 – 44.0 psi)

   b) Start engine and warm it up to normal operating temperature, and measure fuel pressure at idling.

      Fuel pressure specification
      At specified idle speed: 270 – 310 kPa (2.7 – 3.1 kg/cm^2, 38.4 – 44.0 psi)

   c) Stop engine, and measure fuel pressure at one minute after stopping.

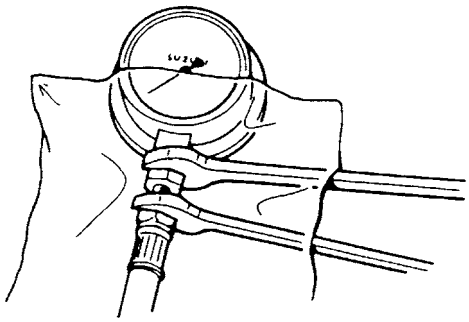
      Fuel pressure specification
      With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes): Over 250 kPa (2.5 kg/cm^2, 35.6 psi)

6) After checking fuel pressure, remove fuel pressure gauge.

WARNING:

As fuel feed line is still under high fuel pressure, make sure to release fuel pressure according to the following procedures.

- **Place fuel container under joint.**
- **Cover joint with rag and loosen joint nut slowly in order to release fuel pressure gradually.**



I2RH01170032-

7) Remove special tools from fuel delivery pipe and fuel feed hose.
8) Connect fuel feed hose to fuel delivery pipe and clamp it securely.
9) With engine OFF and ignition switch ON, check for fuel leaks.

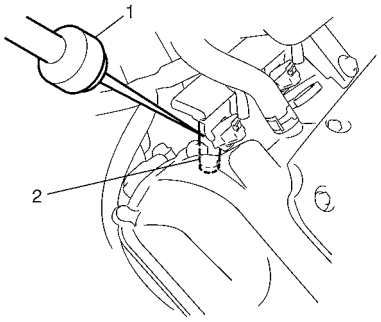
Fuel Cut Operation Inspection

S4RS0A1704002

NOTE:

Before inspection, make sure that gear shift lever is in neutral position (shift select lever is "P" range for A/T vehicle), A/C is OFF and parking brake lever is pulled all the way up.

1) Warm engine up to normal operating temperature.
2) While listening to sound of injector (2) by using sound scope (1) or such, increase engine speed to higher than 3,000 r/min.



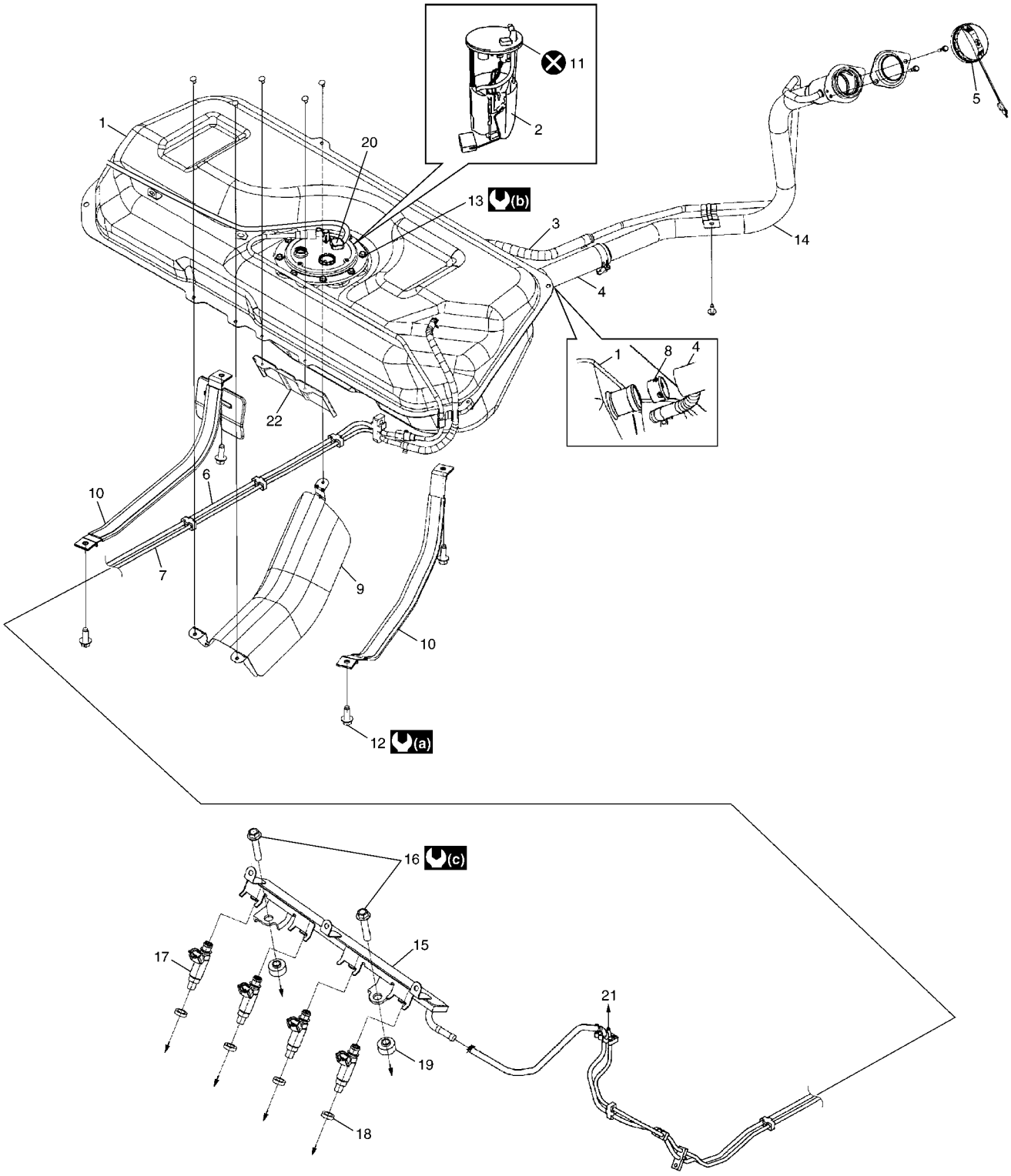
I2RH0B170004-

3) Check to make sure that injector operation sound is stop when throttle valve is closed instantly and it is heard again when engine speed is reduced to approx. 2,000 r/min or less.

Repair Instructions

Fuel System Components

S4RS0A1706001



I4RS0A170003-

1. Fuel tank	10. Fuel tank belt	19. Fuel delivery pipe insulator
2. Fuel pump assembly	11. Fuel pump gasket	20. Wire harness for fuel pump
3. Breather hose	12. Fuel tank bolt	21. To canister
4. Fuel tank filler hose	13. Fuel pump bolt	22. Fuel tank cover
5. Fuel filler cap	14. Fuel filler neck	: Do not reuse.
6. Fuel feed line	15. Fuel delivery pipe	(a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)

7. Fuel vapor line	16. Fuel delivery pipe bolt	(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
8. Fuel tank inlet valve	17. Fuel injector	(c) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
9. Fuel tank protector	18. Injector cushion	

Fuel Hose Disconnecting and Reconnecting

S4RS0A1706023

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

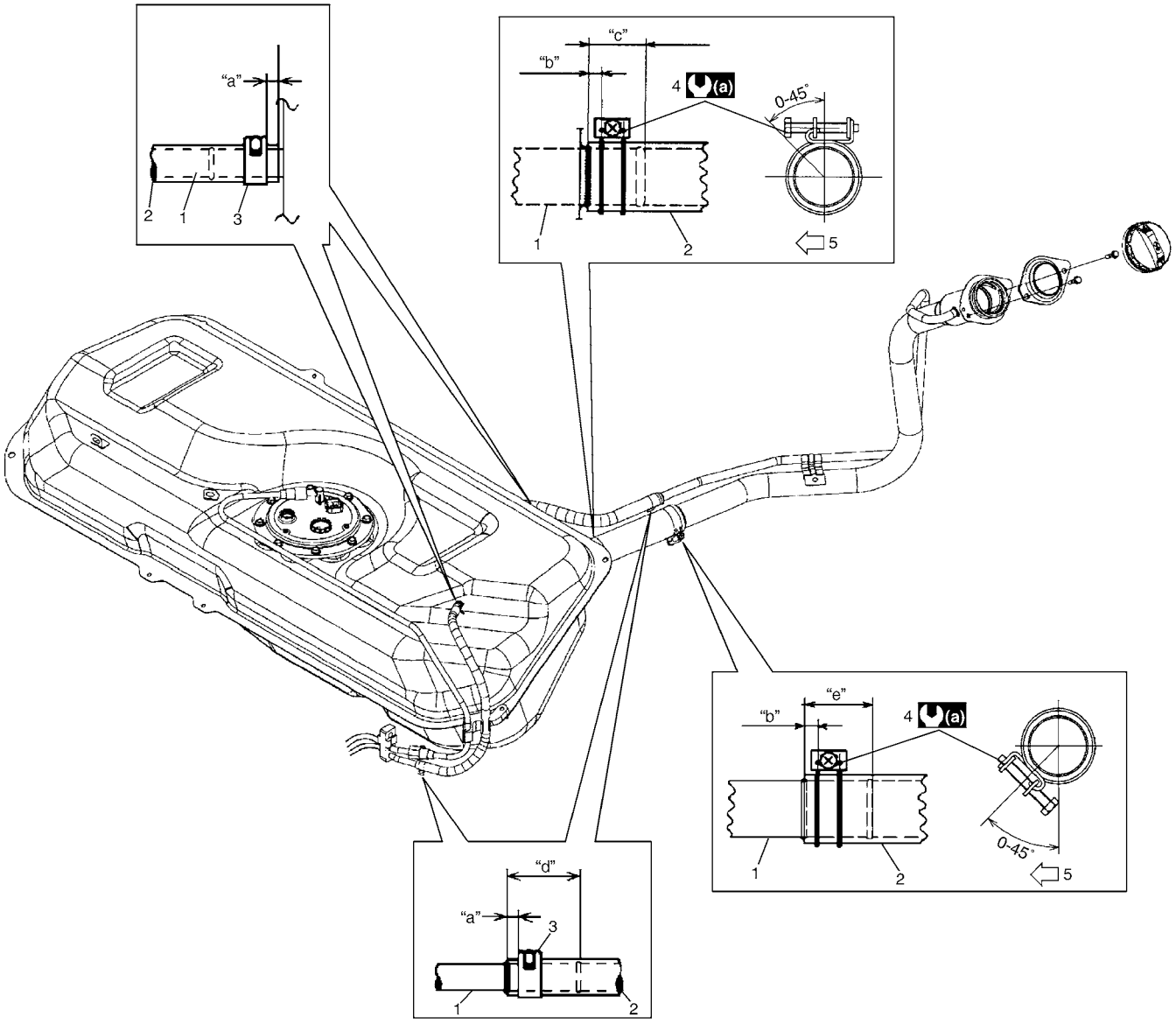
Be sure to connect and clamp each hose correctly as shown in figure.

For Normal Clamp

Fuel tank system

NOTE:

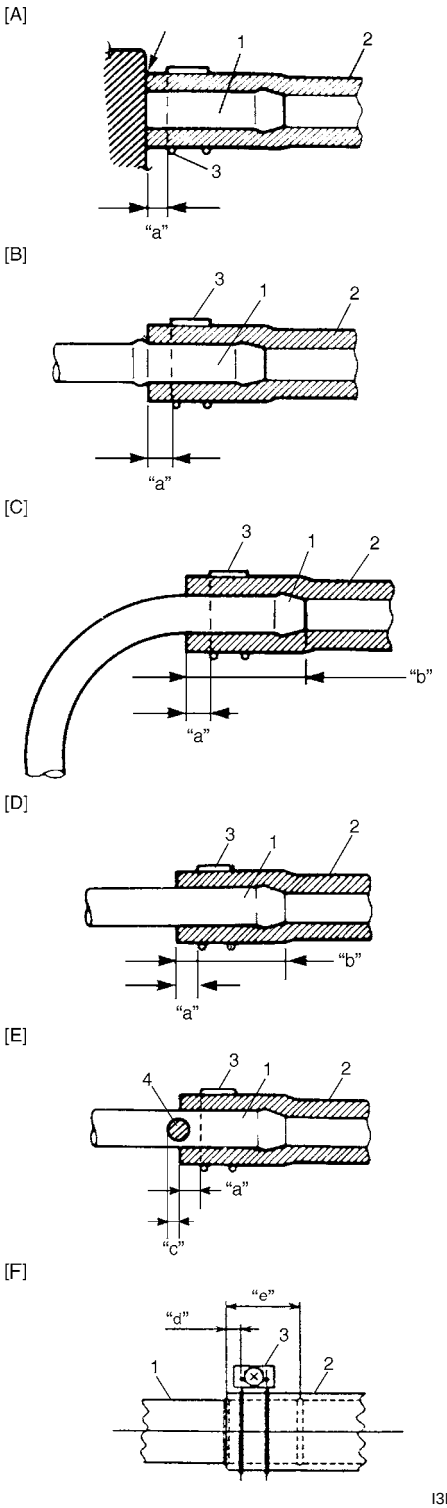
Be sure to install hose to spool of pipe surely.



I4RS0A170018-

1. Pipe	5. Vehicle leftward	"d" 30 mm (1.18 in.)
2. Hose	"a" 3 – 7 mm (0.12 – 0.28 in.)	"e" 38 mm (1.50 in.)
3. Clamp	"b" 5 – 12 mm (0.20 – 0.48 in.)	(a) : 2 N·m (0.2 kg-m, 1.5 lb-ft)
4. Fuel filler hose clamp screw	"c" 33 mm (1.30 in.)	

The other than fuel tank system



I3RM0A170001-

[A]:	With short pipe, fit hose as far as it reaches pipe joint as shown.
[B]:	With the following type pipe, fit hose as far as its peripheral projection as shown.
[C]:	With bent pipe, fit hose as its bent part as shown or till depth "b".
[D]:	With straight pipe, fit hose till depth "b".
[E]:	With red marked pipe, fit hose end reaches red mark on pipe.
[F]:	For fuel tank filler hose, insert it to spool or welding-bead.
"a":	Clamp securely at a position 3 – 7 mm (0.12 – 0.27 in.) from hose end.
"b":	20 – 30 mm (0.79 – 1.18 in.)
"c":	0 – 5 mm (0 – 0.19 in.)
"d":	5 – 12 mm (0.2 – 0.47 in.)
"e":	40 mm (1.57 in.)
4.	Red mark

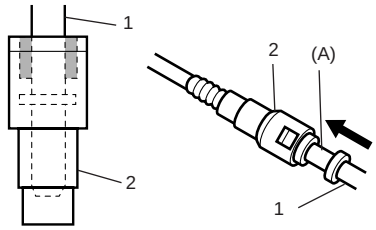
For Quick Joint

Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (2) by blowing compressed air.
2) Unlock joint lock by inserting special tool between pipe and quick joint.

   Special tool
   (A): 09919–47020

3) Disconnect quick joint from pipe.



I4RS0A170019-

Reconnecting

Insert quick joint to fuel pipe until they lock securely (a click is heard), and confirm that quick joint is not disconnected by hand.

Fuel Pressure Relief Procedure

S4RS0A1706002

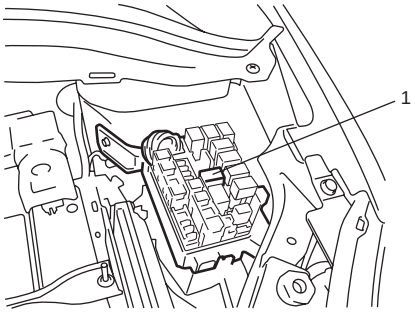
CAUTION:

This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

NOTE:

If ECM detects DTC(s) after servicing, clear DTC(s) referring to "DTC Clearance: in Section 1A".

1) Make sure that engine is cold.
2) Shift transaxle gear shift lever in "Neutral" (shift select lever in "P" range for A/T model), set parking brake and block drive wheels.
3) Remove relay / fuse box cover.
4) Disconnect fuel pump relay (1) from relay / fuse box (2).
5) Remove fuel filter cap in order to release fuel vapor pressure in fuel tank, and then reinstall it.
6) Start engine and run it until engine stops for lack of fuel. Repeat cranking engine 2 – 3 times for about 3 seconds each time in order to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
7) After servicing, connect fuel pump relay (1) to relay / fuse box and install relay / fuse box cover.



I4RS0A170004-

Fuel Leakage Check Procedure

S4RS0A1706003

After performing any service on fuel system, check to make sure that there are no fuel leakages as follows.

1) Turn ON ignition switch for 3 seconds (to operate fuel pump) and then turn it OFF.
   Repeat this (ON and OFF) 3 or 4 times and apply fuel pressure to fuel line until fuel pressure is felt by hand placed on fuel feed hose.
2) In this state, check to see that there are no fuel leakages from any part of fuel system.

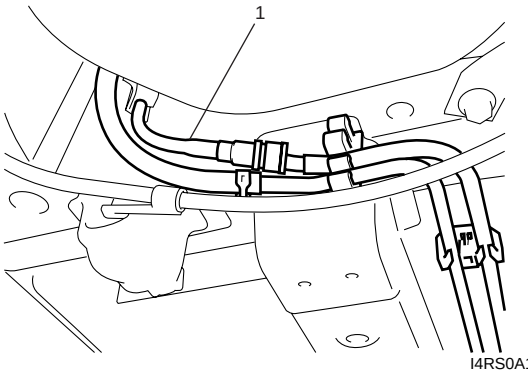
Fuel Lines On-Vehicle Inspection

S4RS0A1706004

CAUTION:

Due to the fact that fuel feed line (1) is under high pressure, use special care when servicing it.

Visually inspect fuel lines for evidence of fuel leakage, hose crack and deterioration or damage.
Make sure all clamps are secure.
Replace parts as needed.



I4RS0A170005-

Fuel Pipe Removal and Installation

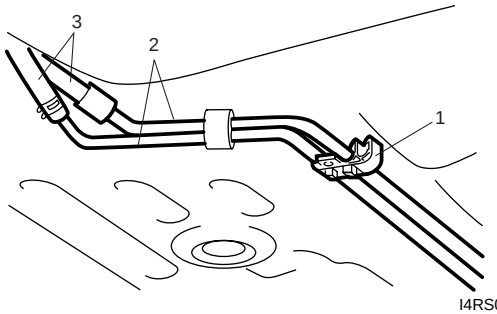
S4RS0A1706005

WARNING:

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk or fire and personal injury.

Removal

1) Relieve fuel pressure in fuel feed line according to "Fuel Pressure Relief Procedure: ".
2) Disconnect negative cable at battery.
3) Disconnect fuel pipe joint and fuel hose (3) from fuel pipe (2) at the front and rear of each fuel pipe referring to "Fuel Hose Disconnecting and Reconnecting: ".
4) Mark the location of clamps (1) on fuel pipes (2), so that the clamps can be reinstalled to where they were.
5) Remove pipes (2) with clamp (1) from vehicle.
6) Remove clamp (1) from pipes (2).



I4RS0A170020-

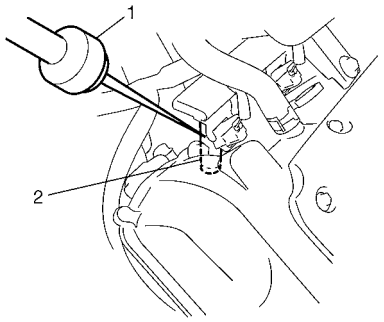
Installation

1) Install clamps to marked location on pipes. If clamp is deformed, its claw is bent or broken, replace it with new one.
2) Install pipes with pipe clamps to vehicle.
3) Connect fuel hoses and pipes to each pipe referring to “Fuel Hose Disconnecting and Reconnecting: ”.
4) Connect negative cable at battery.
5) With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Injector On-Vehicle Inspection

S4RS0A1706006

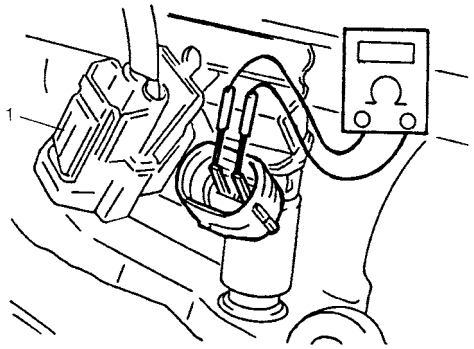
1) Using sound scope (1) or such, check operating sound of injector (2) when engine is running or cranking.
   Cycle of operating sound should vary according to engine speed.
   If no sound or an unusual sound is heard, check injector circuit (wire or coupler) or injector.



I2RH0B170007-

2) Disconnect connector (1) from injector, connect ohmmeter between terminals of injector and check resistance.
   If resistance is out of specification, replace.

   Resistance of fuel injector
   11.3 – 13.8 Ω at 20 °C, 68 °F



I2RH0B170008-

3) Connect connector to injector securely.

Fuel Injector Removal and Installation

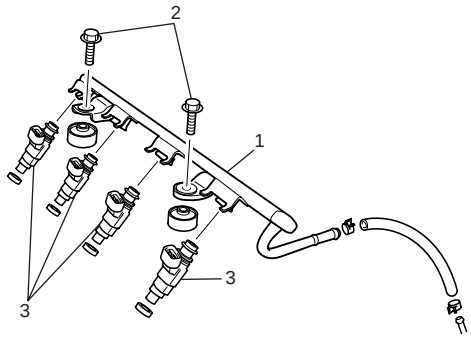
S4RS0A1706007

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

Removal

1) Relieve fuel pressure according to “Fuel Pressure Relief Procedure: ”.
2) Disconnect negative cable at battery.
3) Disconnect MAF sensor connector, and detach EVAP canister purge valve.
4) Remove air cleaner assembly with air intake pipe.
5) Disconnect fuel injector couplers.
6) Disconnect fuel feed hose from fuel delivery pipe (1).
7) Remove fuel delivery pipe bolts (2).
8) Remove fuel injector(s) (3).



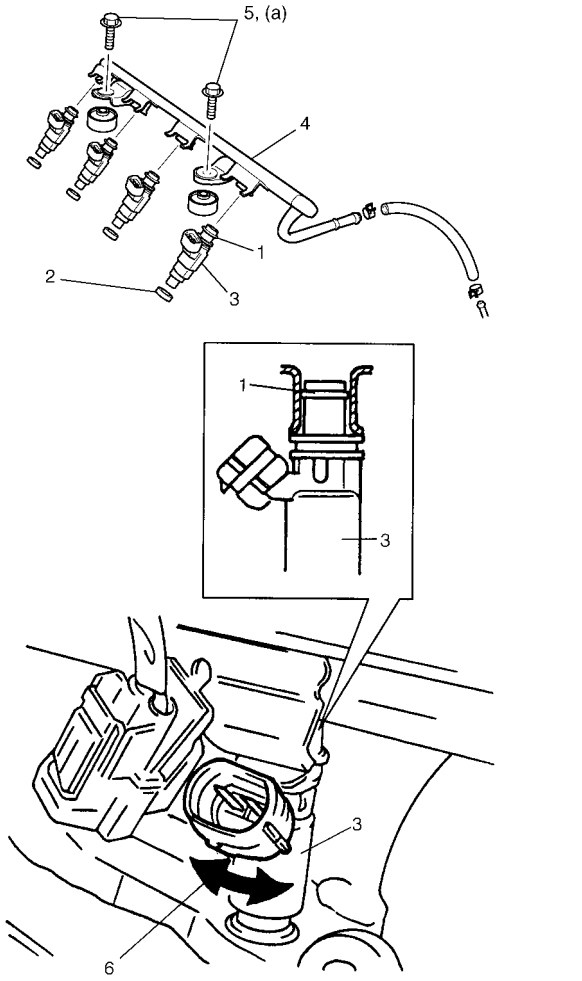
I3RM0A170010-

Installation

Reverse removal procedure for installation noting the following.

- Replace injector O-ring (1) with new one using care not to damage it.
- Check if cushion (2) is scored or damaged. If it is, replace with new one.
- Apply thin coat of fuel to O-rings (1) and then install injectors (3) into delivery pipe (4) and cylinder head. Make sure that injectors rotate smoothly (6). If not, probable cause is incorrect installation of O-ring. Replace O-ring with new one.
- Tighten delivery pipe bolts (5) to specified torque and make sure that injectors rotate smoothly.

Tightening torque
Fuel delivery pipe bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I3RM0A170011-

- After installation, with engine OFF and ignition switch ON, check for fuel leaks around fuel line connection.

Fuel Injector Inspection

S4RS0A1706008

WARNING:

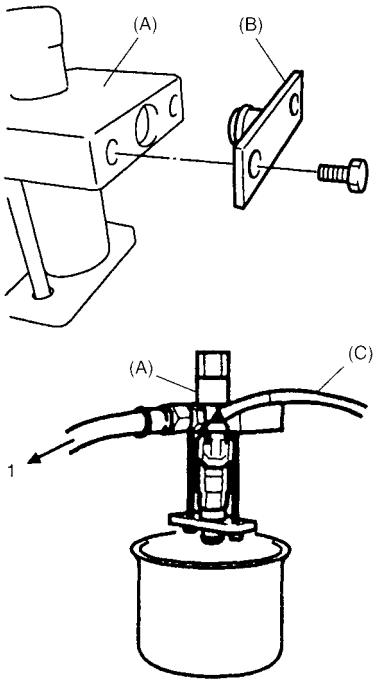
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk or fire and personal injury.

1) Install injector to special tool (injector checking tool).

Special tool
(A): 09912–58421
(B): 09912–57610

2) Connect special tools (hose and attachment) to fuel feed pipe (1) of vehicle.
3) Connect special tool (test lead) to injector.

Special tool
(C): 09930–88530

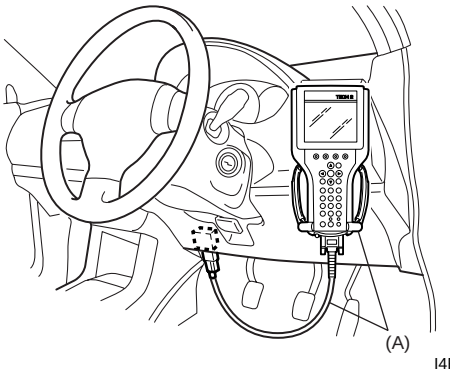


I3RM0A170012-

4) Install suitable vinyl tube onto injector nozzle to prevent fuel from splashing out when injecting.
5) Put graduated cylinder under injector.

6) Operate fuel pump and apply fuel pressure to injector as follows:
   a) When using scan tool:
      i) Connect scan tool to DLC with ignition switch OFF.
      ii) Turn ignition switch ON, clear DTC and select “MISC TEST” mode on scan tool.
      iii) Turn fuel pump ON by using scan tool.

      Special tool
      (A): SUZUKI scan tool



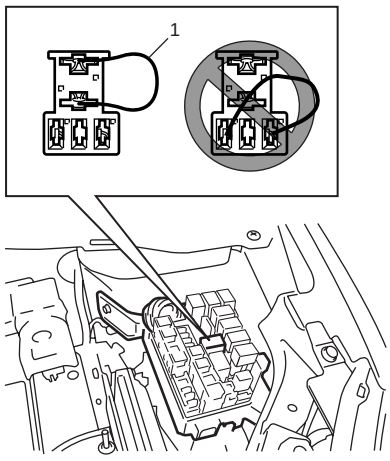
I4RS0A170021-

   b) When not using scan tool:
      i) Remove fuel pump relay from connector.
      ii) Connect two terminals of relay connector using service wire (1) as shown in the figure.

CAUTION:

Check to make sure that connection is made between correct terminals. Wrong connection can cause damage to ECM, wire harness, etc.

      iii) Turn ignition switch ON.



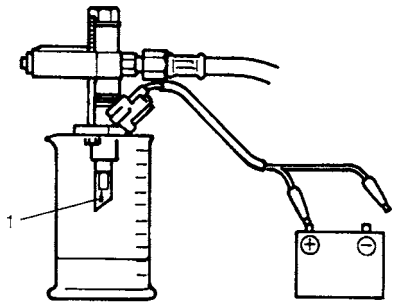
I4RS0A170006-

7) Apply battery voltage to injector (1) for 15 seconds and measure injected fuel volume with graduated cylinder. Test each injector two or three times. If not within specification, replace injector.

Injected fuel volume
43 – 47 cc/15 sec. (1.45/1.51 – 1.58/1.65 US/Imp oz/15 sec.)

8) Check fuel leakage from injector nozzle. Do not operate injector for this check (but fuel pump should be at work). If fuel leaks (1) more than the following specifications, replace.

Fuel leakage
Less than 1 drop/min.



I2RH0B170013-

Fuel Filler Cap Inspection

S4RS0A1706011

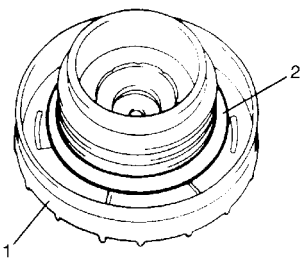
WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

Remove cap (1), and check gasket for even filler neck imprint, and deterioration or any damage. If gasket (2) is in malcondition, replace cap.

NOTE:

If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in fire and personal injury.



I2RH01170008-

Fuel Tank Inlet Valve Removal and Installation

S4RS0A1706015

WARNING:

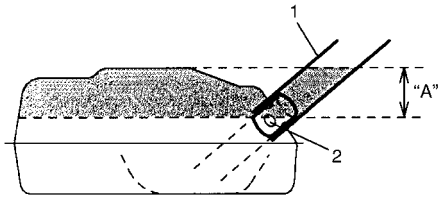
Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

Removal

1) Remove fuel filler cap.
2) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space “A” as shown in figure.

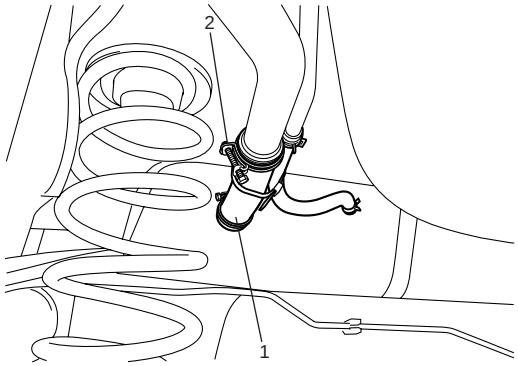
CAUTION:

Do not force pump hose into fuel tank, or pump hose may damage to fuel tank inlet valve (2).



IYSQ01170010-

3) Hoist vehicle, and remove clamp (2) and fuel filler hose (1) from fuel tank.

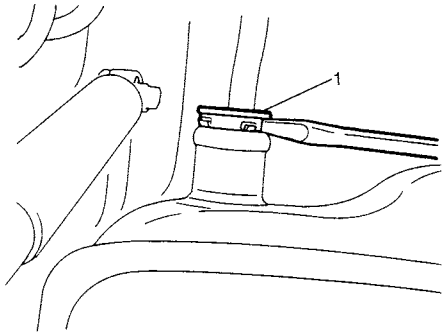


I4RS0A170007-

4) Remove fuel tank inlet valve (1) using flat head rod (2) or the like.

CAUTION:

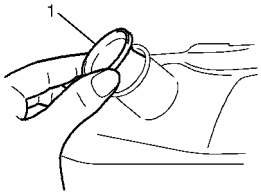
Be careful not to damage fuel tank inlet valve (1) with flat head rod (2) or the like.



I2RH0B170017-

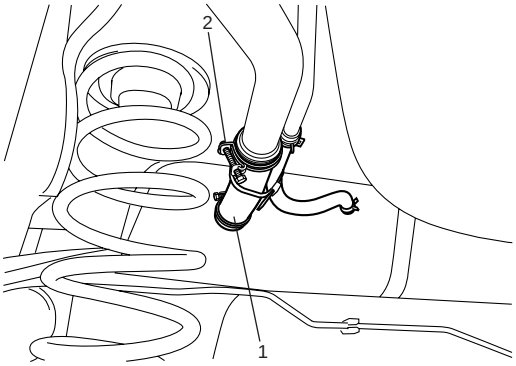
Installation

1) Install fuel tank inlet valve (1) to fuel tank.



I2RH0B170018-

2) Install fuel filler hose (1) to fuel tank and secure it with clamp (2).
For proper installation, refer to “Fuel Hose Disconnecting and Reconnecting: ”.



I4RS0A170007-

3) Lower vehicle and install fuel filler cap.

Fuel Tank Inlet Valve Inspection

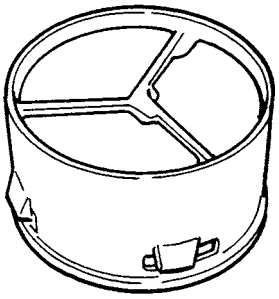
S4RS0A1706016

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

Check fuel tank inlet valve for the following.
If any damage or malfunction is found, replace.

- Damage
- Smooth opening and closing



I2RH0B170019-

Fuel Tank Removal and Installation

S4RS0A1706012

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

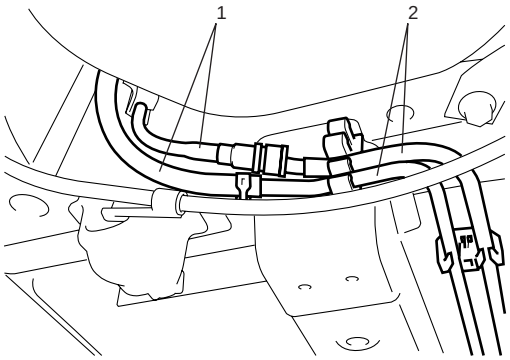
Removal

1) Relieve fuel pressure in fuel feed line according to “Fuel Pressure Relief Procedure: ”.
2) Disconnect negative cable at battery.
3) Hoist vehicle.
4) Remove exhaust center pipe.
5) Disconnect fuel filler hose and breather hose from filler neck referring to “Fuel Tank Inlet Valve Removal and Installation: ”.
6) Due to absence of fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler. Use hand operated pump device to drain fuel tank.

CAUTION:

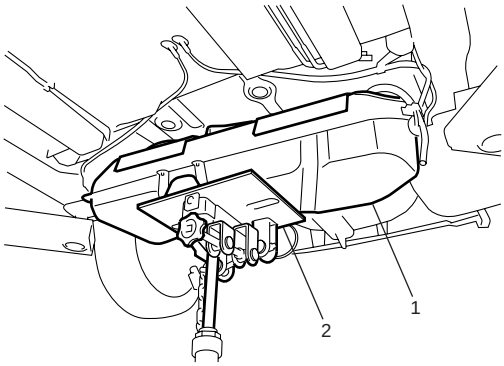
- **Do not force pump hose into fuel tank, or pump hose may damage fuel tank inlet valve.**
- **Never store fuel in an open container due to possibility of fire or explosion.**

7) Disconnect fuel pipe joint and fuel hoses (1) from fuel pipes (2) referring to “Fuel Hose Disconnecting and Reconnecting: ”.



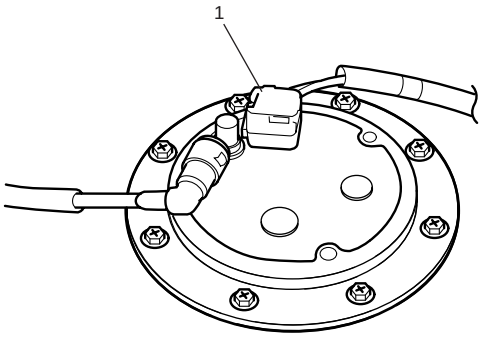
I4RS0A170008-

8) Support fuel tank (1) with jack (2) and remove its mounting bolts.



I4RS0A170009-

9) Lower fuel tank a little as to disconnect wire harness at connector (1), then remove fuel tank.



I4RS0A170010-

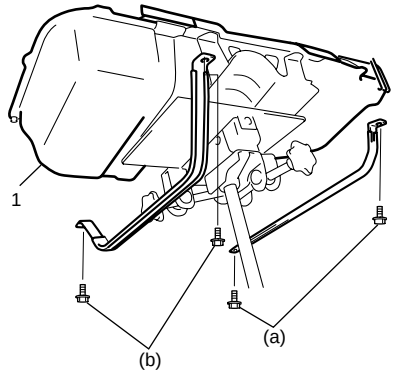
Installation

CAUTION:

- **When connecting joint, clean outside surfaces of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.**
- **Never let the fuel hoses touch the ABS sensor harness (if equipped).**

1) If parts have been removed from fuel tank, install them before installing fuel tank to vehicle.
2) Raise fuel tank (1) with jack and connect fuel pump connector and gauge and clamp wire harness.
3) Install fuel tank to vehicle.

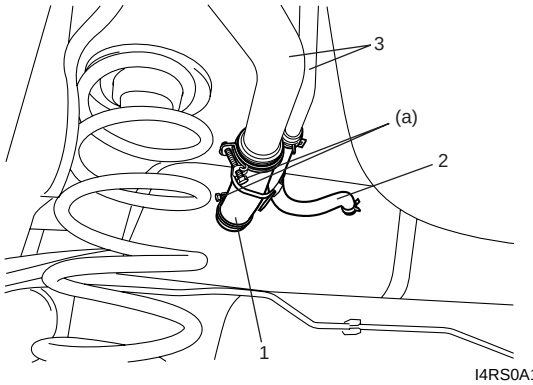
Tightening torque
Fuel tank bolt (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)



I4RS0A170011-

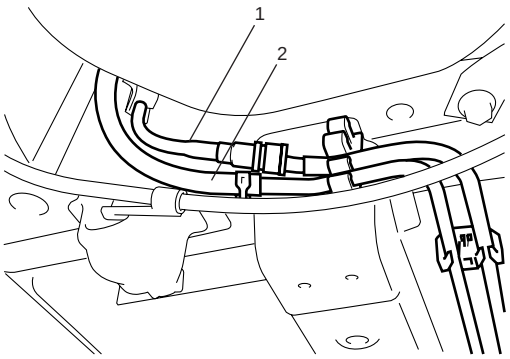
4) Connect fuel filler hose (1) and breather hose (2) to filler neck (3) as shown in figure, and clamp them securely.

Tightening torque
Fuel filler hose clamp (a): 2 N·m (0.2 kg-m, 1.5 lb-ft)



I4RS0A170012-

5) Connect fuel feed hose (1) and vapor hose (2) to each pipe as shown in figure, and clamp them securely.
6) Install exhaust center pipe referring to “Exhaust Pipe and Muffler Removal and Installation: in Section 1K”.



I4RS0A170013-

7) Connect negative cable at battery.
8) With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Tank Inspection

S4RS0A1706013

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump assembly gaskets for leaks, visually inspect fuel tank for leaks and damage.
Replace any damaged or malconditioned parts.

Fuel Tank Purging Procedure

S4RS0A1706014

WARNING:

- **Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.**
- **This purging procedure will not remove all fuel vapor.**
  Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.

CAUTION:

Never remain water in fuel tank after washing, or fuel tank inside will get corrosion.

The following procedure are used for purging fuel tank.

1) After removing fuel tank, remove all hoses, pipes and fuel pump assembly from fuel tank.
2) Drain all remaining fuel from tank.
3) Place fuel tank to flushing area.
4) Fill tank with warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean. Replace tank if its inside is rusty.
5) Completely flush out remaining water after washing.

Fuel Pump On-Vehicle Inspection

S4RS0A1706017

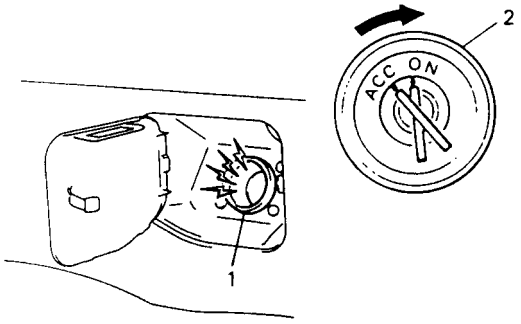
WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

NOTE:

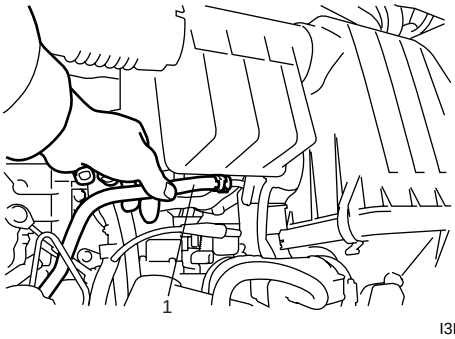
The fuel pressure regulator is incorporated with the fuel pump assembly so individual inspection of it is impossible.

1) Remove filler cap and turn ON ignition switch (2). Then fuel pump operating sound should be heard from fuel filler (1) for about 2 seconds and stop. Be sure to reinstall fuel filler cap after checking.
If the check result is not satisfactory, go to “Fuel Pump and Its Circuit Check: in Section 1A”.



IVSY01170013-

2) Turn OFF ignition switch and leave over 10 minutes as it is.
3) Fuel pressure should be felt at fuel feed hose (1) for about 2 seconds after ignition switch ON.
If fuel pressure is not felt, go to “Fuel Pressure Check: in Section 1A”.



I3RM0A170019-

Fuel Pump Assembly Removal and Installation

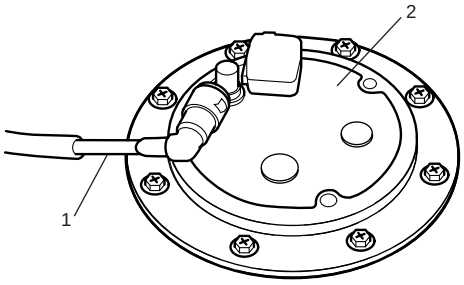
S4RS0A1706019

WARNING:

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk or fire and personal injury.

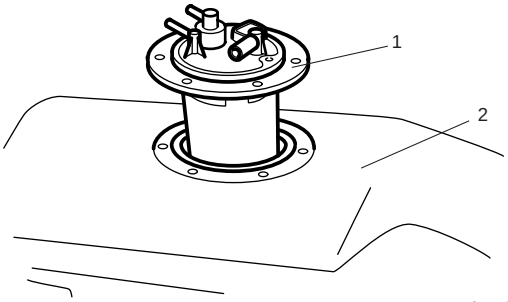
Removal

1) Remove fuel tank from vehicle. Refer to “Fuel Tank Removal and Installation: ”.
2) Disconnect fuel feed pipe (1) from fuel pump assembly (2) referring to “Fuel Hose Disconnecting and Reconnecting: ”.



I4RS0A170014-

3) Remove fuel pump assembly (1) from fuel tank (2).



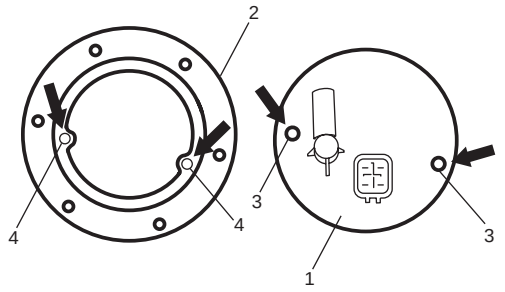
I3RM0A170021-

Installation

CAUTION:

When connecting joint, clean outside surface of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.

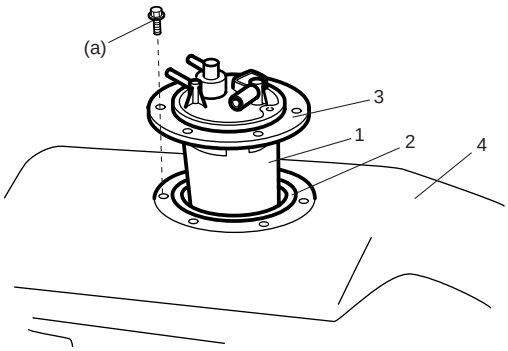
1) Clean mating surfaces of fuel pump assembly (1) and fuel tank.
2) Put plate (2) on fuel pump assembly (1) by matching the protrusion of fuel pump assembly (3) to plate hole (4) as shown.



I4RS0A170015-

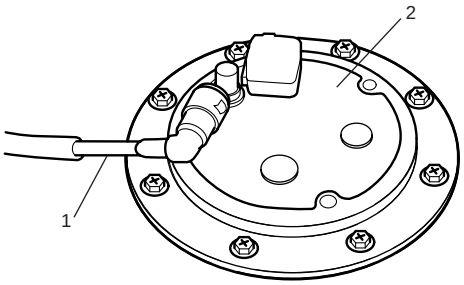
3) Install new gasket (2) and fuel pump assembly (1) with plate (3) to fuel tank (4).

Tightening torque
Fuel pump assembly bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I3RM0A170023-

4) Connect fuel feed line (1) (pipe joint) to fuel pump assembly (2).



I4RS0A170014-

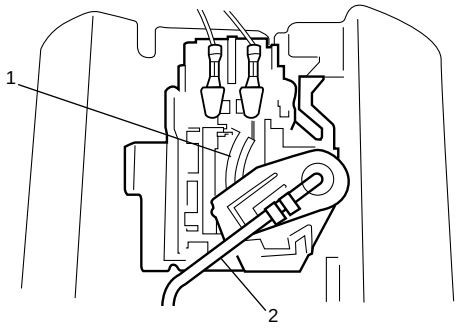
5) Install fuel tank to vehicle. Refer to “Fuel Tank Removal and Installation: ”.

Fuel Level Sensor Removal and Installation

S4RS0A1706022

CAUTION:

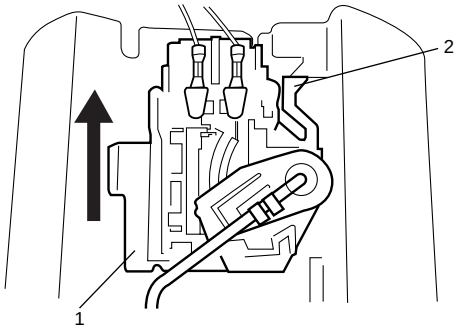
- **Do not touch resister plate (1) and deform arm (2). It may cause fuel level sensor to fail.**
- **Be very careful not to cause damage to fuel tube installed section (sealed section in bore). If it be damaged, replace it with new one, or fuel will leak from the part.**



I4RS0A170016-

Removal

1) Remove fuel pump assembly from fuel tank referring to “Fuel Pump Assembly Removal and Installation: ”.
2) Disconnect fuel level sensor connector.
3) With pressing snap-fit part (2), remove fuel level sensor (1) by sliding it in the arrow direction as shown in figure.



I4RS0A170017-

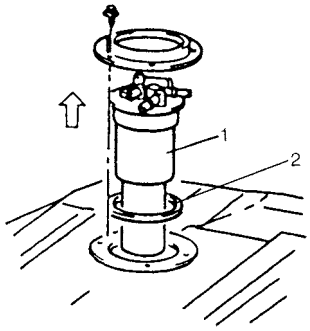
Installation

Reverse removal procedure for installation.

Fuel Pump Inspection

S4RS0A1706021

- Check fuel pump assembly for damage.
- Check fuel suction filter (1) for evidence of dirt and contamination.
  If present, replace or clean and check for presence of dirt in fuel tank.
- For electrical circuit, refer to “Fuel Pressure Check: in Section 1A”.
- For inspection of fuel level gauge (2), refer to “Fuel Level Sensor Inspection: in Section 9C”.



I3RM0A170024-

Specifications

Tightening Torque Specifications

S4RS0A1707001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Fuel delivery pipe bolt	25	2.5	18.0	☞
Fuel tank bolt	50	5.0	36.5	☞
Fuel filler hose clamp	2	0.2	1.5	☞
Fuel pump assembly bolt	11	1.1	8.0	☞

NOTE:

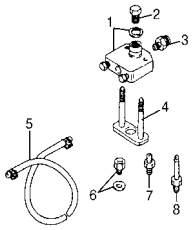
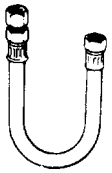
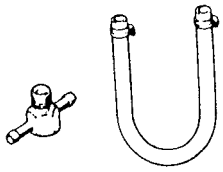
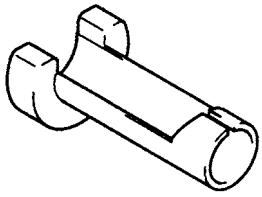
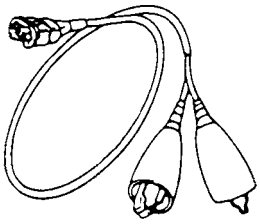
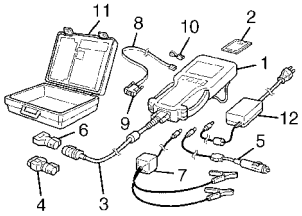
The specified tightening torque is also described in the following.
“Fuel System Components: ”
“Fuel Hose Disconnecting and Reconnecting: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A1708001

09912–57610 Injector checking tool plate ☞ 	09912–58421 Checking tool set This kit includes the following items. 1. Tool body and washer, 2. Body plug, 3. Body attachment-1, 4. Holder, 5. Return hose and clamp, 6. Body attachment-2 and washer, 7. Hose attachment-1, 8. Hose attachment-2 ☞ 
09912–58432 Fuel pressure gauge hose This tool included in fuel pressure gauge set (09912-58413). ☞ 	09912–58442 Fuel pressure gauge This tool included in fuel pressure gauge set (09912-58413). ☞
09912–58490 3-way joint & hose ☞ 	09919–47020 Quick joint remover ☞ 
09930–88530 Injector test lead ☞ 	SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ 

Ignition System

General Description

Ignition System Construction

S4RS0A1801001

The ignition system is an electronic (distributorless) ignition system. It consists of the parts as described below.

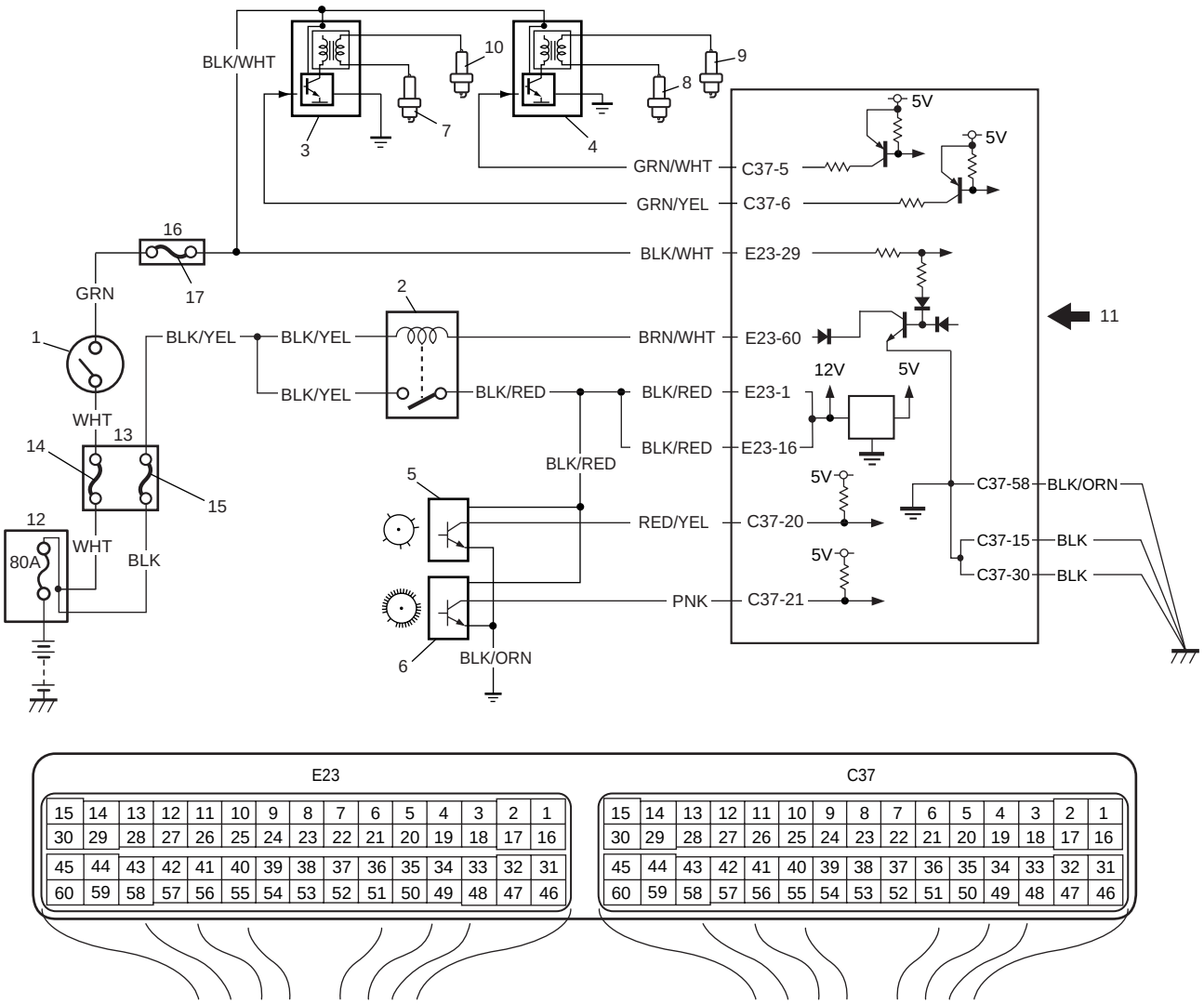
- **ECM**
  It detects the engine and vehicle conditions through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the ignitor (power unit) in the ignition coil assembly.
- **Ignition coil assembly (including an ignitor)**
  The ignition coil assembly has a built-in ignitor which turns ON and OFF the current flow to the primary coil according to the signal from ECM. When the current flow to the primary coil is turned OFF, a high voltage is induced in the secondary coil.
- **High-tension cords and spark plugs**
- **CMP sensor (Camshaft position sensor) and CKP sensor (Crankshaft position sensor)**
  Using signals from these sensors, ECM identifies the specific cylinder whose piston is in the compression stroke, detects the crank angle and adjusts initial ignition timing automatically.
- **TP sensor, ECT sensor, MAP sensor, MAF sensor, IAT sensor, knock sensor and other sensors / switches**

Although this ignition system does not have a distributor, it has two ignition coil assemblies (one is for No.1 and No.4 spark plugs and the other is for No.2 and No.3 spark plugs). When an ignition signal is sent from ECM to the ignitor in the ignition coil assembly for No.1 and No.4 spark plugs, a high voltage is induced in the secondary coil and that passes through the high-tension cords and causes No.1 and No.4 spark plugs to spark simultaneously. Likewise, when an ignition signal is sent to the ignitor in the other ignition coil assembly, No.2 and No.3 spark plugs spark simultaneously.

Schematic and Routing Diagram

Ignition System Wiring Circuit Diagram

S4RS0A1802001



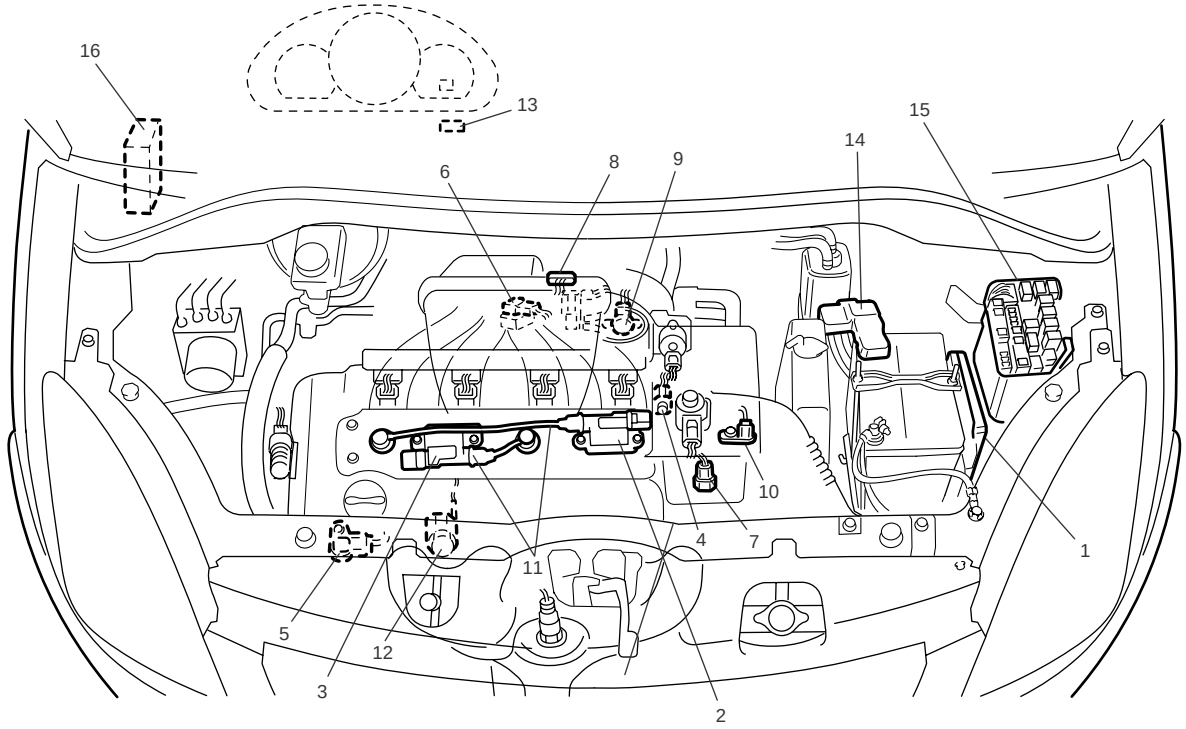
I4RS0A180001-

1. Ignition switch	7. No.1 spark plug	13. Relay box
2. Main relay	8. No.2 spark plug	14. “IG ACC” fuse
3. Ignition coil assembly for No.1 and No.4 spark plugs	9. No.3 spark plug	15. “FI” fuse
4. Ignition coil assembly for No.2 and No.3 spark plugs	10. No.4 spark plug	16. Junction block assembly
5. CMP sensor	11. Sensed information (MAP sensor, ECT sensor, MAF and IAT sensor, TP sensor, Knock sensor, VSS, Electric load signal, Engine start signal)	17. “IG COIL” fuse
6. CKP sensor	12. Main relay box	

Component Location

Ignition System Components Location

S4RS0A1803001



I4RS0A180002-

1. ECM	7. ECT sensor	13. Data link connector
2. Ignition coil assembly for No.1 and No.4 spark plugs	8. MAF and IAT sensor	14. Main relay box
3. Ignition coil assembly for No.2 and No.3 spark plugs	9. TP sensor	15. Relay box
4. CMP sensor	10. VSS	16. Junction block assembly
5. CKP sensor	11. High-tension cords	
6. MAP sensor	12. Knock sensor	

Diagnostic Information and Procedures

Ignition System Symptom Diagnosis

S4RS0A1804001

Condition	Possible cause	Correction / Reference Item
Engine cranks, but will not start or hard to start (No spark)	Blown fuse for ignition coil	*Replace.*
	Loose connection or disconnection of lead wire or high-tension cord(s)	*Connect securely.*
	Faulty high-tension cord(s)	*Replace.*
	Faulty spark plug(s)	*Replace.*
	Faulty ignition coil	*Replace ignition coil assembly.*
	Faulty CKP sensor or CKP sensor plate	*Clean, tighten or replace.*
	Faulty CMP sensor or sensor rotor tooth of camshaft	*Clean, tighten or replace.*
	Faulty ECM	*Replace.*
Poor fuel economy or engine performance	Incorrect ignition timing	*Check related sensors and CKP sensor plate.*
	Faulty spark plug(s) or high-tension cord(s)	*Adjust, clean or replace.*
	Faulty ignition coil assembly	*Replace.*
	Faulty CKP sensor or CKP sensor plate	*Clean, tighten or replace.*
	Faulty CMP sensor or sensor rotor tooth of camshaft	*Clean, tighten or replace.*
	Faulty knock sensor	*Replace.*
	Faulty ECM	*Replace.*

Reference Waveform of Ignition System

S4RS0A1804002

1) Remove ECM from its bracket with ECM connectors connected referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.
2) Oscilloscope waveform of CMP sensor and No.1/ No.4 ignition trigger signal are as shown in the figure when connecting oscilloscope between terminal “C37-20” of ECM connector and ground, and between terminal “C37-6” and ground.

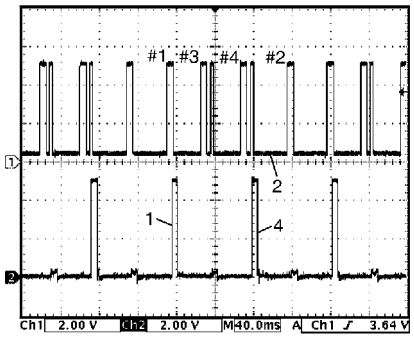
Measurement condition for waveform [A]

Measurement terminal	**CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58”**
Oscilloscope setting	**CH1: 2 V/DIV, CH2: 2 V/DIV Time: 40 ms/DIV**
Measurement condition	**After warmed up engine to normal operating temperature Engine at specified idle speed**

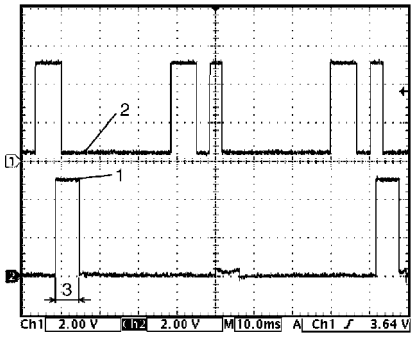
Measurement condition for waveform [B]

Measurement terminal	**CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58”**
Oscilloscope setting	**CH1: 2 V/DIV, CH2: 2 V/DIV Time: 10 ms/DIV**
Measurement condition	**After warmed up engine to normal operating temperature Engine at specified idle speed**

[A]



[B]



I3RB0A180003-

[A]:	Oscilloscope waveforms at specified idle speed
[B]:	Detail waveforms at specified idle speed
1.	No.1 ignition trigger signal
2.	CMP sensor signal
3.	Primary coil current flow time
4.	No.4 ignition trigger signal

Ignition System Check

S4RS0A1804003

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: in Section 1A".
2	**Ignition spark test** 1) Check all spark plugs for condition and type referring to "Spark Plug Inspection: ". 2) If OK, perform ignition spark test referring to "Ignition Spark Test: ". *Is spark emitted from all spark plugs?*	Go to Step 11.	Go to Step 3.
3	**DTC check** 1) Perform DTC check referring to "DTC Check: in Section 1A". *Is DTC stored in ECM?*	Go to applicable DTC diag. flow.	Go to Step 4.
4	**Electrical connection check** 1) Check ignition coil assemblies and high-tension cords for electrical connection. *Are they connected securely?*	Go to Step 5.	Connect securely.
5	**High-tension cords check** 1) Check high-tension cord for resistance referring to "High-Tension Cord Inspection: ". *Is check result satisfactory?*	Go to Step 6.	Replace high-tension cord(s).
6	**Ignition coil assembly power supply and ground circuit check** 1) Check ignition coil assembly power supply and ground circuits for open and short. *Are circuits in good condition?*	Go to Step 7.	Repair or replace.
7	**Ignition coil assembly check** 1) Check ignition coil for resistance referring to "Ignition Coil Assembly (Including ignitor) Inspection: ". *Is check result satisfactory?*	Go to Step 8.	Replace ignition coil assembly.
8	**CKP sensor check** 1) Check CKP sensor referring to "Crankshaft Position (CKP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	Go to Step 9.	Tighten CKP sensor bolt, replace CKP sensor or CKP sensor plate.
9	**CMP sensor check** 1) Check CMP sensor referring to "Camshaft Position (CMP) Sensor Inspection: in Section 1C". *Is check result satisfactory?*	Go to Step 10.	Tighten CMP sensor bolt, replace CMP sensor or intake camshaft.
10	**Ignition trigger signal circuit check** 1) Check ignition trigger signal wire for open, short and poor connection. *Is circuit in good condition?*	Go to Step 11.	Repair or replace.
11	**A known-good ignition coil assembly substitution** 1) Substitute a known-good ignition coil assembly and then repeat Step 2. *Is check result of Step 2 satisfactory?*	Go to Step 12.	Substitute a known-good ECM and then repeat Step 2.

Step	Action	Yes	No
12	**Knock sensor check** 1) Confirm that knock sensor circuit is in good condition referring to “DTC P0327 / P0328: Knock Sensor Circuit Low / High: in Section 1A” 2) Check oscilloscope waveform of knock sensor signal referring to “Reference waveform No.20” and “Reference waveform No.21” under “Inspection of ECM and Its Circuits: in Section 1A” *Is check result satisfactory?*	Go to Step 13.	Substitute a known-good knock sensor and recheck.
13	**Ignition timing check** 1) Check initial ignition timing and ignition timing advance referring to “Ignition Timing Inspection: ”. *Is check result satisfactory?*	System is in good condition.	Check CMP sensor, CMP sensor rotor tooth of camshaft, CKP sensor, CKP sensor plate and/or input signals related to this system.

Ignition Spark Test

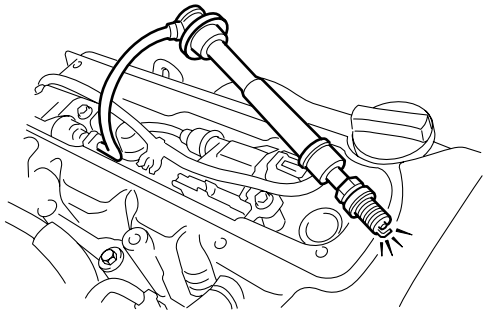
S4RS0A1804004

1) Remove air cleaner assembly with air intake pipe.
2) Disconnect all injector couplers from injectors.

WARNING:

Without disconnection of injector couplers, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.

3) Remove spark plug and check it for condition and type referring to “Spark Plug Inspection: ”.
4) If OK, connect ignition coil coupler to ignition coil assembly and connect spark plug to ignition coil assembly or high-tension cord. Ground spark plug.
5) Crank engine and check if each spark plug sparks.



I4RS0A180006-

6) If no spark is emitted, inspect the related parts as described in “Ignition System Symptom Diagnosis: ”.

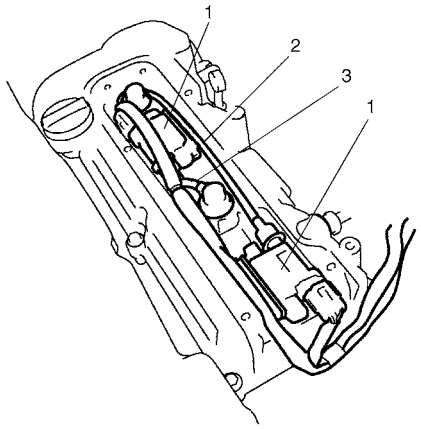
Repair Instructions

High-Tension Cord Removal and Installation

S4RS0A1806001

Removal

1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
2) Disconnect No.1 cylinder (2) and No.3 cylinder (3) high-tension cords from ignition coil assemblies (1) while gripping each cap.



I4RS0A180003-

3) Pull out high-tension cords from spark plugs while gripping each cap.

CAUTION:

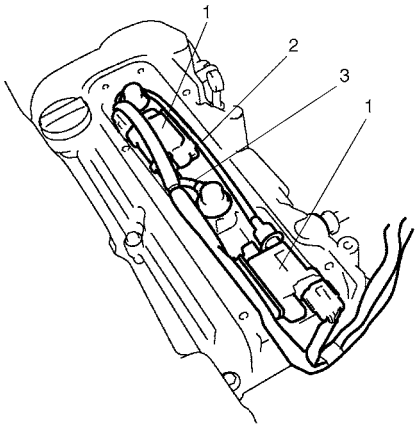
- **Removal of high-tension cords together with clamps will be recommended so as not to damage their inside wire (resistive conductor).**
- **For the same reason, pull out each connection by gripping cap portion.**

Installation

1) Install No.1 cylinder (2) and No.3 cylinder (3) high-tension cords to spark plugs and ignition coil assemblies (1) while gripping each cap.

CAUTION:

- **Never attempt to use metal conductor high-tension cords as replacing parts.**
- **Insert each cap portion fully when installing high-tension cords.**



I4RS0A180004-

High-Tension Cord Inspection

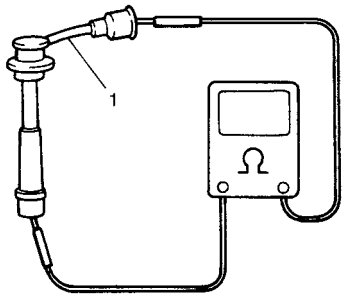
S4RS0A1806002

Measure resistance of high-tension cord (1) by using ohmmeter.
If resistance exceeds specification, replace high-tension cord(s).

High-tension cord resistance

No.1 cylinder high-tension cord resistance: 1.4 – 4.0 kΩ

No.3 cylinder high-tension cord resistance: 0.6 – 2.0 kΩ



I2RH0B180005-

Spark Plug Removal and Installation

S4RS0A1806003

Removal

1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
2) Pull out high-tension cords by gripping their caps and then remove ignition coil assemblies referring to “Ignition Coil Assembly (Including ignitor) Removal and Installation: ”.
3) Remove spark plugs.

Installation

1) Install spark plugs and tighten them to specified torque.

   Tightening torque
   Spark plug: 25 N·m (2.5 kg-m, 18.0 lb-ft)

2) Install ignition coil assemblies referring to “Ignition Coil Assembly (Including ignitor) Removal and Installation: ”.
3) Install high-tension cords securely by gripping their caps.
4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.

Spark Plug Inspection

S4RS0A1806004

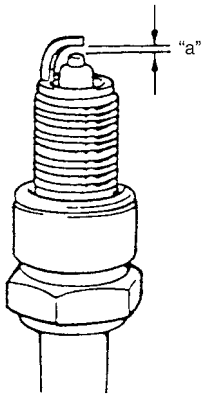
Inspect spark plug for:

- Electrode wear
- Carbon deposits
- Insulator damage

If any abnormality is found, adjust air gap, clean with spark plug cleaner or replace them with new plugs.

Spark plug air gap
“a”: 1.0 – 1.1 mm (0.040 – 0.043 in.)

Spark plug type
NGK: BKR6E-11
DENSO: K20PR-U11



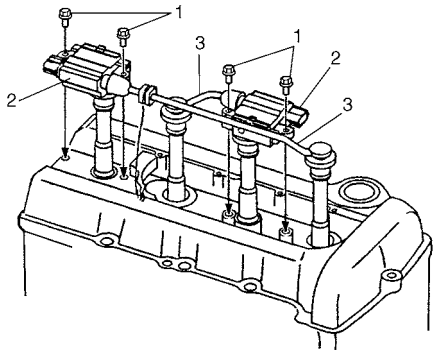
IYSQ01181012-

Ignition Coil Assembly (Including ignitor) Removal and Installation

S4RS0A1806005

Removal

1) Disconnect negative cable at battery.
2) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
3) Disconnect ignition coil coupler.
4) Disconnect high-tension cord (3) from ignition coil assembly (2).
5) Remove ignition coil bolts (1) and then pull out ignition coil assembly.



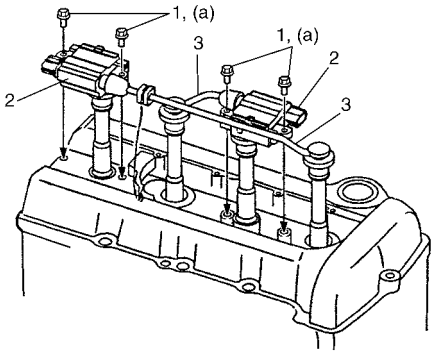
I2RH0B180006-

Installation

1) Install ignition coil assembly (2).
2) Tighten ignition coil bolts (1) to specified torque, and then connect ignition coil coupler.

   Tightening torque
   Ignition coil bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

3) Install high-tension cord (3) to ignition coil assembly while gripping its cap.



I3RM0A180004-

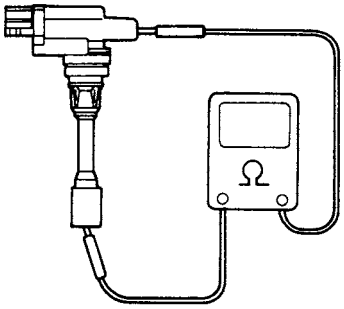
4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.
5) Connect negative cable to battery.

Ignition Coil Assembly (Including ignitor) Inspection

S4RS0A1806006

Measure secondary coil for resistance.
If resistance is out of specification, replace ignition coil assembly.

Secondary coil resistance
7.6 – 10.2 kΩ at 20 °C, 68 °F



I2RH0B180007-

Ignition Timing Inspection

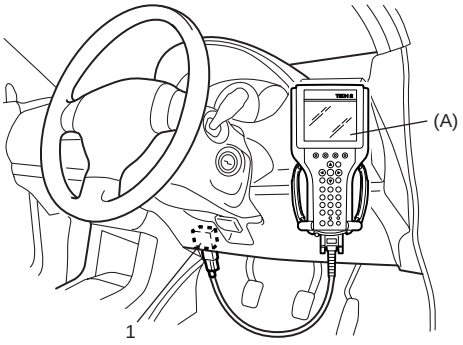
S4RS0A1806007

NOTE:

- **Ignition timing is not adjustable. If ignition timing is out of specification, check system related parts.**
- **Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake.**

1) Connect scan tool to DLC (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



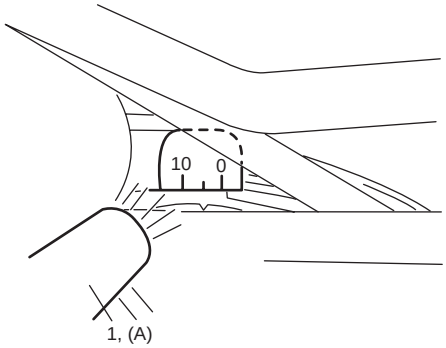
I4RS0A180005-

2) Start engine and warm it up to normal operating temperature.
3) Make sure that all of electrical loads except ignition are switched off.
4) Check to be sure that idle speed is within specification referring to "Idle Speed / Idle Air Control (IAC) Duty Inspection: in Section 1A".
5) Fix ignition timing by using "Fixed Spark" of "Misc Test" mode on scan tool.
6) Set timing light (1) to high-tension cord for No.1 cylinder and check that ignition timing is within specification.

Initial ignition timing (fixed with SUZUKI scan tool)
5 ± 3° BTDC (at specified idle speed)

Ignition order
1 – 3 – 4 – 2

Special tool
(A): 09930–76420



I3RB0A180004-

7) If ignition timing is out of specification, check the followings.
   - CKP sensor
   - CKP sensor plate
   - TP sensor
   - CMP sensor
   - CMP sensor rotor tooth of camshaft
   - VSS
   - Timing chain cover installation
8) After checking initial ignition timing, release ignition timing fixation by using scan tool.
9) With engine idling (throttle opening at closed position and vehicle stopped), check that ignition timing is about 3° – 13° BTDC. (Constant variation within a few degrees from 3° – 13° indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
   If the check results are not satisfactory, check CKP sensor and ECM.

Specifications

Tightening Torque Specifications

S4RS0A1807001

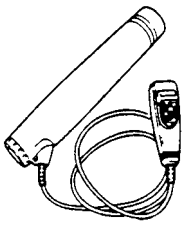
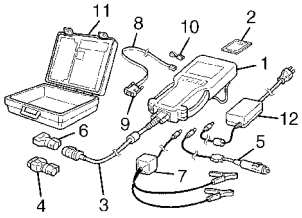
Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Spark plug	25	2.5	18.0	☞
Ignition coil bolt	10	1.0	7.5	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A1808001

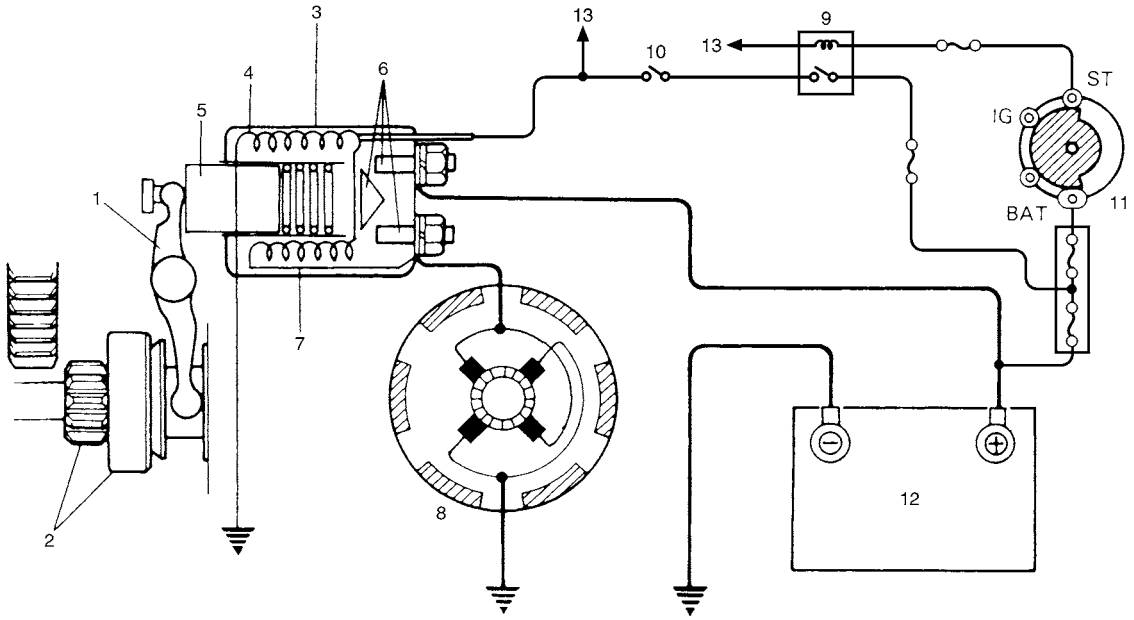
09930–76420 Timing-light (dry cell type) ☞		SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞	

Starting System

Schematic and Routing Diagram

Cranking System Circuit Diagram

S4RS0A1902001



I4RS0A190001-

1. Pinion drive lever	6. Magnetic switch contacts	11. Ignition & Starter switch
2. Pinion & Over-running clutch	7. Pull-in coil	12. Battery
3. Magnetic switch	8. Starting motor	13. To ECM
4. Hold-in coil	9. Starting motor control relay	
5. Plunger	10. A/T: Transmission range switch (shift lever switch)	

Diagnostic Information and Procedures

Cranking System Symptom Diagnosis

S4RS0A1904001

Possible symptoms due to starting system trouble would be as follows:

- Starting motor does not run (or runs slowly)
- Starting motor runs but fails to crank engine
- Abnormal noise is heard

Proper diagnosis must be made to determine exactly where the cause of each trouble lies in battery, wiring harness, (including starting motor switch), starting motor or engine.
Do not remove motor just because starting motor does not run. Check the following items and narrow down scope of possible causes.

1) Condition of trouble
2) Tightness of battery terminals (including ground cable connection on engine side) and starting motor terminals
3) Discharge of battery
4) Mounting of starting motor

Condition	Possible cause	Correction / Reference Item
Motor not running (No operating sound of magnetic switch)	Shift lever switch is not in P or N, or not adjusted (A/T)	*Shift in P or N, or adjust switch. (A/T)*
	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Poor contact in battery terminal connection	*Retighten or replace.*
	Loose grounding cable connection	*Retighten.*
	Fuse set loose or blown off	*Tighten or replace.*
	Poor contacting action of ignition switch and magnetic switch	*Replace.*
	Lead wire coupler loose in place	*Retighten.*
	Open-circuit between ignition switch and magnetic switch	*Repair.*
	Open-circuit in pull-in coil	*Replace magnetic switch.*
	Brushes are seating poorly or worn down	*Repair or replace.*
	Poor sliding of plunger and/or pinion	*Repair.*
	Faulty starting motor control relay	*"Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: in Section 1C".*
	Faulty ECM and its circuit	*"Inspection of ECM and Its Circuits: in Section 1A".*
Motor not running (Operating sound of magnetic switch heard)	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Loose battery cable connections	*Retighten.*
	Burnt main contact point, or poor contacting action of magnetic switch	*Replace magnetic switch.*
	Brushes are seating poorly or worn down	*Repair or replace.*
	Weakened brush spring	*Replace.*
	Burnt commutator	*Replace armature.*
	Layer short-circuit of armature	*Replace.*
	Crankshaft rotation obstructed	*Repair.*
Starting motor running but too slow (small torque) (If battery and wiring are satisfactory, inspect starting motor)	Insufficient contact of magnetic switch main contacts	*Replace magnetic switch.*
	Layer short-circuit of armature	*Replace.*
	Disconnected, burnt or worn commutator	*Repair commutator or replace armature.*
	Worn brushes	*Replace brush.*
	Weakened brush springs	*Replace spring.*
	Burnt or abnormally worn end bush	*Replace bush.*
Starting motor running, but not cranking engine	Worn pinion tip	*Replace over-running clutch.*
	Poor sliding of over-running clutch	*Repair.*
	Over-running clutch slipping	*Replace over-running clutch.*
	Worn teeth of ring gear	*Replace flywheel (M/T) or drive plate (A/T).*
Noise	Abnormally worn bush	*Replace bush.*
	Worn pinion or worn teeth of ring gear	*Replace over-running clutch, flywheel (M/T) or drive plate (A/T).*
	Poor sliding of pinion (failure in return movement)	*Repair or replace.*
	Worn internal or planetary gear teeth	*Replace.*
	Lack of oil in each part	*Lubricate.*

Condition	Possible cause	Correction / Reference Item
Starting motor does not stop running	Fused contact points of magnetic switch	*Replace magnetic switch.*
	Short-circuit between turns of magnetic switch coil (layer short-circuit)	*Replace magnetic switch.*
	Failure of returning action in ignition switch	*Replace.*

Cranking System Test

S4RS0A1904002

CAUTION:

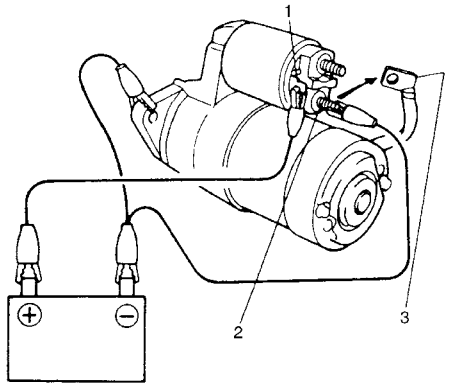
Each test must be performed within 3 – 5 seconds to avoid coil from burning.

Pull-In Test

Connect battery to the magnetic switch as shown.
Check that plunger and pinion move outward.
If plunger and pinion don't move, replace the magnetic switch.

NOTE:

Before testing, disconnect lead wire from terminal "M" (2).

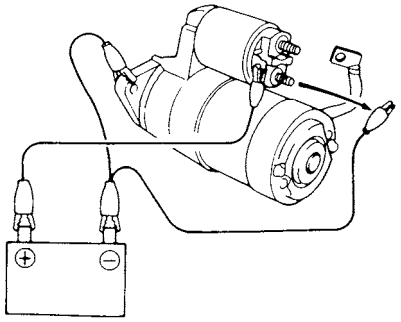


I2RH01190002-

1.	Terminal "S"
3.	Lead wire (switch to motor)

Hold-In Test

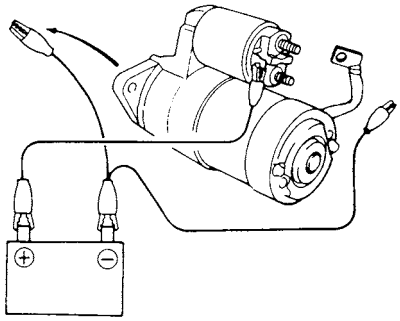
While connected as the figure with plunger out, disconnect negative lead from terminal "M".
Check that plunger and pinion remain out.
If plunger and pinion return inward, replace the magnetic switch.



I2RH01190003-

Plunger and Pinion Return Test

Disconnect negative lead from starting motor body.
Check that plunger and pinion return inward.
If plunger and pinion don't return, replace the magnetic switch.

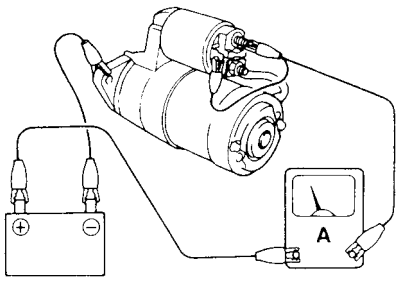


I2RH01190004-

No-Load Performance Test

Connect battery and ammeter to starter as shown.
Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter indicates specified current.

Specified current (No-load performance test)
90 A MAX. at 11 V

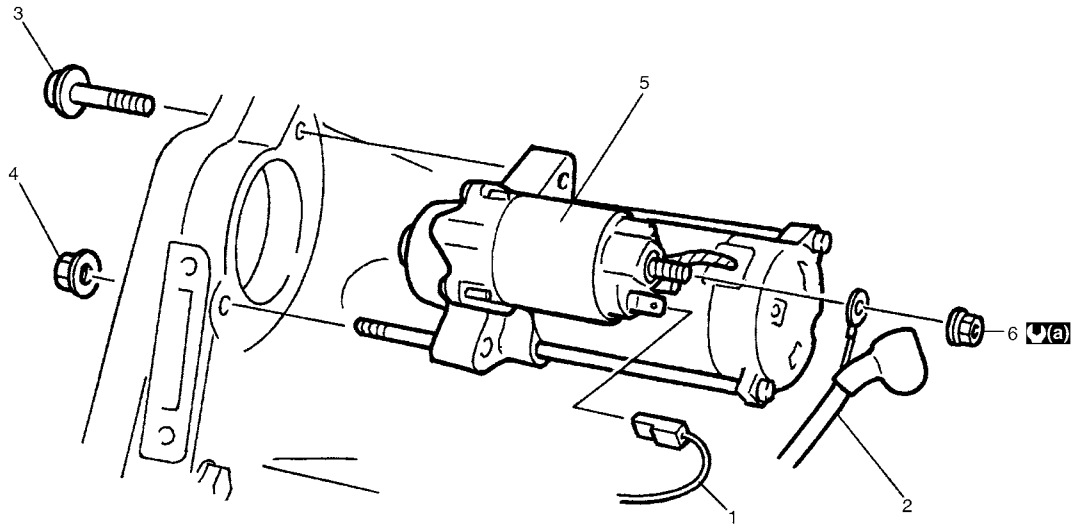


I2RH01190005-

Repair Instructions

Starting Motor Dismounting and Remounting

S4RS0A1906001



I4RS0A190002-

(a) : 9.8 N·m (0.98 kg-m, 7.0 lb-ft)

Dismounting

1) Disconnect negative (–) battery lead at battery.
2) Disconnect magnetic switch lead wire (1) and battery cable (2) from starting motor terminals.
3) Detach shift & select control cable bracket from transaxle. (M/T model only)
4) Remove starting motor mount bolt (3) and nut (4).
5) Remove starting motor (5).

Remounting

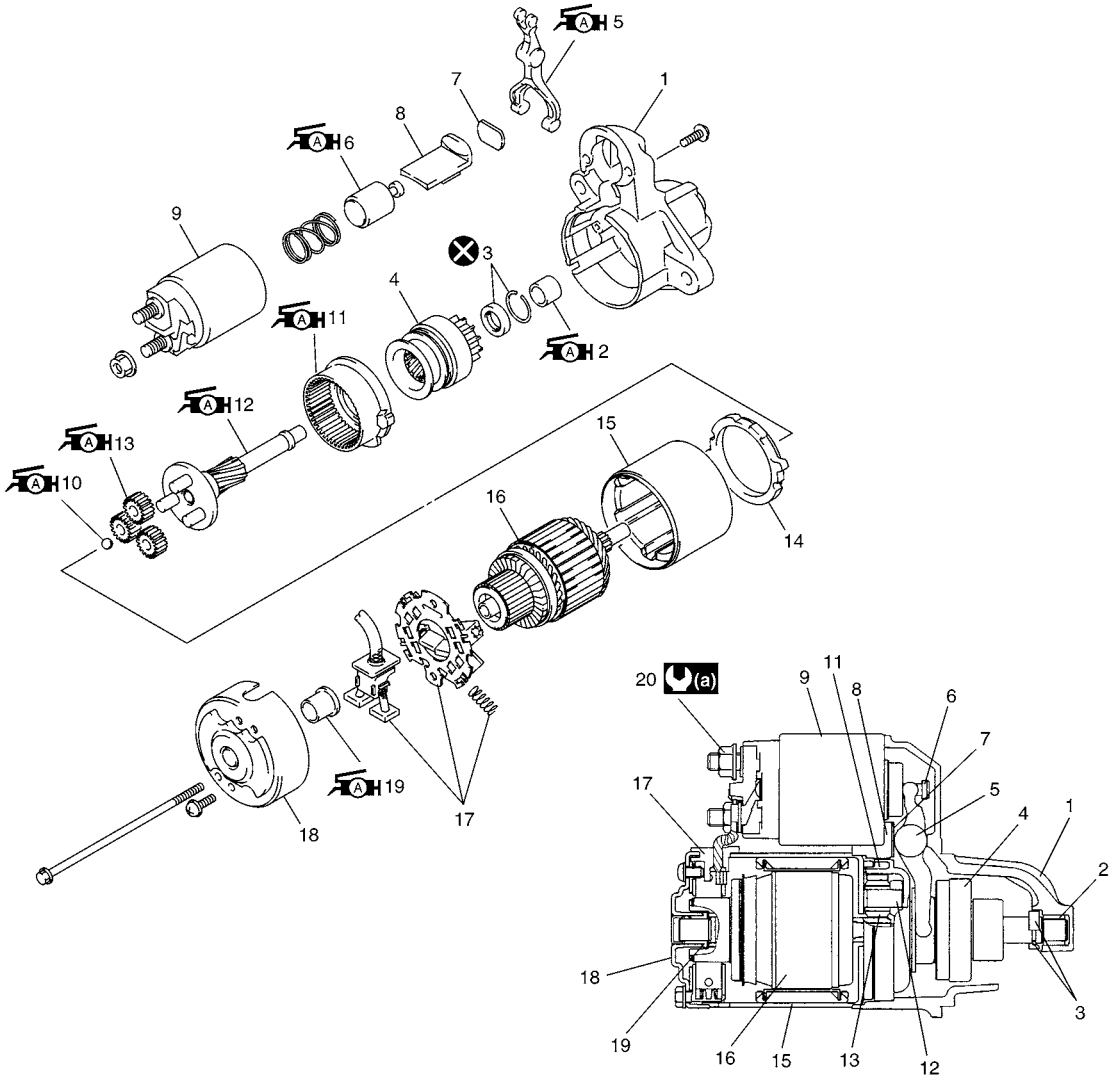
Reverse the dismounting procedure noting the following.

- Tighten battery cable nut (6) to specified torque.

Tightening torque
Starting motor battery cable nut (a): 9.8 N·m (0.98 kg-m, 7.0 lb-ft)

Starting Motor Components

S4RS0A1906002



I4RS0A190003-

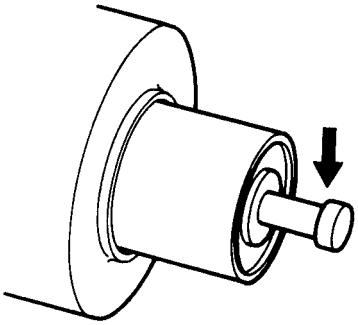
1. Front housing	8. Seal rubber	15. Yoke	⊗ : Do not reuse.
2. Bush	9. Magnetic switch	16. Armature	A H : Apply grease 99000-25010 to sliding surface of each part.
3. Pinion stop ring	10. Ball	17. Brush assembly	
4. Over-running clutch	11. Internal gear	18. Rear bracket	
5. Lever	12. Planetary carrier shaft	19. Rear bush	
6. Plunger	13. Planetary gear	20. Starting motor battery cable nut	
7. Plate	14. Packing	(a) : 9.8 N·m (0.98 kg-m, 7.0 lb-ft)	

Starting Motor Inspection

S4RS0A1906003

Plunger

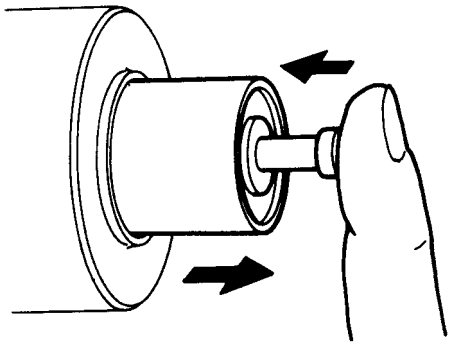
Inspect plunger for wear. Replace if necessary.



I2RH01190008-

Magnetic Switch

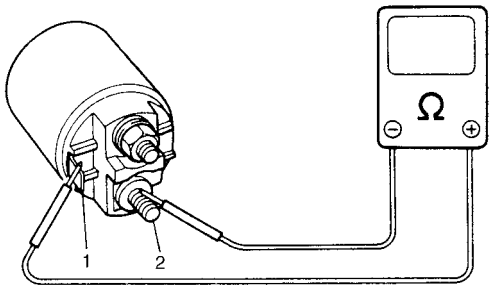
Push in plunger and release it. The plunger should return quickly to its original position. Replace if necessary.



I2RH01190009-

Pull-in coil open circuit test

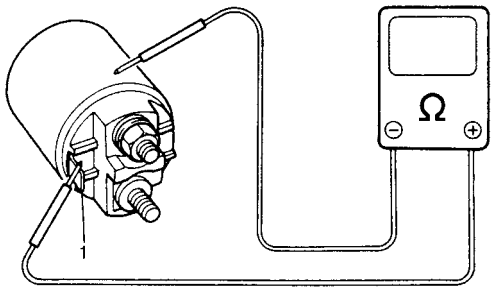
Check for continuity across magnetic switch “S” terminal (1) and “M” terminal (2). If no continuity, coil is open and should be replaced.



I2RH01190010-

Hold-in coil open circuit test

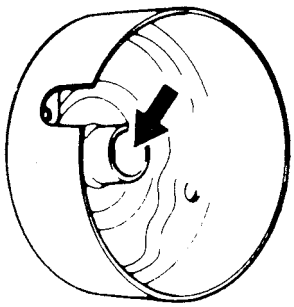
Check for continuity across magnetic switch “S” terminal (1) and coil case. If no continuity, coil is open and should be replaced.



I2RH01190011-

Rear Bracket Bush

Inspect bush for wear or damage. Replace if necessary.

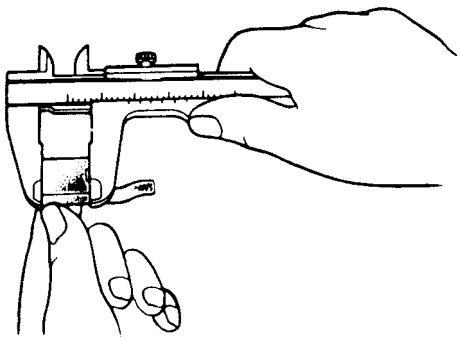


I2RH01190012-

Brush

- Check brushes for wear.
  Measure length of brushes and if below the limit, replace the brush.

  Brush length
  Standard: 12.3 mm (0.48 in.)
  Limit: 7.0 mm (0.28 in.)



I2RH01190013-

- Install brushes to each brush holder and check for smooth movement.

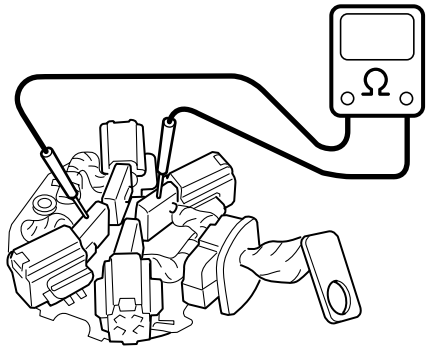
Spring

Inspect brush springs for wear, damage or other abnormal conditions. Replace if necessary.

Brush spring tension
Standard: 2.2 kg (4.85 lb)
Limit: 0.6 kg (1.33 lb)

Brush Holder

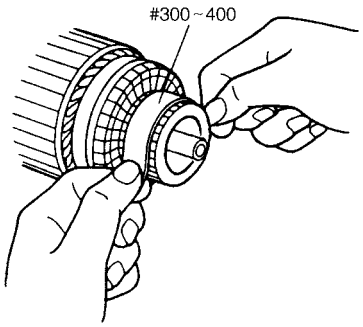
- Check movement of brush in brush holder. If brush movement within brush holder is sluggish, check brush holder for distortion and sliding faces for contamination.
  Clean or correct as necessary.
- Check for continuity across insulated brush (positive side) and grounded brush (negative side).
  If continuity exists, brush holder is grounded due to defective insulation and should be replaced.



I4RS0A190004-

Armature

- Inspect commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.



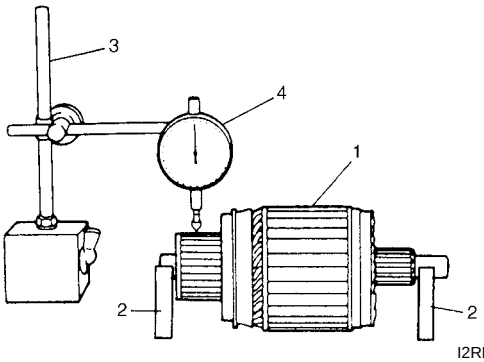
I2RH01190015-

- Check commutator for uneven wear with armature (1) supported on V-blocks (2). If deflection of dial gauge (4) pointer exceeds limit, repair or replace.

NOTE:

The following specification presupposes that the armature is free from bend. Bent armature must be replaced.

Commutator out of round
Standard: 0.05 mm (0.002 in.) or less
Limit: 0.4 mm (0.016 in.)

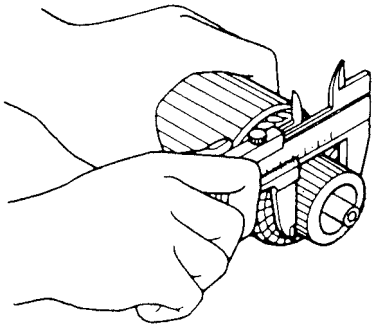


I2RH01190016-

3. Magnetic stand

- Inspect the commutator for wear. If diameter is below limit, replace the armature.

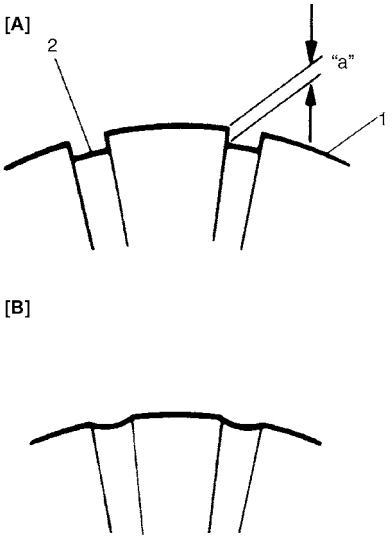
Commutator outside diameter
Standard: 29.4 mm (1.16 in.)
Limit: 28.8 mm (1.14 in.)



I2RH01190017-

- Inspect the commutator (1) for insulator (2) depth. Correct or replace if below limit.

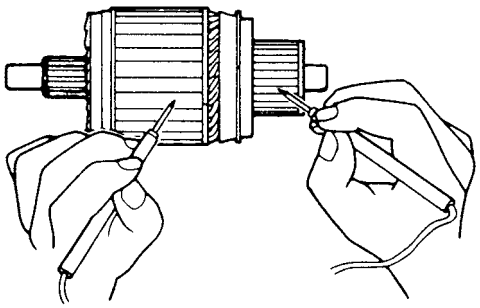
Commutator insulator depth “a”
Standard: 0.4 – 0.6 mm (0.016 – 0.023 in.)
Limit: 0.2 mm (0.008 in.)



I3RH0A190005-

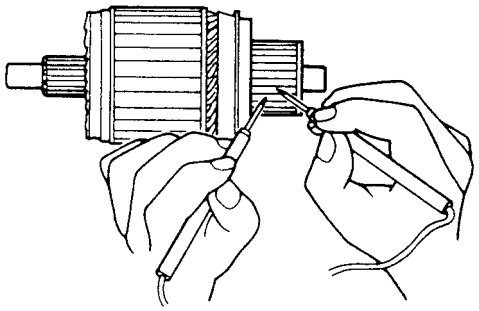
[A]: Correct
[B]: Incorrect

- Check the commutator and armature core. If there is continuity, the armature is grounded and must be replaced.



I2RH01190019-

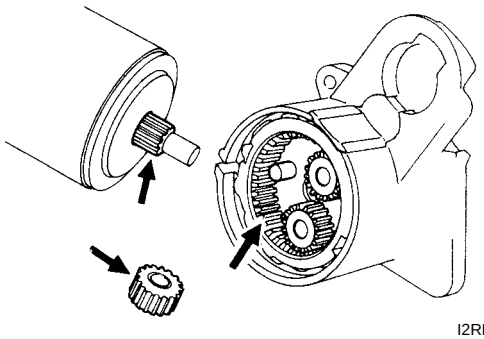
- Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and the armature must be replaced.



I2RH01190020-

Gears

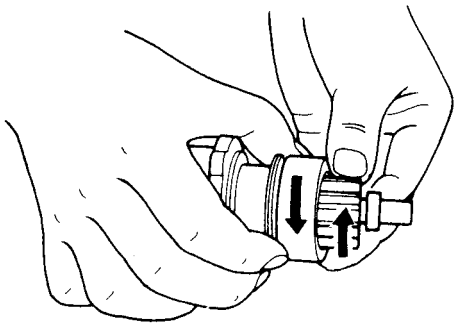
Inspect the internal gear and the planetary gears for wear, damage or other abnormal conditions. Replace if necessary.



I2RH01190021-

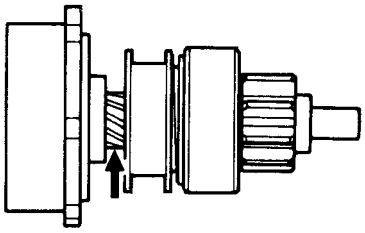
Pinion and Over-Running Clutch

- Inspect the pinion for wear, damage or other abnormal conditions.
  Check that clutch locks up when turned in direction of drive and rotates smoothly in reverse direction.
  Replace if necessary.



I2RH01190022-

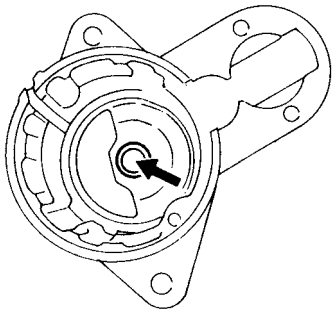
- Inspect the spline teeth for wear or damage. Replace if necessary.
  Inspect the pinion for smooth movement.



I2RH01190023-

Front Housing Bush

Inspect the bush for wear or damage. Replace if necessary.



I2RH01190024-

Specifications

Cranking System Specifications

S4RS0A1907002

Voltage			12 volts	
Output			1.2 kW	
Rating			30 seconds	
Direction of rotation			Clockwise as viewed from pinion side	
Brush length			Standard: 12.3 mm (0.48 in.)	Limit: 7.0 mm (0.28 in.)
Number of pinion teeth			8	
Performance		Condition	Guarantee	
Around at 20 °C (68 °F)	No load characteristic	11.0 V	90 A maximum 2370 r/min minimum	
	Load characteristic	7.5 V 300 A	10.65 N·m (1.065 kg-m, 7.70 lb-ft) minimum 840 r/min minimum	
	Locked characteristic	4.0 V	780 A maximum 20 N·m (2.0 kg-m, 14.5 lb-ft) minimum	
	Magnetic switch operating voltage		8 volts maximum	

Tightening Torque Specifications

S4RS0A1907001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Starting motor battery cable nut	9.8	0.98	7.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Starting Motor Dismounting and Remounting: ”
“Starting Motor Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”

Special Tools and Equipment

Recommended Service Material

S4RS0A1908001

NOTE:

Required service material is also described in the following.
“Starting Motor Components: ”

Charging System

General Description

Battery Description

S4RS0A1A01001

The battery has three major functions in the electrical system.

- It is a source of electrical energy for cranking the engine.
- It acts as a voltage stabilizer for the electrical system.
- It can, for a limited time, provide energy when the electrical load exceeds the output of the generator.

Carrier and Hold-Down

The battery carrier should be in good condition so that it will support the battery securely and keep it level. Before installing the battery, the battery carrier and hold-down clamp should be clean and free from corrosion and make certain there are no parts in carrier.
To prevent the battery from shaking in its carrier, the hold-down bolts should be tight enough but not over-tightened.

Electrolyte Freezing

The freezing point of electrolyte depends on its specific gravity. Since freezing may ruin a battery, it should be protected against freezing by keeping it in a fully charged condition. If a battery is frozen accidentally, it should not be charged until it is warmed.

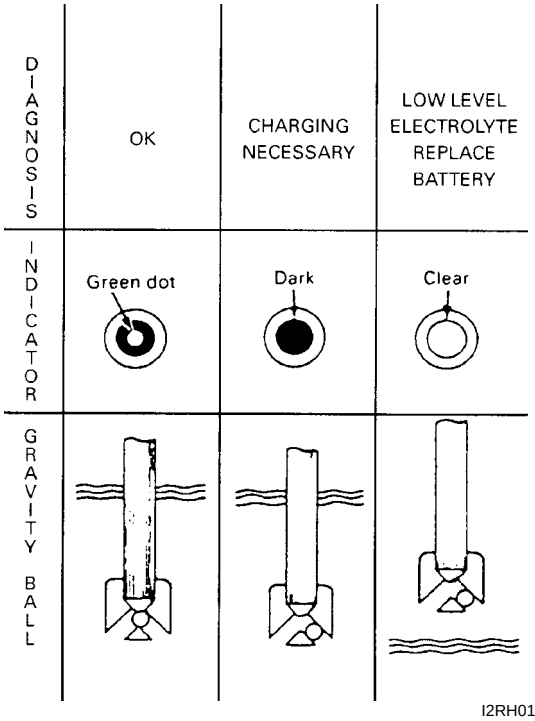
Sulfation

If the battery is allowed to stand for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. “Sulfation” means the result as well as the process of that reaction. Such a battery can be revived by very slow charging and may be restored to usable condition but its capacity is lower than before.

Built-In Indicator (If Equipped)

The battery has a built-in temperature compensated indicator in the top of the battery. This indicator is to be used with the following diagnostic procedure. When checking the indicator, make sure that the battery has a clean top. A light may be needed in some poorly-lit areas.
Three types of indication available under normal operation are as follows.

- **Green dot**
  Battery is sufficiently charged for testing.
- **Dark**
  Battery must be charged before testing. If there is a cranking complaint, battery should be tested as described in “Battery Inspection: ”. Charging and electrical systems should also be checked at this time.
- **Clear or light yellow**
  This means that fluid level is below the bottom of hydrometer. Its possible cause is excessive or prolonged charging, a broken case, excessive tipping or normal battery deterioration. When the battery is found in such condition, it is possible that high charging voltage is caused by the faulty charging system and therefore, charging and electrical systems need to be checked. If there is a trouble in cranking and its cause lies in the battery, it should be replaced.



I2RH011A0001-

Care of battery

WARNING:

- **Never expose battery to open flame or electric spark because of battery generate gas which is flammable and explosive.**
- **Do not allow battery fluid to contact eyes, skin, fabrics, or painted surfaces as fluid is a corrosive acid. Flush any contacted area with water immediately and thoroughly.**
- **Batteries should always be kept out of reach of children.**

1) The battery is a very reliable component, but needs periodical attentions.
   - Keep the battery carrier clean.
   - Prevent rust formation on the terminal posts.
   - Keep the electrolyte up to the upper level uniformly in all cells.

- When keeping battery on vehicle over a long period of time, follow instructions given below.
  - Weekly, start the engine and run it until it reaches normal operating temperature with engine speed of 2000 to 3000 rpm. Make sure all electric switches are off before storing the vehicle.
  - Recharge the battery twice a month to prevent it from discharging excessively. This is especially important when ambient temperature is low.
    The battery discharges even when it is not used, while vehicles are being stored. Battery electrolyte can freeze and battery case can crack at cold ambient condition if battery is not properly charged.

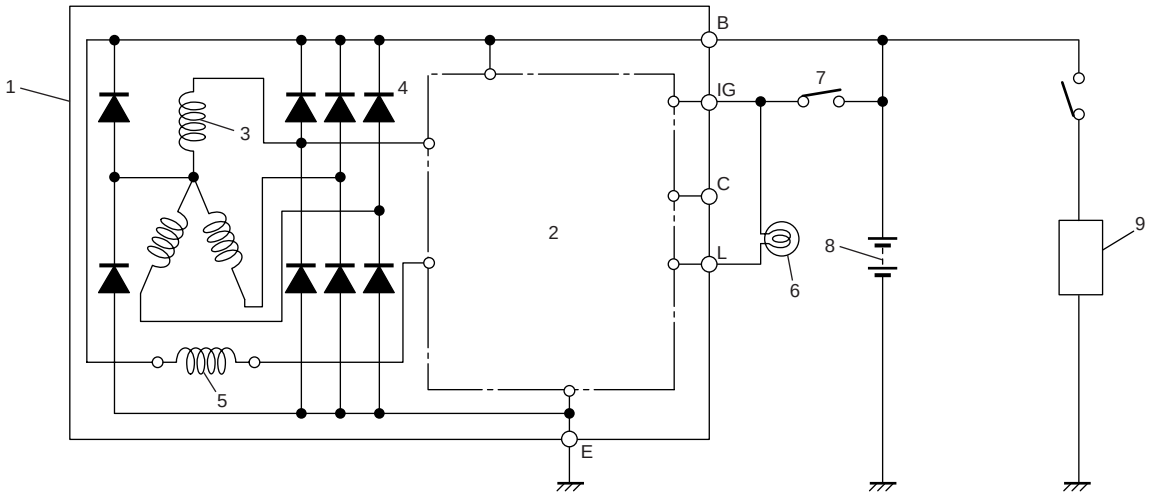
2) Keep the battery cable connections clean.
   The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current.
   Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.
3) Be always in the know as to the state of charge of the battery. The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an instrument for measuring the specific gravity (S.G.) of the battery electrolyte. The S.G. of the electrolyte is indicative of the state of charge. Refer to “Battery Inspection: ”.

Generator Description

S4RS0A1A01002

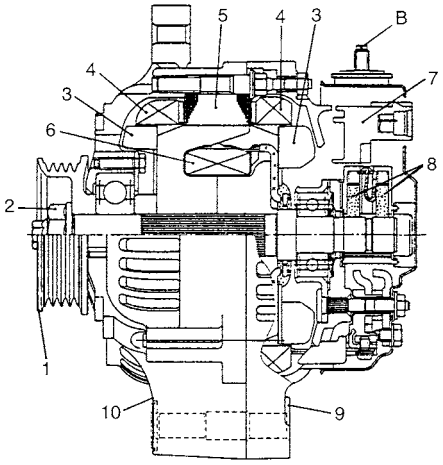
The generator is a small and high performance type with an IC regulator incorporated. The internal components are connected electrically as shown in the following figure.
The generator features are as follows:

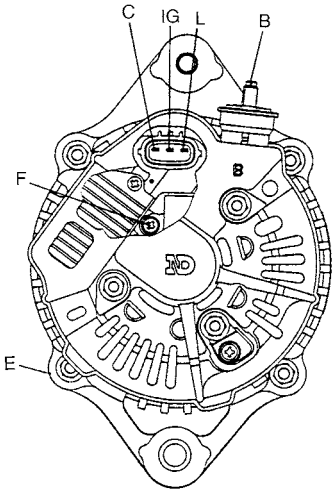
- Solid state regulator is mounted inside the generator.
- All regulator components are enclosed into a solid mold.
- This unit along with the brush holder assembly is attached to the rear housing.
- The IC regulator uses integrated circuits and controls the voltage produced by the generator, and the voltage setting cannot be adjusted.
- The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long period of attention-free service.
- The stator windings are assembled on the inside of a laminated core that forms part of the generator frame.



I4RS0A1A0001-

1. Generator with regulator assembly	3. Stator coil	5. Field coil (rotor coil)	7. Main switch	9. Load
2. I.C. regulator	4. Diode	6. Charge indicator light	8. Battery	





I2RH0B1A0002-

1. Pulley	5. Stator core	9. Rear end frame	E: Ground
2. Pulley nut	6. Field coil	10. Drive end frame	F: Field coil terminal
3. Rotor fan	7. Regulator	B: Generator output (Battery terminal)	IG: Ignition terminal
4. Stator coil	8. Brush	C: C terminal	L: Lamp terminal

Diagnostic Information and Procedures

Battery Inspection

S4RS0A1A04001

Visual Inspection

Check for obvious damage, such as cracked or broken case or cover, that could permit loss of electrolyte. If obvious damage is noted, replace battery. Determine cause of damage and correct as needed.

Generator Symptom Diagnosis

S4RS0A1A04002

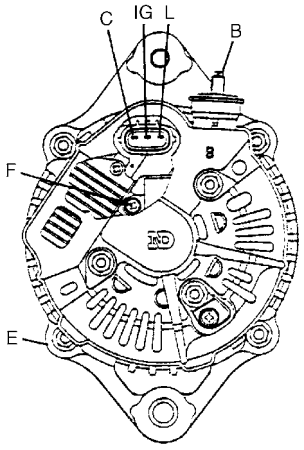
CAUTION:

- **Do not mistake polarities of "IG" terminal and "L" terminal.**
- **Do not create short circuit between "IG" and "L" terminals. Always connect these terminals through a lamp.**
- **Do not connect any load between "L" and "E" terminals.**
- **When connecting charger or booster battery to vehicle battery, refer to "Jump Starting in Case of Emergency: ".**

Trouble in charging system will show up as one or more of the following conditions:

1) Faulty indicator lamp operation.
2) An undercharged battery as evidenced by slow cranking or indicator dark.
3) An overcharged battery as evidenced by excessive spewing of electrolyte from vents.

Noise from generator may be caused by loose drive pulley, loose mounting bolts, worn or dirty bearings, defective diode, or defective stator.



I2RH0B1A0004-

B: Generator output (Battery terminal)	F: Field coil terminal
C: C terminal	IG: Ignition terminal
E: Ground	L: Lamp terminal

Charging Indicator Lamp Operation

Condition	Possible cause	Correction / Reference Item
Charge light does not light with ignition ON and engine off	Fuse blown	*Check fuse.*
	Indicator lamp (LED) faulty	*Replace combination meter.*
	Wiring connection loose	*Tighten loose connection.*
	IC regulator or field coil faulty	*Check generator.*
	Poor contact between brush and slip ring	*Repair or replace.*
Charge light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	*Adjust or replace drive belt.*
	IC regulator or generator faulty	*Check charging system.*
	Wiring faulty	*Repair wiring.*

Generator Test (Undercharged Battery Check)

S4RS0A1A04003

This condition, as evidenced by slow cranking or low specific gravity can be caused by one or more of the following conditions even though indicator lamp may be operating normal. The following procedure also applies to cars with voltmeter and ammeter.

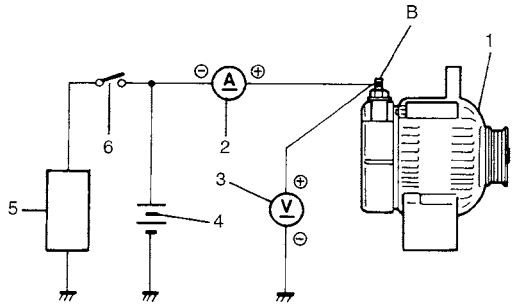
- Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
- Check drive belt for proper tension.
- If battery defect is suspected, refer to “Battery Description: ”.
- Inspect wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starting motor and ignition ground cable.

No-Load Check

1) Connect voltmeter and ammeter as shown in the figure.

NOTE:

Use fully charged battery.



I2RH011A0006-

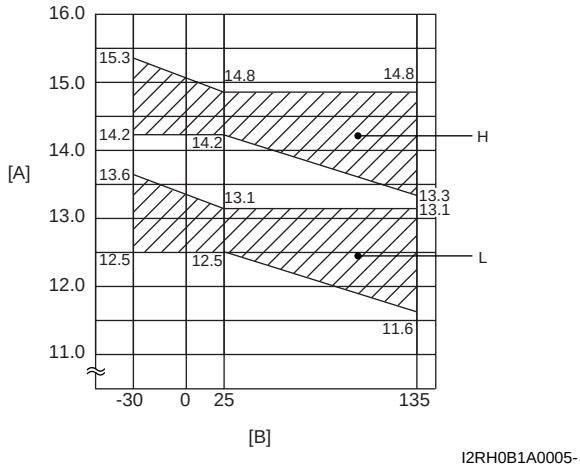
1.	Generator
2.	Ammeter (between generator “B” terminal and battery (+) terminal)
3.	Voltmeter (between generator “B” terminal and ground)
4.	Battery
5.	Load
6.	Switch

2) Run engine from idling up to 2,000 rpm with all accessories turned off and read meters.
If voltage is higher than standard value, check ground of brushes.
If brushes are not grounded, replace IC regulator.
If voltage is lower than standard value, proceed to the following check.

Specification for undercharged battery (No-load check)
Current: 10 A
Voltage: 14.2 – 14.8 V at Hi (H) (at 25 °C, 77 °F)
Voltage: 12.5 – 13.1 V at Lo (L) (at 25 °C, 77 °F)

NOTE:

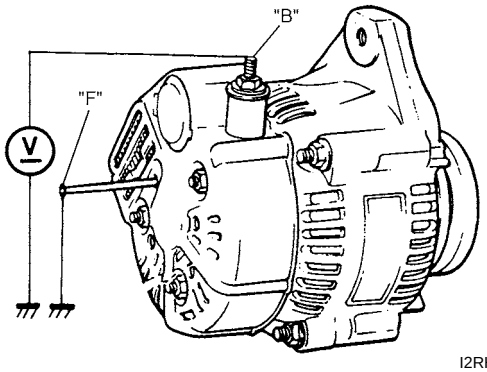
Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in the figure.



I2RH0B1A0005-

[A]:	Regulated voltage (V)
[B]:	Heatsink temperature (°C)

3) Ground “F” terminal and start engine, then measure voltage at “B” terminal as shown in the figure.
   - Voltage is higher than standard value. It is considered that generator itself is good but IC regulator has been damaged, replace IC regulator.
   - Voltage is lower than standard value. It is considered that generator itself has problem, check the generator.



I2RH011A0008-

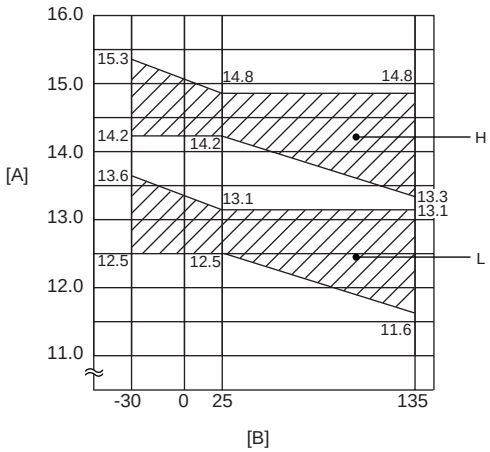
Load Check

1) Run engine at 2,000 rpm and turn on head light and heater motor.
2) Measure current and if it is less than 20 A, repair or replace generator.

Generator Test (Overcharged Battery Check)

S4RS0A1A04004

1) To determine battery condition, refer to “Battery Description: ”.
2) If obvious overcharged condition exists as evidenced by excessive spewing of electrolyte, measure generator “B” terminal voltage at engine 2000 rpm.
3) If measured voltage is higher than upper limit value, disassemble generator.
4) Check ground of brushes. If brushes are not grounded, replace IC regulator. Then check field coil for grounds and shorts.



I2RH0B1A0005-

[A]:	Regulated voltage (V)
[B]:	Heatsink temperature (°C)

Repair Instructions

Jump Starting in Case of Emergency

S4RS0A1A06001

With Auxiliary (Booster) Battery

CAUTION:

If vehicle is manual transaxle model and has a catalytic converter, do not push or tow it to start. Damage to its emission system and/or to other parts may result.

Both booster and discharged battery should be treated carefully when using jumper cables. Follow the procedure outlined as follows, being careful not to cause sparks.

WARNING:

- **Departure from these conditions or procedure described as follows could result in:**
  - **Serious personal injury (particularly to eyes) or property damage from such causes as battery explosion, battery acid, or electrical burns.**
  - **Damage to electronic components of either vehicle.**
- **Remove rings, watches, and other jewelry. Wear approved eye protection.**
- **Be careful so that metal tools or jumper cables do not contact positive battery terminal (or metal in contact with it) and any other metal on vehicle, because a short circuit could occur.**
- **Do not connect negative cable directly to negative terminal of dead battery.**

1) Set parking brake and place automatic transaxle in PARK (NEUTRAL on manual transaxle). Turn off ignition, turn off lights and all other electrical loads.
2) Check electrolyte level. If it is below low level line, add distilled water.
3) Attach end of one jumper cable to positive terminal of booster battery and the other end of the same cable to positive terminal of discharged battery. (Use 12-volt battery only to jump start engine).
4) Attach one end of the remaining negative cable to negative terminal of booster battery, and the other end to a solid engine ground (such as exhaust manifold) at least 45 cm (18 in.) away from battery of vehicle being started.
5) Start engine of vehicle with booster battery and turn off electrical accessories. Then start engine of the vehicle with discharged battery.
6) Disconnect jumper cables in the exact reverse order.

With Charging Equipment

CAUTION:

When jump starting engine with charging equipment, be sure equipment used is 12-volt and negative ground. Do not use 24-volt charging equipment. Using such equipment can cause serious damage to electrical system or electronic parts.

Battery Dismounting and Remounting

S4RS0A1A06002

Dismounting

1) Disconnect negative cable (1).
2) Disconnect positive cable (2).
3) Remove retainer (3).
4) Remove battery (4).

Handling

When handling battery, the following safety precautions should be followed:

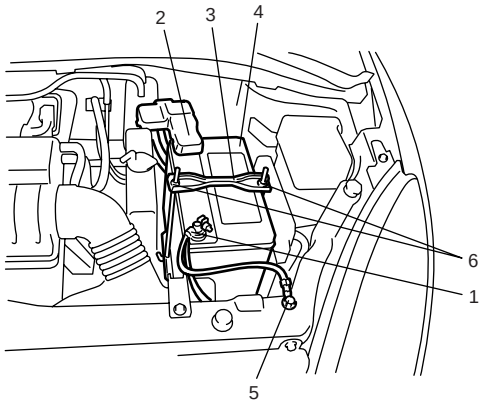
- Hydrogen gas is produced by battery. A flame or spark near battery may cause the gas to ignite.
- Battery fluid is highly acidic. Avoid spilling on clothing or other fabric. Any spilled electrolyte should be flushed with large quantity of water and cleaned immediately.

Remounting

1) Reverse removal procedure.
2) Tighten battery cables securely.

NOTE:

Check to be sure that ground cable has enough clearance to hood panel by terminal.



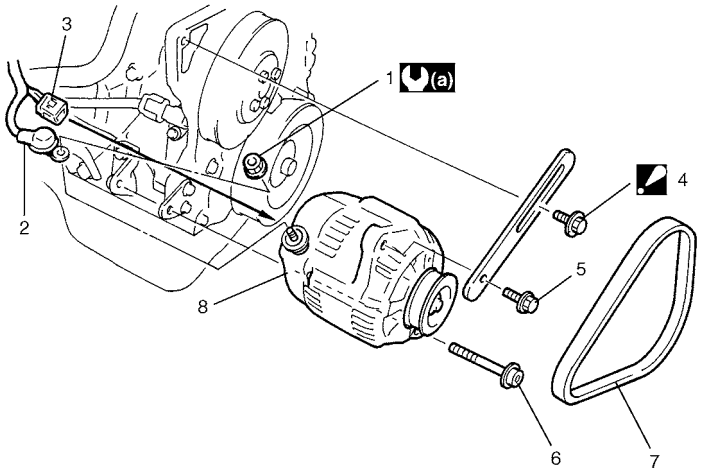
I4RS0A1A0005-

5.	Body ground bolt
6.	Nut

Generator Dismounting and Remounting

S4RS0A1A06003

1) Disconnect negative cable at battery.
2) Remove right side drive shaft referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”
3) Dismount in numerical order as shown in the figure.
4) Reverse dismounting procedure for remounting.

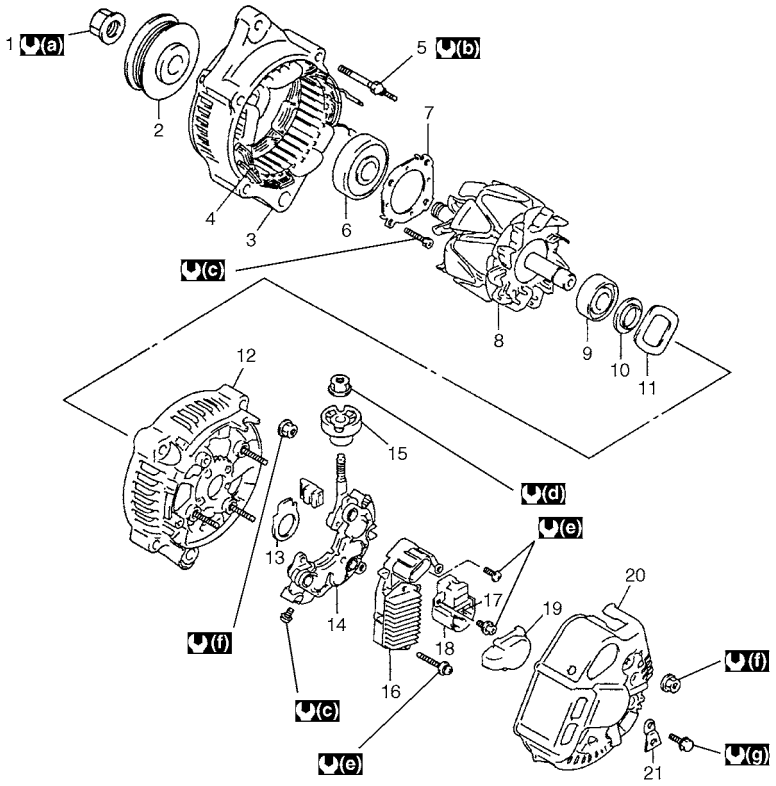


I4RS0A1A0003-

1. “B” terminal nut	4. Generator adjusting bolt : Only loosen this bolt.	7. Generator belt
2. “B” terminal wire	5. Generator adjusting arm bolt	8. Generator
3. Connector	6. Generator pivot bolt	(a) : 8.0 N·m (0.8 kg·m, 6.0 lb-ft)

Generator Components

S4RS0A1A06004



I4RS0A1A0004-

1. Pulley nut	7. Bearing retainer	13. Seal plate	19. Brush holder cover	(d) : 3.6 N·m (0.36 kg-m, 3.0 lb-ft)
2. Pulley	8. Rotor	14. Rectifier	20. Rear end cover	(e) : 2.0 N·m (0.2 kg-m, 1.5 lb-ft)
3. Drive end frame	9. End housing bearing	15. Insulator	21. Terminal plate	(f) : 4.5 N·m (0.45 kg-m, 3.5 lb-ft)
4. Stator	10. Bearing cover	16. Regulator	(a) : 111 N·m (11.1 kg-m, 80.5 lb-ft)	(g) : 3.8 N·m (0.38 kg-m, 3.0 lb-ft)
5. Stud bolt	11. Wave washer	17. Brush	(b) : 9.8 N·m (0.98 kg-m, 7.0 lb-ft)	
6. Drive end bearing	12. Rear end frame	18. Brush holder	(c) : 3.0 N·m (0.3 kg-m, 2.5 lb-ft)	

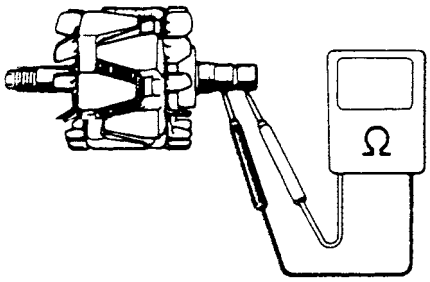
Generator Inspection

S4RS0A1A06005

Rotor

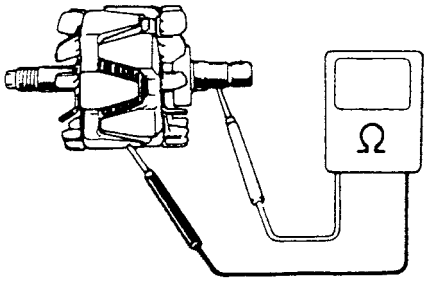
1) Using an ohmmeter, check for continuity between slip rings of rotor. If there is no continuity, replace the rotor.

Standard resistance between slip rings of rotor
2.7 – 3.1 Ω at 20 °C (68 °F)



IYSQ011A0042-

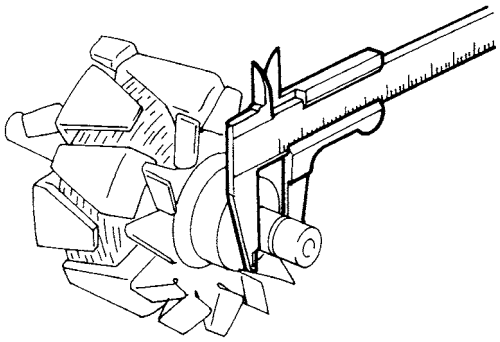
2) Using an ohmmeter, check that there is no continuity between slip ring and rotor. If there is continuity, replace the rotor.



IYSQ011A0043-

3) Check slip rings for roughness or scoring. If rough or scored, replace the rotor.
Using a vernier caliper, measure the slip ring diameter. If the diameter is less than minimum, replace the rotor.

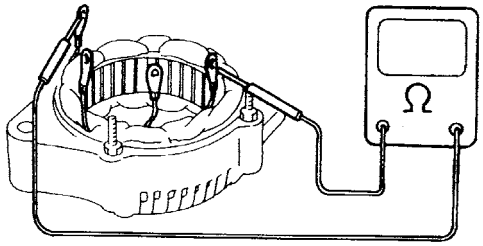
Slip ring diameter
Standard: 14.2 – 14.4 mm (0.560 – 0.566 in.)
Limit: 12.8 mm (0.503 in.)



IYSQ011A0044-

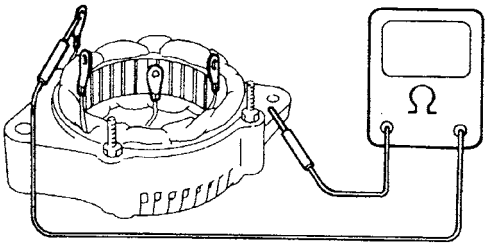
Stator

1) Using an ohmmeter, check all leads for continuity. If there is no continuity, replace the stator.



I2RH011A0014-

2) Using an ohmmeter, check that there is no continuity between coil leads and stator core. If there is continuity, replace the stator.

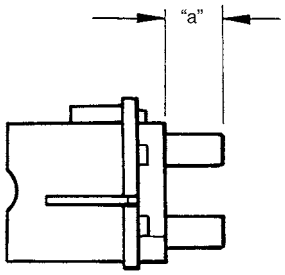


I2RH011A0015-

Brush and Brush Holder

Check each brush for wear by measuring its length as shown. If the brush is found worn down to service limit, replace the brush.

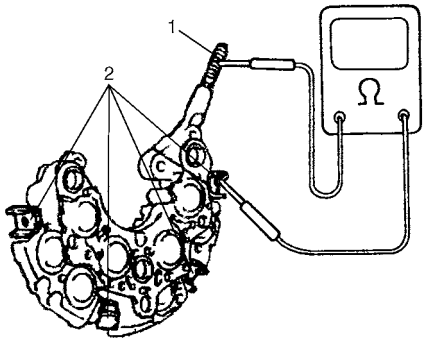
Exposed brush length “a”
Standard: 10.5 mm (0.41 in.)
Limit: 1.5 mm (0.05 in.)



IYSQ011A0047-

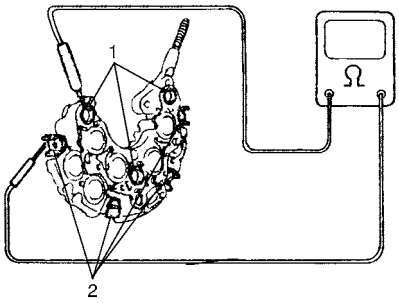
Rectifier

1) Using an ohmmeter, connect one tester probe to the “B” terminal (1) and the other to each rectifier terminal (2).



I1JA011A0002-

2) Reverse the polarity of the tester probes and repeat Step 1).
3) Check that one shows continuity and the other shows no continuity.
   If there is continuity, replace the rectifier.
4) Using an ohmmeter, connect one tester probe to each negative terminal (1) and the other to each rectifier terminal (2).



I2RH011A0017-

5) Reverse the polarity of the tester probes and repeat Step 4).
6) Check that one shows continuity and the other shows no continuity.
   If there is continuity, replace the rectifier.

Specifications

Charging System Specifications

S4RS0A1A07002

Battery

Battery type		46B24R
Rated capacity	AH/5HR, 12 Volts	36
Electrolyte	L (US / lmp pt.)	3.2 (6.76 / 5.63)

Generator

Type	70 A type
Rated voltage	12 V
Nominal output	70 A
Permissible max. speed	18,000 r/min.
No-load speed	1020 r/min. (rpm)
Regulated voltage	14.2 – 14.8 V (Hi), 12.5 – 13.1 V (Lo)
Exposed brush length	Standard: 10.5 mm (0.41 in.) Limit: 1.5 mm (0.05 in.)
Permissible ambient temperature	–30 to 90 °C (–22 to 194 °F)
Polarity	Negative ground
Rotation	Clockwise viewed from pulley side

Tightening Torque Specifications

S4RS0A1A07001

NOTE:

The specified tightening torque is also described in the following.
“Generator Dismounting and Remounting: ”
“Generator Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”

Exhaust System

General Description

Exhaust System Description

S4RS0A1B01001

The exhaust system consists of an exhaust manifold, three-way catalytic converter (TWC) in catalyst case, exhaust pipes, a muffler and seals, gasket and etc.
The three-way catalytic converter is an emission control device added to the exhaust system to lower the levels of Hydrocarbon (HC), Carbon Monoxide (CO), and Oxides of Nitrogen (NOx) pollutants in the exhaust gas.

Diagnostic Information and Procedures

Exhaust System Check

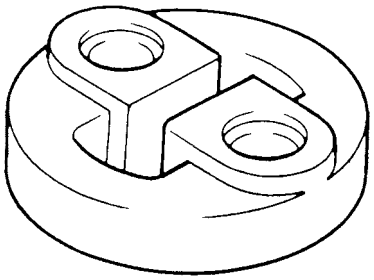
S4RS0A1B04001

WARNING:

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

At every interval of periodic maintenance service, and when vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.



IYSY011B0003-

- Check exhaust system for leakage, loose connection, dent and damage.
- If bolts or nuts are loosened, tighten them to specified torque referring to “Exhaust System Components: ”.
- Check nearby body areas damaged, missing, or mispositioned part, open seam, hole connection or any other defect which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

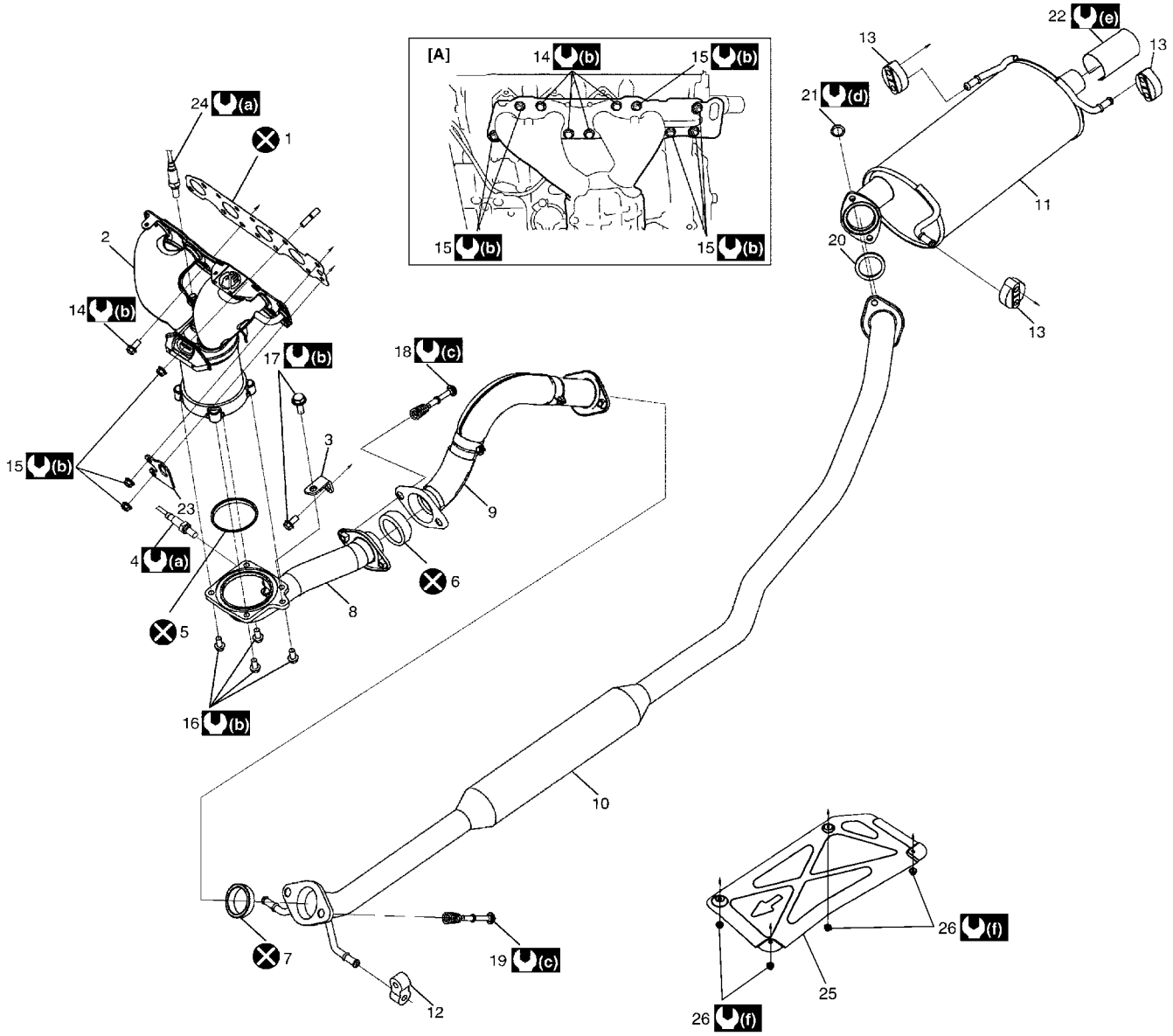
Repair Instructions

Exhaust System Components

S4RS0A1B06001

WARNING:

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.



I4RS0A1B0001-

[A]: Installing location of exhaust manifold bold and nut.	11. Muffler	22. Muffler tail pipe
1. Exhaust manifold gasket	12. Center pipe mounting	23. Engine hook
2. Exhaust manifold	13. Muffler mounting	24. Heated oxygen sensor No.2 (connector color: gray)
3. Exhaust manifold stiffener	14. Exhaust manifold bolt	25. Heat insulator
4. Heated oxygen sensor No.1 (connector color: green)	15. Exhaust manifold nut	(a) : 45 N·m (4.5 kg-m, 32.5 lb-ft)
5. Exhaust pipe No.1 gasket	16. Exhaust No.1 pipe bolt	(b) : 50 N·m (5.0 kg-m, 36.5 lb-ft)
6. No.1 seal ring	17. Exhaust manifold stiffener bolt	(c) : 43 N·m (4.3 kg-m, 31.0 lb-ft)
7. No.2 seal ring	18. Exhaust No.2 pipe bolt	(d) : 60 N·m (6.0 kg-m, 43.5 lb-ft)
8. Exhaust No.1 pipe	19. Exhaust center pipe bolt	(e) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
9. Exhaust No.2 pipe	20. Exhaust pipe No.2 gasket	(f) : 3 N·m (0.3 kg-m, 2.5 lb-ft)
10. Exhaust center pipe	21. Muffler nut	: Do not reuse.

Exhaust Manifold Removal and Installation

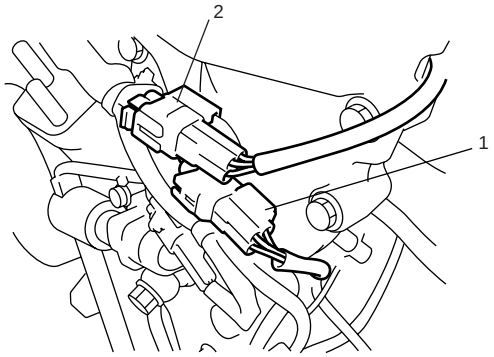
S4RS0A1B06003

Removal

WARNING:

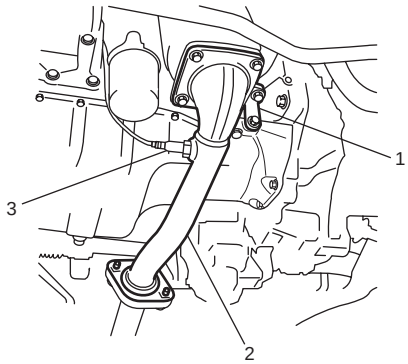
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

1) Disconnect negative cable at battery.
2) Remove front bumper with front grille referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Remove radiator referring to “Radiator Removal and Installation: in Section 1F” for equipped with A/C.
4) With hose connected, detach A/C condenser from vehicle body for equipped with A/C.
5) Disconnect heated oxygen sensor No.1 connector (1) (connector color: green) and heated oxygen sensor No.2 connector (2) (connector color: gray), and then detach it from its stay.



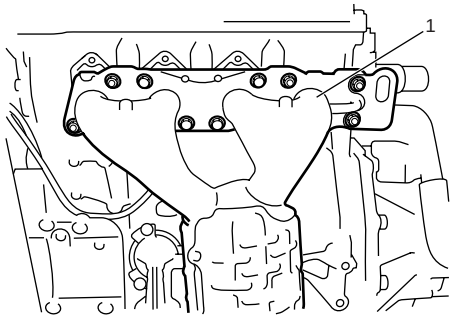
I4RS0A1B0006-

6) Remove exhaust manifold stiffener (1).
7) Remove heated oxygen sensors (3) from exhaust manifold and exhaust No.1 pipe, if necessary.
8) Disconnect exhaust No.1 pipe (2) from exhaust manifold.



I4RS0A1B0002-

9) Remove exhaust manifold (1) and its gasket from cylinder head.



I4RS0A1B0003-

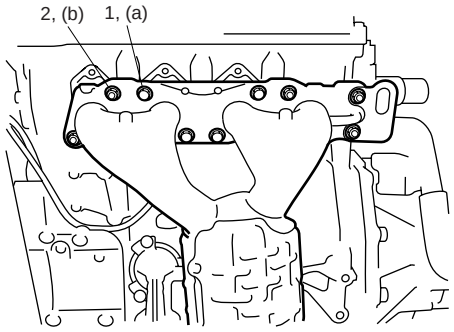
Installation

1) Install new gasket to cylinder head. Then install exhaust manifold.
   Tighten manifold bolts (1) and nuts (2) to specified torque.

   Tightening torque
   Exhaust manifold bolt (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)
   Exhaust manifold nut (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

   NOTE:

   Be sure to install exhaust manifold bolts and nuts to proper location referring to “Exhaust System Components: ”.



I4RS0A1B0004-

2) Install new seal ring and connect exhaust No.1 pipe (1) to exhaust manifold.
   Tighten pipe fasteners to specified torque.

   Tightening torque
   Exhaust No.1 pipe bolt (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)

3) Install exhaust manifold stiffener (2).
   Tighten exhaust manifold stiffener bolts to specified torque.

   Tightening torque
   Exhaust manifold stiffener bolt (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

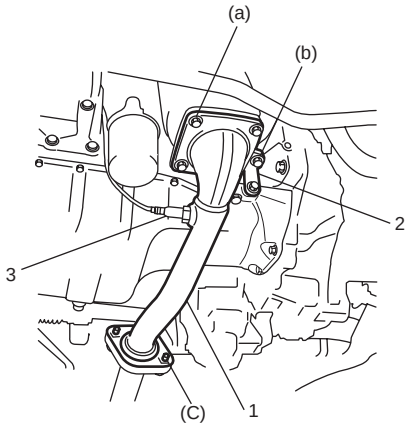
4) Install new seal ring and connect exhaust No.1 pipe (1) to exhaust No.2 pipe. Tighten pipe fasteners to specified torque.

Tightening torque
Exhaust No.2 pipe bolt (c): 43 N·m (4.3 kg-m, 31.0 lb-ft)

5) Install heated oxygen sensors (3) referring to “Exhaust System Components: ”, if removed.

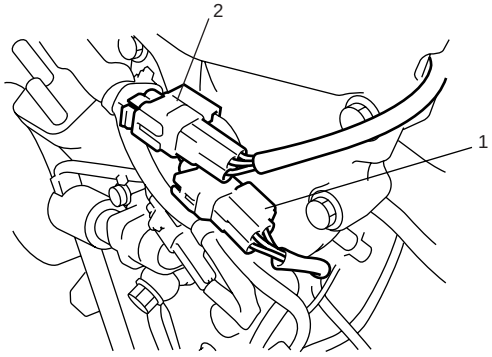
NOTE:

Be sure to identify heated oxygen sensor No.1 and No.2 by its connector color.



I4RS0A1B0005-

6) Connect heated oxygen sensor No.1 connector (1) (connector color: green) and heated oxygen sensor No.2 connector (2) (connector color: gray), and then fit coupler to bracket securely.



I4RS0A1B0006-

7) Install A/C condenser to vehicle body for equipped with A/C.
8) Install radiator referring to “Radiator Removal and Installation: in Section 1F” for equipped with A/C.
9) Install front bumper with front grille by referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
10) Connect negative cable at battery.
11) Check exhaust system for exhaust gas leakage.

Exhaust Pipe and Muffler Removal and Installation

S4RS0A1B06004

For replacement of exhaust pipe, be sure to hoist vehicle and observe WARNING under “Exhaust System Components: ” and the following.

CAUTION:

Exhaust manifold have three way catalytic converter in it, it should not be exposed to any impulse.
Be careful not to drop it or hit it against something.

- Tighten bolts and nuts to specified torque when reassembling. Refer to “Exhaust System Components: ”.
- After installation, start engine and check each joint of exhaust system for leakage.

Specifications

Tightening Torque Specifications

S4RS0A1B07001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Exhaust manifold bolt	50	5.0	36.5	☞
Exhaust manifold nut	50	5.0	36.5	☞
Exhaust No.1 pipe bolt	50	5.0	36.5	☞
Exhaust manifold stiffener bolt	50	5.0	36.5	☞
Exhaust No.2 pipe bolt	43	4.3	31.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Exhaust System Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Section 2

Suspension

CONTENTS

Precautions 2-1
Precautions 2-1
Precautions on Suspension 2-1

Suspension General Diagnosis 2A-1
Diagnostic Information and Procedures 2A-1
Suspension, Wheels and Tires Symptom Diagnosis 2A-1
Specifications 2A-3
Wheel Alignment Specifications 2A-3

Front Suspension 2B-1
General Description 2B-1
Front Suspension Construction 2B-1
Front Wheel Alignment Construction 2B-2
Repair Instructions 2B-2
Front Wheel Alignment Inspection and Adjustment 2B-2
Front Strut Assembly Components 2B-4
Front Strut Assembly Removal and Installation 2B-4
Front Strut Assembly Disassembly and Assembly 2B-6
Front Strut Assembly Check 2B-7
Front Wheel Hub and Steering Knuckle Components 2B-8
Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation 2B-8
Front Wheel Hub, Disc, Nut and Bearing Check 2B-12
Suspension Control Arm / Bushing Removal and Installation 2B-12
Suspension Control Arm / Bushing Disassembly and Assembly 2B-13
Suspension Control Arm / Steering Knuckle Check 2B-14
Suspension Control Arm Bushing Check 2B-14
Suspension Control Arm Joint Check 2B-14
Front Suspension Frame, Stabilizer Bar and/or Bushings Components 2B-15
Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation 2B-15
Front Suspension Frame Check 2B-18
Front Stabilizer Bar, Bushing and/or Joint Check 2B-19
Front Suspension Fasteners Check 2B-19
Specifications 2B-19
Tightening Torque Specifications 2B-19
Special Tools and Equipment 2B-20
Special Tool 2B-20

Rear Suspension 2C-1
General Description 2C-1
Rear Suspension Construction 2C-1
Component Location 2C-2
Rear Suspension Component Location 2C-2
Repair Instructions 2C-3
Rear Shock Absorber Removal and Installation 2C-3
Rear Shock Absorber Inspection 2C-4
Rear Shock Absorber Bush Removal and Installation 2C-4
Rear Shock Absorber Bush Inspection 2C-5
Coil Spring Removal and Installation 2C-5
Spring Upper Seat / Spring Lower Seat Inspection 2C-6
Spring Upper Seat and Lower Seat Removal and Installation 2C-6
Rear Axle Removal and Installation 2C-7
Trailing Arm, Rear Axle and Coil Spring Inspection 2C-10
Rear Axle Bush Inspection 2C-10
Wheel Bearing and Wheel Stud Bolt Removal and Installation 2C-11
Rear Wheel Disc, Nut and Bearing Inspection 2C-12
Spindle Removal and Installation 2C-12
Spindle Inspection 2C-13
Rear Suspension Fasteners Inspection 2C-13
Specifications 2C-14
Tightening Torque Specifications 2C-14
Special Tools and Equipment 2C-14
Special Tool 2C-14

Wheels and Tires 2D-1
General Description 2D-1
Tires Description 2D-1
Wheels Description 2D-2
Irregular and/or Premature Wear Description 2D-2
Wear Indicators Description 2D-3
Radial Tire Waddle Description 2D-3
Radial Tire Lead / Pull Description 2D-4
Balancing Wheels Description 2D-4
Repair Instructions 2D-5
General Balance Procedures 2D-5

Tire Rotation....2D-5
Wheel Removal and Installation....2D-6
Tire Mounting and Dismounting....2D-6
Tire Repair....2D-6
Specifications....2D-7
Wheels and Tires Specifications....2D-7
Tightening Torque Specifications....2D-7

Precautions

Precautions

Precautions on Suspension

S4RS0A2000001

Suspension Caution
Refer to “Suspension Caution: in Section 00”.

Wheels and Tires Caution
Refer to “Wheels and Tires Caution: in Section 00”.

General Precautions
Refer to “General Precautions: in Section 00”.

Vehicle Lifting Points
Refer to “Vehicle Lifting Points: in Section 0A”.

Fastener Caution
Refer to “Fastener Caution: in Section 00”.

Fastener Information
Refer to “Fasteners Information: in Section 0A”.

Brake Caution
Refer to “Brake Caution: in Section 00”.

Suspension General Diagnosis

Diagnostic Information and Procedures

Suspension, Wheels and Tires Symptom Diagnosis

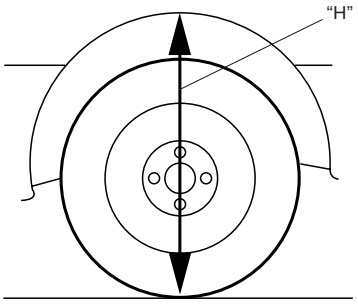
S4RS0A2104001

Condition	Possible cause	Correction / Reference Item
Vehicle pulls (Leads)	Mismatched or uneven tires	*Replace tire.*
	Tires not adequately inflated	*Adjust tire pressure.*
	Broken or sagging springs	*Replace spring.*
	Radial tire lateral force	*Replace tire.*
	Disturbed wheel alignment	*Check and adjust wheel alignment.*
	Brake dragging in one road wheel	*Repair brake.*
	Loose, bent or broken front or rear suspension parts	*Tighten or replace suspension parts.*
Abnormal or excessive tire wear	Sagging or broken spring	*Replace spring.*
	Tire out of balance	*Adjust balance or replace tire.*
	Disturbed wheel alignment	*Check and adjust wheel alignment.*
	Faulty strut (shock absorber)	*Replace strut.*
	Hard driving	*Replace tire.*
	Overloaded vehicle	*Replace tire.*
	Not rotating tire	*Replace or rotate tire.*
	Worn or loose wheel bearing	*Replace wheel bearing.*
	Wobbly wheel or tire	*Replace wheel or tire.*
	Tires not adequately inflated	*Adjust tire pressure.*
Wheel tramp	Blister or bump on tire	*Replace tire.*
	Improper strut (shock absorber) action	*Replace strut.*
Shimmy, shake or vibration	Tire or wheel out of balance	*Balance wheels or replace tire and/or wheel.*
	Loosen wheel bearings	*Replace wheel bearing.*
	Worn tie-rod ends	*Replace tie-rod end.*
	Worn lower ball joints	*Replace front suspension arm.*
	Excessive wheel runout	*Repair or replace wheel and/or tire.*
	Blister or bump on tire	*Replace tire.*
	Excessively loaded radial runout of tire / wheel assembly	*Replace tire or wheel.*
	Disturbed wheel alignment	*Check and adjust wheel alignment.*
	Loose or worn steering linkage	*Tighten or replace steering linkage.*
	Loose steering gear case bolts	*Tighten case bolts.*
Abnormal noise, front end	Worn, sticky or loose tie-rod ends, lower ball joints, tie-rod inside ball joints or drive shaft joints	*Replace tie-rod end, suspension arm, tie-rod or drive shaft joint.*
	Damaged struts or mountings	*Repair or replace.*
	Worn suspension arm bushings	*Replace.*
	Loose stabilizer bar	*Tighten bolts or nuts, replace bushes.*
	Loose wheel nuts	*Tighten wheel nuts.*
	Loose suspension bolts or nuts	*Tighten suspension bolts or nuts.*
	Broken or otherwise damaged wheel bearings	*Replace.*
	Broken suspension springs	*Replace.*
	Poorly lubricated or worn strut bearings	*Replace strut bearing.*
	Malfunction of Power Steering System	*Check and correct.*
Low or uneven trim height	Broken or sagging springs	*Replace.*
	Over loaded	*Check loading.*
NOTE:	Incorrect springs	*Replace.*
See NOTE *1.	Tires not adequately inflated	*Adjust tire pressure.*
Ride too soft	Faulty struts (shock absorber)	*Replace strut.*
Suspension bottoms	Overloaded	*Check loading.*
	Faulty struts (shock absorber)	*Replace strut.*
	Incorrect, broken or sagging springs	*Replace.*

Condition	Possible cause	Correction / Reference Item
Body leans or sways in corners	Loose stabilizer bar	*Tighten stabilizer bar bolts or nuts, or replace bushes.*
	Faulty struts (shock absorbers) or mountings	*Replace strut or tighten mounting.*
	Broken or sagging springs	*Replace.*
	Overloaded	*Check loading.*
Cupped tires	Front struts defective	*Replace.*
	Worn wheel bearings	*Replace.*
	Excessive tire or wheel run-out	*Replace tire or wheel disc.*
	Worn ball joints	*Replace front suspension arm.*
	Tire out of balance	*Adjust tire balance.*

NOTE:

***1: Right-to-left trim height (“H”) difference should be within 15 mm (0.6 in.) with curb weight. (same with rear side.)**



I2RH01210001-

Specifications

Wheel Alignment Specifications

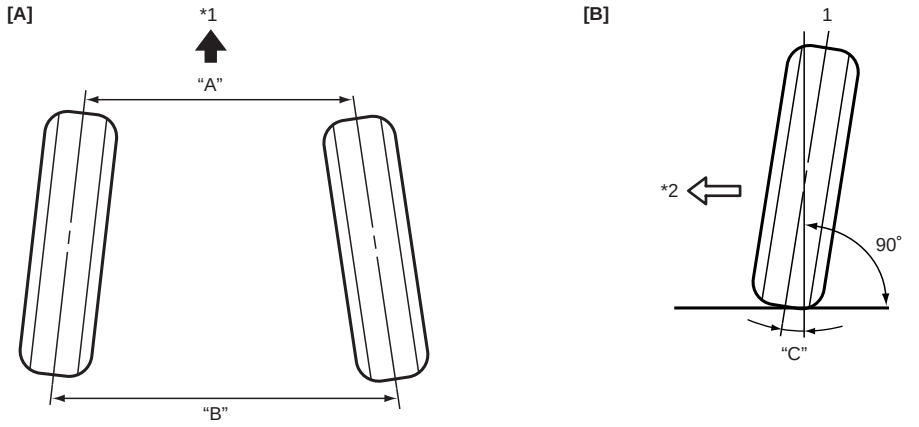
S4RS0A2107001

Wheel alignment specifications

Item		Front	Rear
Front toe (“B” – “A”) (total) Rear toe (Non adjustable, for reference only)		IN 0 + 1.0 / –0.5 mm (IN 0 + 0.0394 / –0.0197 in.)	IN 5.2 ± 5.2 mm (0.205 ± 0.205 in.)
Camber “C” (Non adjustable, for reference only)		0 ° 00’ ± 1 °	–1 ° 00’ ± 1°
Caster (Non adjustable, for reference only)		5 ° 12’ ± 2 °	—
Side Slip Limit mm/m (in./3.3 ft)		IN 0 to IN 3.0 (IN 0 to IN 0.118)	—
Steering angle (Turning angle)	Inside	39.1 ° ± 3 °	—
	Outside	33.3 ° ± 3 °	—

NOTE:

Toe value in the specifications table was measured by using a toe-in gauge.



I4RH01210001-

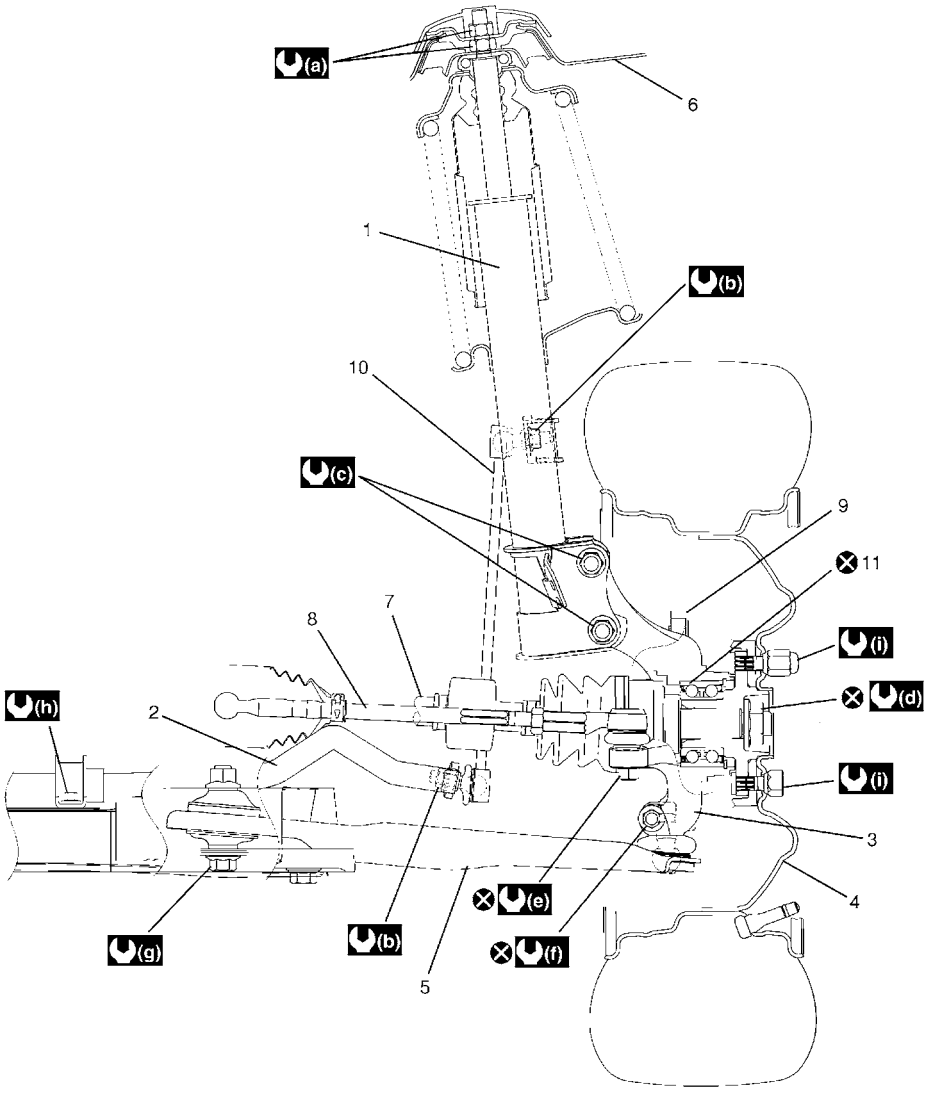
[A]: Toe-in (Top view)	1. Center line of wheel	*2. Body center
[B]: Camber (Front view)	*1. Forward	

Front Suspension

General Description

Front Suspension Construction

S4RS0A2201001



I4RS0A220001-

1. Strut assembly	7. Drive shaft	(b) : 50 N·m (5.0 kg-m, 36.5 lb-ft)	(h) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
2. Stabilizer bar	8. Tie-rod	(c) : 105 N·m (10.5 kg-m, 76.0 lb-ft)	(i) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
3. Steering knuckle	9. Brake disc	(d) : 175 N·m (17.5 kg-m, 126.5 lb-ft)	⊗ : Do not reuse.
4. Wheel	10. Stabilizer bar joint	(e) : 45 N·m (4.5 kg-m, 32.5 lb-ft)	
5. Suspension control arm	11. Wheel bearing	(f) : 60 N·m (6.0 kg-m, 43.5 lb-ft)	
6. Vehicle body	(a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)	(g) : 170 N·m (17.0 kg-m, 123.0 lb-ft)	

Front Wheel Alignment Construction

S4RS0A2201002

Among factors for front wheel alignment, only toe setting can be adjusted. Camber and caster can be adjusted. Therefore, should camber or caster be out of specification due to the damage caused by hazardous road conditions or collision, whether the damage is in body or in suspension should be determined and damaged body should be repaired or damaged suspension should be replaced.

Preliminary Checks Prior to Adjustment Front Wheel Alignment

Steering and vibration complaints are not always the result of improper alignment. An additional item to be checked is the possibility of tire lead due to worn or improperly manufactured tires. eadis the vehicle deviation from a straight path on a level road without hand pressure on the steering wheel. Refer to “Radial Tire Lead / Pull Description: in Section 2D” in order to determine if the vehicle has a tire lead problem. Before making any adjustment affecting wheel alignment, the following checks and inspections should be made to ensure correctness of alignment readings and alignment adjustments:

- Check all tires for proper inflation pressures and approximately the same tread wear.
- Check for loose of ball joints. Check tie-rod ends; if excessive looseness is noted, it must be corrected before adjusting.
- Check for run-out of wheels and tires.
- Check vehicle trim heights; if out of limits and a correction is to be made, it must be made before adjusting toe.
- Check for loose of suspension arms.
- Check for loose or missing stabilizer bar attachments.
- Consideration must be given to excess loads, such as tool boxes. If this excess load is normally carried in vehicle, it should remain in vehicle during alignment checks.
- Consider condition of equipment being used to check alignment and follow manufacturer instructions.
- Regardless of equipment used to check alignment, vehicle must be on a level surface both fore and aft and transversely.

NOTE:

To prevent possible incorrect reading of toe, camber or caster, vehicle front and rear end must be moved up and down a few times before inspection.

Repair Instructions

Front Wheel Alignment Inspection and Adjustment

S4RS0A2206001

Toe Inspection and Adjustment

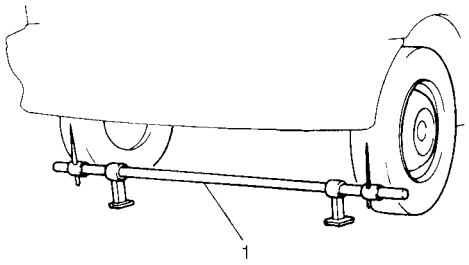
Preparation for toe inspection and adjustment.

- Place vehicle in non-loaded state on level floor.
- Set steering wheel in straight state.
- Check that inflation pressure of each tire is adjusted properly and disc wheel is free from deflection.
- Check that each suspension part is free from bend, dent, wear or damage in any other form.
- Check that ground clearance at the right and left is just about the same.

Inspection

Measure toe with toe-in gauge (1).
Toe should be within following specifications.
If toe is out of the value corresponding specification, adjust toe properly.

Toe
IN 0 +1.0 / –0.5 mm (0 + 0.0394 / –0.0197in.)



I2RH01220062-

Adjustment

1) Loosen right and left tie-rod end lock nuts (1) first.
2) Rotate right and left tie-rods (2) by the same amount to align toe to specification. In this adjustment, right and left tie-rods (2) should become equal in length

NOTE:

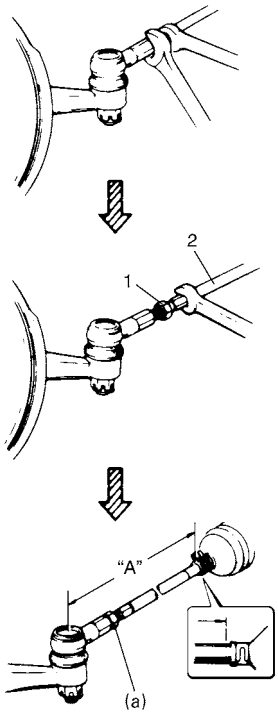
Before rotating tie-rods (2), apply grease between tie-rods and rack boots so that boots won be twisted.

3) After adjustment, tighten lock nuts (1) to specified torque.

Tightening torque
Tie-rod end lock nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

NOTE:

Make sure that rack boots are not twisted.



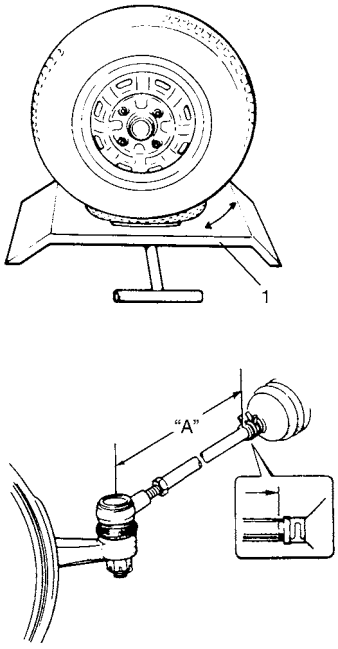
I3RH0A220002-

Steering Angle Check and Adjustment
When tie-rod or tie-rod end was replaced, check toe and then also steering angle with turning radius gauge (1). If steering angle is not correct, check if right and left tie-rods are equal in length

NOTE:

If tie-rod lengths were changed to adjust steering angle, reinspect toe-in.

Steering angle
Inside: 39.1 ° ± 3 °
Outside: 33.3 ° ± 3 °



I3RH0A220003-

Reference Information

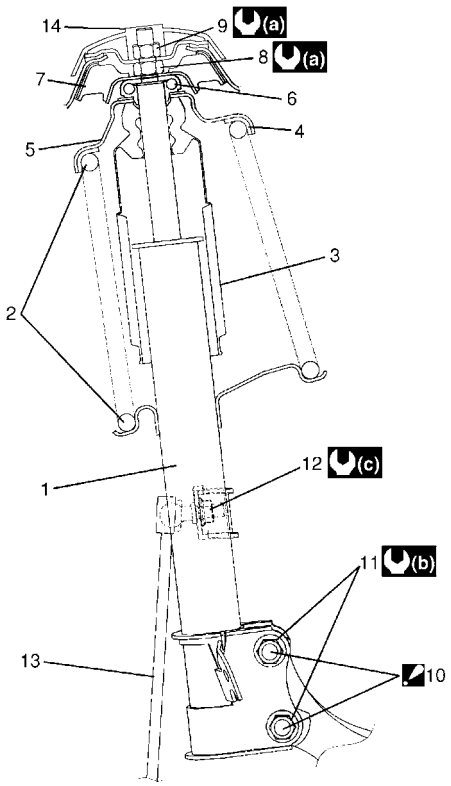
Side slip
When checked with side slip tester, side slip should satisfy following specification.

Side slip
0 to IN 3.0 mm/m (0 to IN 0.118 in/3.3 ft)

If side slip exceeds the limit, toe or front wheel alignment may not be correct.

Front Strut Assembly Components

S4RS0A2206005



I4RS0A220002-

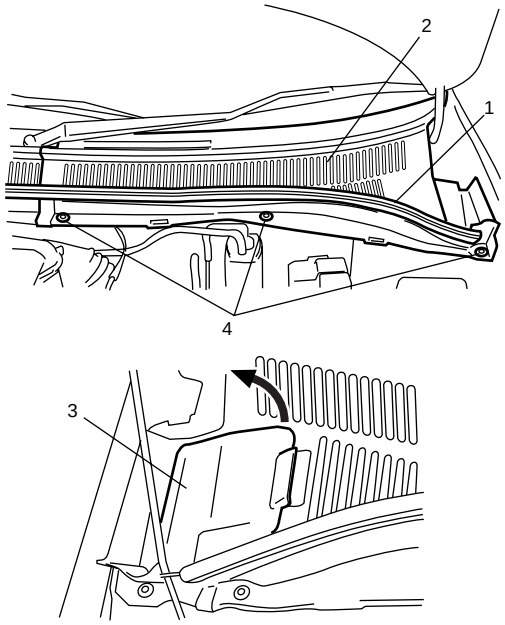
1. Strut assembly	6. Strut bearing	11. Strut bracket nut	(b) : 105 N·m (10.5 kg-m, 76.0 lb-ft)
2. Coil spring	7. Strut support	12. Stabilizer joint nut	(c) : 50 N·m (5.0 kg-m, 36.5 lb-ft)
3. Bump stopper	8. Strut support lower nut	13. Stabilizer joint	
4. Coil spring seat	9. Strut nut	14. Strut rod cap	
5. Coil spring upper seat	10. Strut bracket bolt : Insert from vehicle front side.	(a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)	

Front Strut Assembly Removal and Installation

S4RS0A2206006

Removal

1) Remove hood rear seal (1), and then remove left side cowl top garnish (2) and right side cover cap (3) from vehicle.



I4RS0A220003-

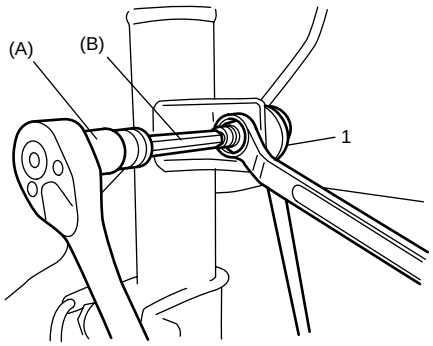
4. Clip

NOTE:

When servicing component parts of strut assembly, remove strut rod cap and then loosen strut nut a little before removing strut assembly. This will make service work easier. Note, however, nut must not be removed at this point.

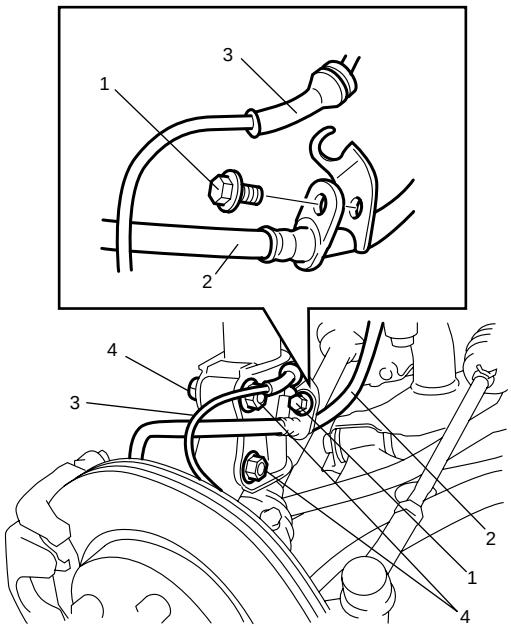
2) Hoist vehicle, allowing front suspension to hang free.
3) Remove wheel and disconnect stabilizer joint (1) from strut bracket.
When loosening joint nut, hold stud with special tools.

Special tool
(A): 09900–00411 (socket)
(B): 09900–00413 (5 mm)



I4RS0A220004-

4) Remove brake hose mounting bolt (1) and take off brake hose (2) and then ABS wheel speed sensor harness (3) (if equipped) from strut bracket as shown in figure.
5) Remove strut bracket bolts and nuts (4).

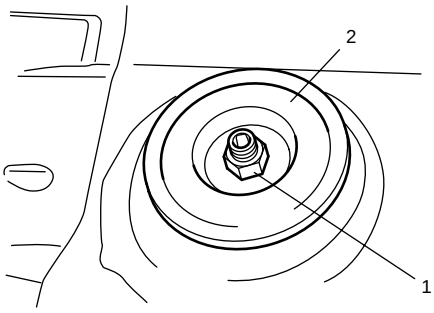


I4RS0A220005-

6) Remove strut rod cap.
7) Remove strut nut (1), and remove rebound stopper (2).

NOTE:

Hold strut by hand so that it will not fall off.



I4RS0A220006-

8) Remove strut assembly.

Installation
Install strut assembly by reversing removal procedure, noting the following instructions.

- Insert bolts in such direction as shown in figure.
- Tighten all fasteners to specified torque.

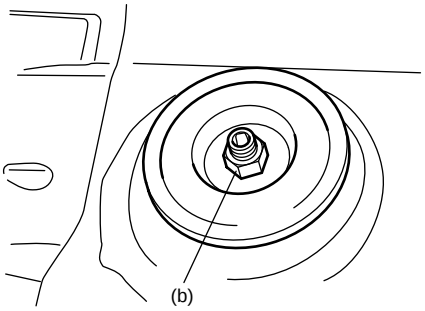
Tightening torque
Strut bracket nut (a): 105 N·m (10.5 kg-m, 76.0 lb-ft)
Brake hose mounting bolt (c): 25 N·m (2.5 kg-m, 18.0 lb-ft)
Stabilizer joint nut (d): 50 N·m (5.0 kg-m, 36.5 lb-ft)

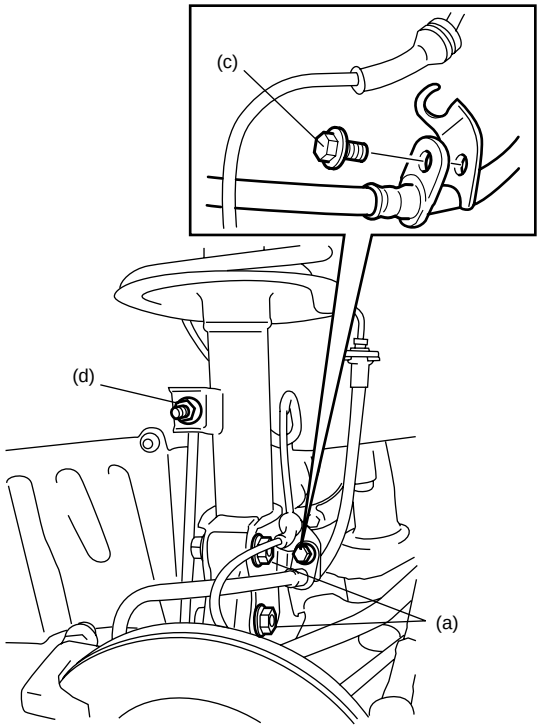
- Lower hoist and vehicle in non-loaded condition, tighten strut nut (b) to specified torque.

Tightening torque
Strut nut (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

CAUTION:

- **Don twist brake hose and ABS wheel speed sensor harness (if equipped) when installing it.**
- **Install ABS wheel speed sensor harness (if equipped) to strut bracket as shown in figure.**





I4RS0A220008-

- Tighten wheel nuts to specified torque.

  Tightening torque
  Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

- After installation, confirm front wheel alignment.

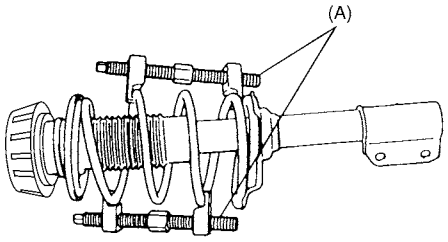
Front Strut Assembly Disassembly and Assembly

S4RS0A2206007

Disassembly

1) With special tool (A) placed to spring as shown, turn special tool bolts alternately until spring tension is released. Whether it is released or not can be known by whether strut turns lightly while strut spring is held stationary.

   Special tool
   (A): 09940-71431



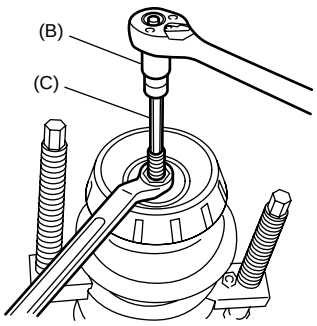
I4RS0A220009-

WARNING:

Use a commercially available spring compressor and follow the operation procedure described in the Instruction Manual supplied with that spring compressor.

2) While keeping spring compressed with special tool as shown, remove strut support lower nut.

   Special tool
   (B): 09900-00411 (socket)
   (C): 09900-00414 (6 mm)



I4RS0A220007-

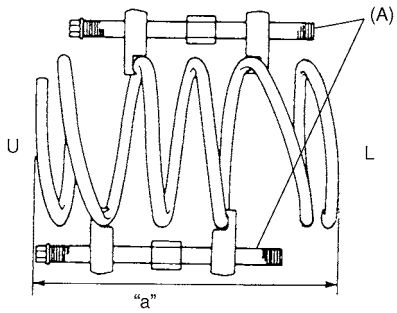
3) Disassemble strut assembly.

Assembly

For assembly, reverse disassembly procedure, noting the following instructions.

1) Compress spring with special tool (A) until total length becomes about 280 mm (11.0 in.) as shown.

   Length
   280 mm (11.0 in.)



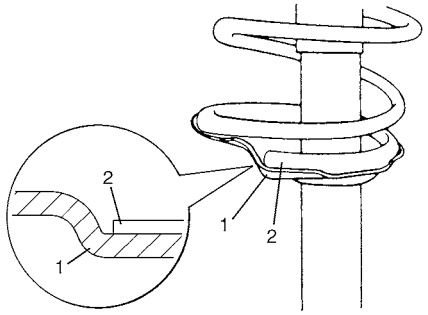
I4RS0A220010-

U:	Upper side (small dia.)
L:	Lower side (large dia.)

2) Install compressing coil spring, and mate spring end (2) with stepped part of spring lower seat (1) as shown.

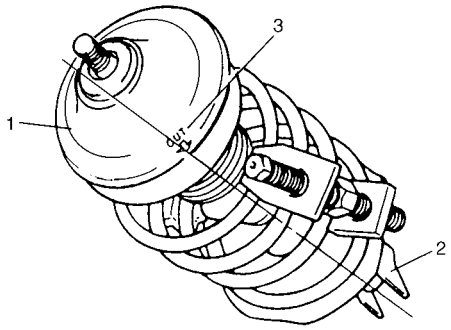
CAUTION:

End of coil spring must not interfere with step of spring lower seat.



I4RS0A220011-

3) Install bump stopper onto strut rod. For installing direction, refer to the figure in “Front Suspension Construction: ”.
4) Pull strut rod as far up as possible and use care not to allow it to retract into strut.
5) Install spring seat on coil spring and then spring upper seat (1) aligning UTmark (3) on spring upper seat and center of strut bracket (2).

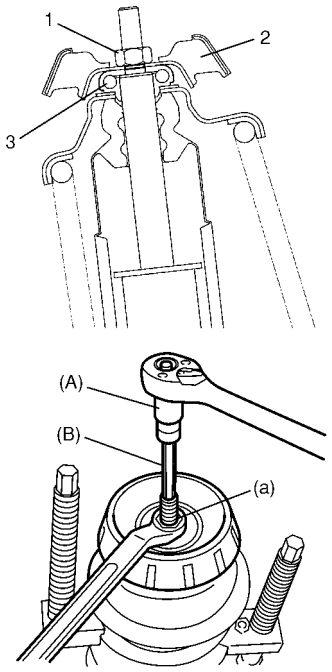


I4RS0A220012-

6) Install bearing (3), strut support (2) and strut support lower nut (1) in this sequence.
Tighten strut support lower nut (1) to specified torque.
When tightening strut support lower nut, hold stud with special tools.

Special tool
(A): 09900–00411 (socket)
(B): 09900–00414 (6 mm)

Tightening torque
Strut support lower nut (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)

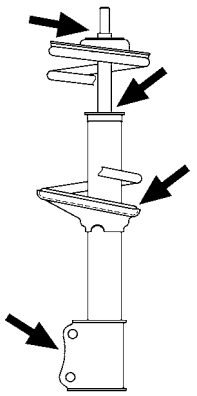


I4RS0A220013-

Front Strut Assembly Check

S4RS0A2206008

- Inspect strut for oil leakage, damage or deformation.
- If strut is found faulty, replace it as an assembly unit, because it can not be disassembled.



I4RS0A220014-

- Inspect strut function referring to the following procedures.

1) Check and adjust tire pressures as specified.
2) Bounce vehicle body 3 or 4 times continuously by pushing front end on the side with strut to be checked.
3) Apply the same amount of force at each push and note strut resistance both when pushed and rebounding.
4) Also, note how many times vehicle body rebounds before coming to stop after hands are off. Do the same for strut on the other side.

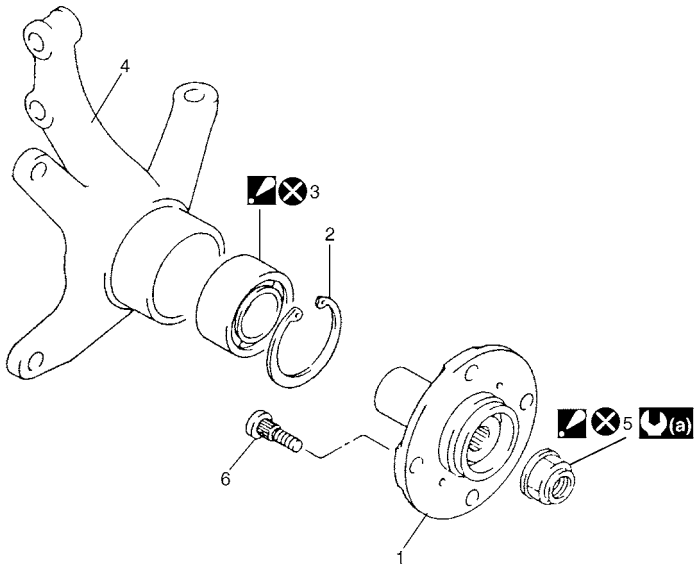
5) Compare strut resistance and number of rebalance on the right with those on the left. And they must be equal in both. With proper strut, vehicle body should come to stop the moments hands are off or after only one or two small rebalances.

If conditions of struts are in doubt, compare them with known-good vehicle or strut.

- Inspect bearing for wear, abnormal noise or gripping. If defective, replace.
- Inspect spring seat for cracks or deformation. If defective, replace.
- Inspect bump stopper for deterioration. If defective, replace.
- Inspect rebound stopper and strut mount for wear, cracks or deformation. If defective, replace.

Front Wheel Hub and Steering Knuckle Components

S4RS0A2206009



I4RS0A220015-

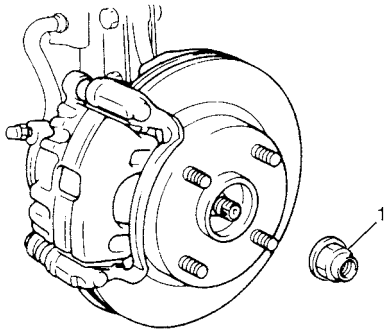
1. Front wheel hub	4. Steering knuckle	(a) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
2. Circlip	5. Drive shaft nut : Calk, after tightening.	⊗ : Do not reuse.
3. Wheel bearing : Face grooved rubber seal side to wheel hub.	6. Hub bolt	

Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation

S4RS0A2206010

Removal

1) Hoist vehicle and remove wheel.
2) Uncaulk drive shaft nut (1).
3) Depress foot brake pedal and hold it there. Remove drive shaft nut (1).
4) Remove caliper carrier bolts.



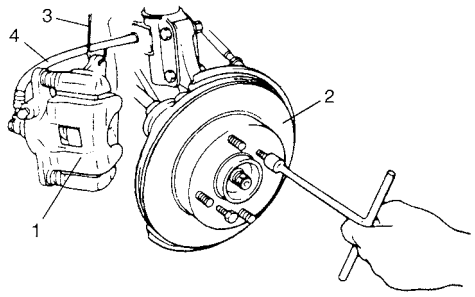
I4RS0A220016-

5) Remove caliper (1) with carrier.

NOTE:

Hang removed caliper with a wire hook or the like (3) so as to prevent brake hose (4) from bending and twisting excessively or being pulled.
Don operate brake pedal with pads removed.

6) Pull brake disc (2) off by using two 8 mm bolts.



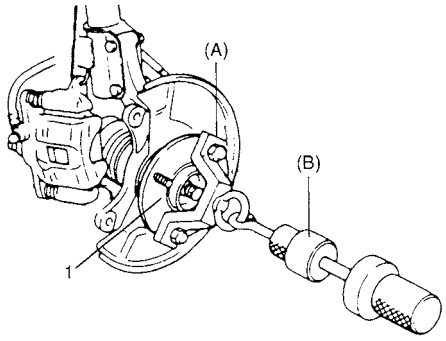
I2RH01220027-

7) Pull out wheel hub (1) with special tools.

Special tool
(A): 09943-17912
(B): 09942-15511

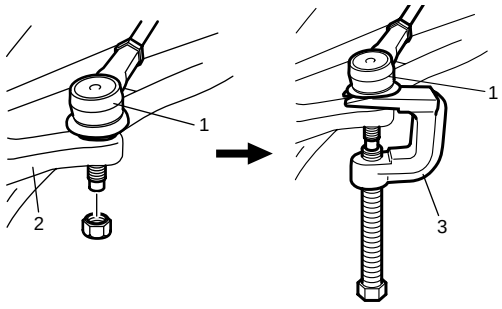
CAUTION:

When wheel hub is removed, replace wheel bearing with new one.



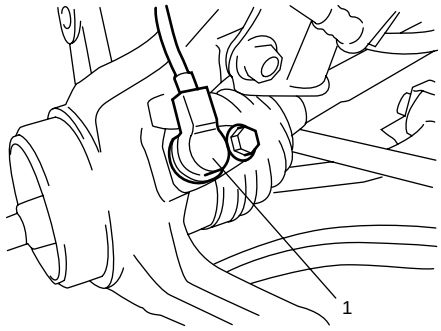
I2RH01220028-

8) Disconnect tie-rod end (1) from steering knuckle (2) with puller (3).



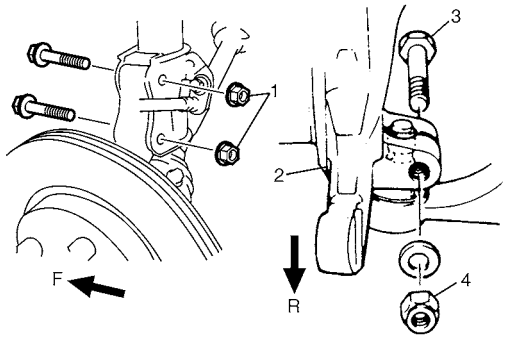
I4RS0A220017-

9) Remove wheel speed sensor (1) from knuckle (if equipped with ABS).



I4RS0A220018-

10) Loosen strut bracket nuts (1).
11) Remove ball joint bolt (3) and nut (4).
12) Remove strut bracket bolts from strut bracket and then steering knuckle (2).



I4RS0A220019-

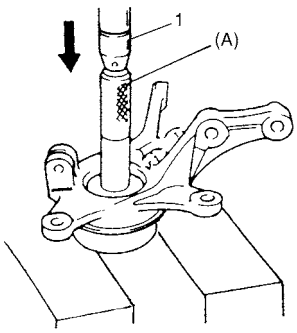
F:	Forward
R:	Rearward

13) Remove circlip from knuckle.
14) Using hydraulic press (1) and special tool, remove wheel bearing.

Special tool
(A): 09913-75520

CAUTION:

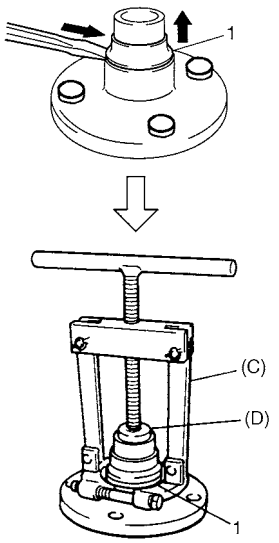
When installing wheel bearing, replace it with new one.



I2RH01220033-

15) Remove wheel bearing outside inner race (1).

Special tool
(C): 09913-65810
(D): 09913-85230

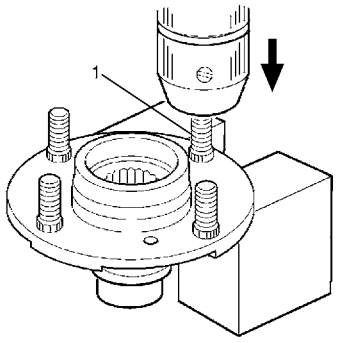


I3RH0A220006-

16) Remove hub bolts (1) with copper hammer or hydraulic press.

CAUTION:

Never remove bolt unless replacement is necessary.
Be sure to use a new bolt for replacement.



I4RS0A220020-

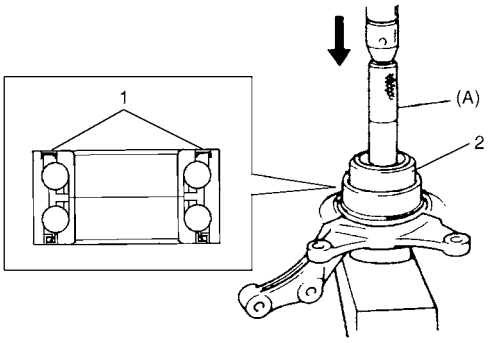
Installation
For installation, reverse removal procedure, noting the following instructions.

1) Face grooved rubber seal side (1) of new wheel bearing (2) upward as shown in figure and press-fit it into knuckle using special tool.

Special tool
(A): 09913-75510

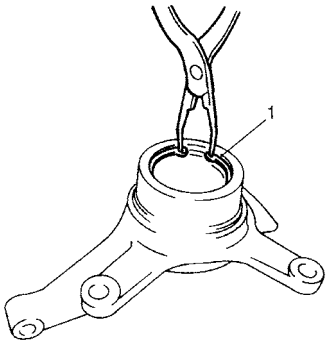
CAUTION:

When installing wheel bearing, replace it with new one.



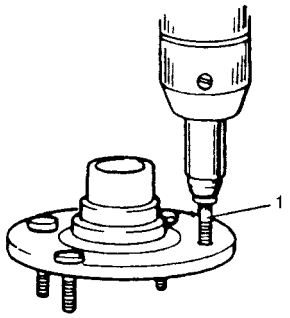
I4RS0A220021-

2) Install circlip (1).



I2RH01220037-

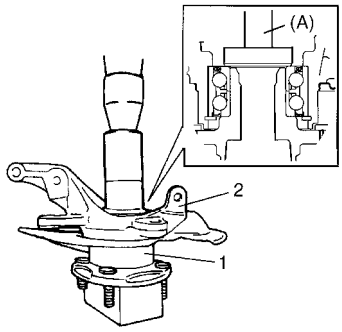
3) Insert new hub bolt (1) in hub hole. Rotate hub bolt slowly to assure that serrations are aligned with those made by original bolt.



I2RH01220040-

4) Using special tool, drive wheel hub (1) into steering knuckle (2) and then install steering knuckle (2) to strut and lower ball joint.

Special tool
(A): 09913-75520



I4RH01220012-

5) Install ball joint bolt (1) and nut (2) from the direction as shown in figure.
6) Tighten new suspension arm ball joint nut (2) to specified torque.

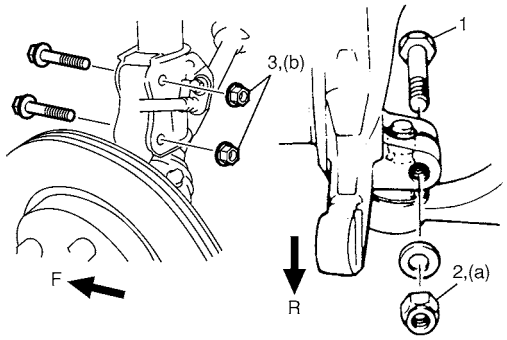
Tightening torque
Suspension arm ball joint nut (a): 60 N·m (6.0 kg-m, 43.5 lb-ft)

CAUTION:

Never reuse the removed suspension arm ball joint nut.

7) Tighten strut bracket nuts (3) to specified torque.

Tightening torque
Strut bracket nut (b): 105 N·m (10.5 kg-m, 76.0 lb-ft)

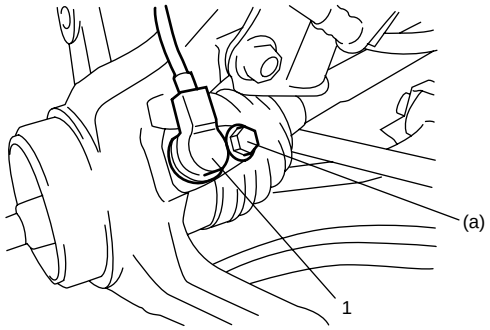


I4RS0A220022-

F:	Forward
R:	Rearward

8) Install ABS wheel speed sensor (1) (if equipped with ABS).

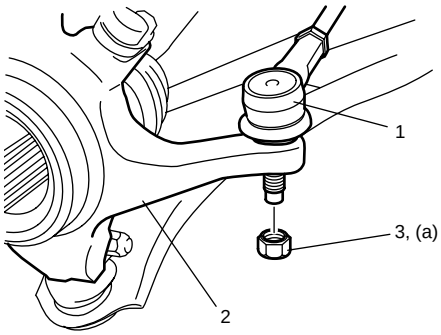
Tightening torque
ABS wheel speed sensor mounting bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I4RS0A220023-

9) Connect tie-rod end (1) to steering knuckle (2), tighten new nut (3) to specified torque.

Tightening torque
Tie-rod end nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)



I4RS0A220024-

10) Install brake disk (2) and brake caliper (3).
11) Tighten caliper carrier bolt to specified torque.

Tightening torque
Caliper carrier bolt: 85 N·m (8.5 kg-m, 61.5 lb-ft)

12) Depress foot brake pedal and hold it there.
Tighten new drive shaft nut (1) to specified torque.

Tightening torque
Drive shaft nut (a): 175 N·m (17.5 kg-m, 126.5 lb-ft)

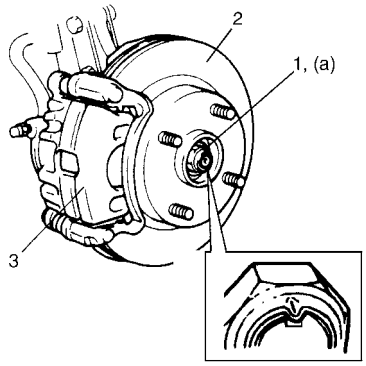
CAUTION:

Never reuse drive shaft nut (1).

13) Caulk drive shaft nut (1) as shown.

CAUTION:

Be careful while caulking nut so that no crack will occur in caulked part of nut. Cracked nut must be replaced with new one.



I4RS0A220025-

14) Tightening wheel nuts to specified torque.

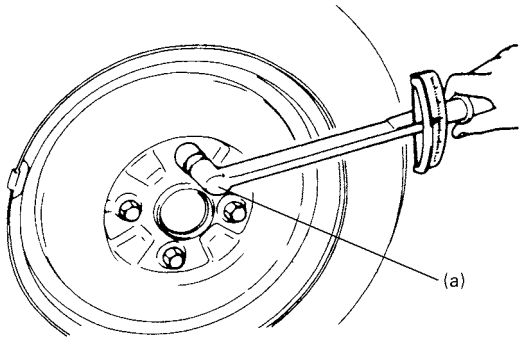
Tightening torque
Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

Front Wheel Hub, Disc, Nut and Bearing Check

S4RS0A2206012

- Inspect each wheel disc for dents, distortion and cracks.
  A disc in badly damaged condition must be replaced.
- Check installation face inside of wheel disc for rust.
  As rust affects adversely, remove it thoroughly.
- Check wheel nuts for tightness and, as necessary, retighten them to specification.
- Check wheel bolt press-fitted into wheel hub for wear, damage, poor thread condition, and looseness.
  Replace defective bolt with a new one.
  When bolt installation is found loose, replace both bolt and wheel hub with new ones.

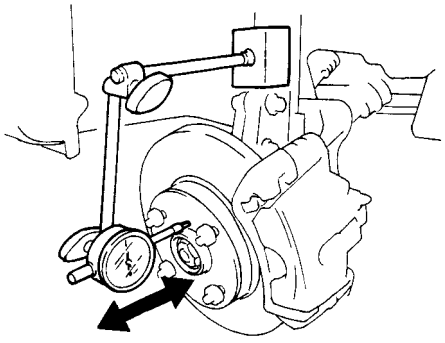
Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01220009-

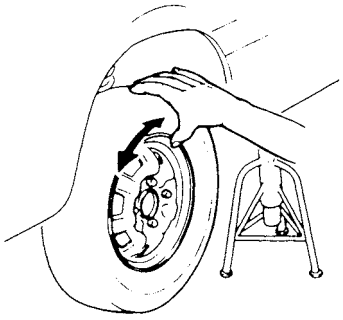
- Check wheel bearing for wear. When measuring thrust play, apply a dial gauge to wheel hub.

Thrust play limit
0.1 mm (0.004 in.)



I2RH01220010-

- By rotating wheel actually, check wheel bearing for noise and smooth rotation.
  If defective, replace bearing.



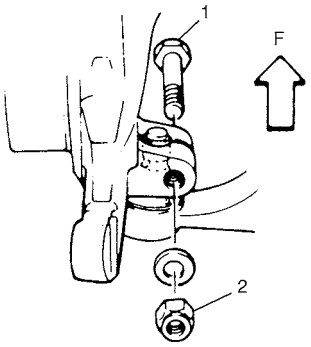
I2RH01220011-

Suspension Control Arm / Bushing Removal and Installation

S4RS0A2206013

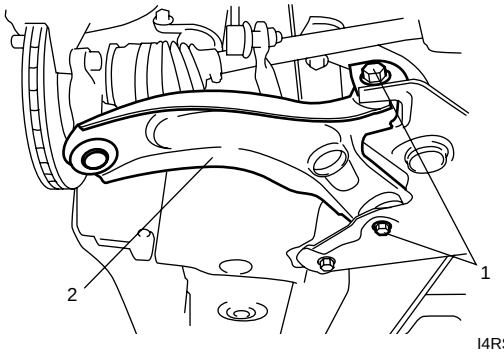
Removal

1) Remove suspension control arm ball joint bolt (1) and nut (2).



I2RH01220046-

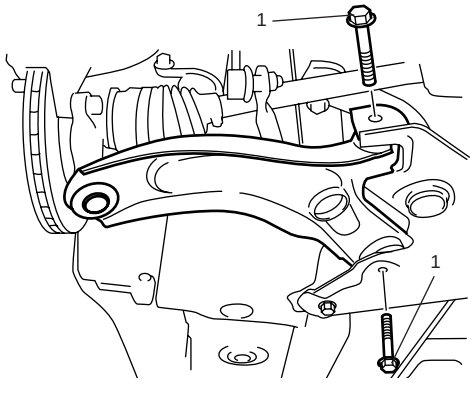
2) Remove suspension control arm bolts (1).
3) Remove suspension control arm (2).



I4RS0A220026-

Installation

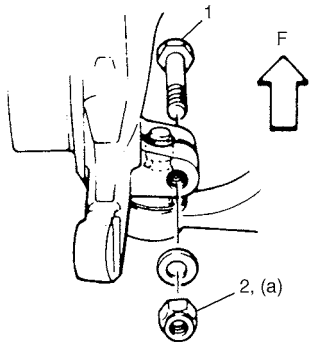
1) Install suspension control arm as shown but tighten new suspension control arm bolts (1) only temporarily.



I4RS0A220027-

2) Install suspension control arm ball joint to steering knuckle. Align ball stud groove with steering knuckle bolt hole. Then install ball joint bolt (1) from the direction as shown in figure. Tighten new suspension arm ball joint nut (2) to specified torque.

Tightening torque
Suspension arm ball joint nut (a): 60 N·m (6.0 kg-m, 43.5 lb-ft)

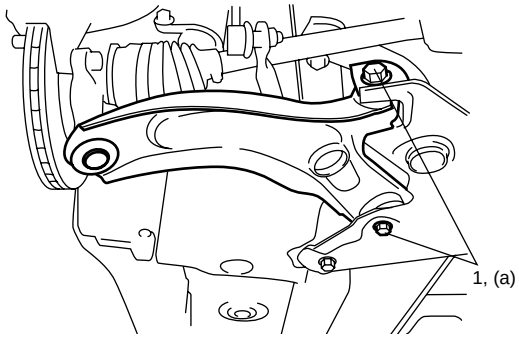


I2RH01220054-

F: Forward

3) Lower hoist and vehicle in non-loaded condition, tighten control arm mounting bolts (1) to specified torque.

Tightening torque
Control arm mounting bolt (a): 170 N·m (17.0 kg-m, 123.0 lb-ft)



I4RS0A220028-

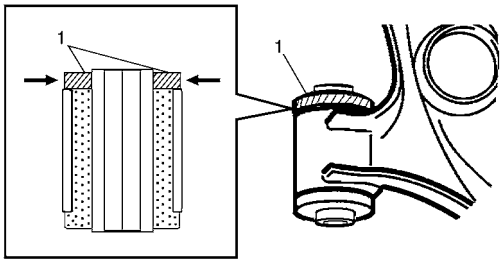
4) Confirm front wheel alignment referring to “Front Wheel Alignment Inspection and Adjustment: ”.

Suspension Control Arm / Bushing Disassembly and Assembly

S4RS0A2206014

Disassembly

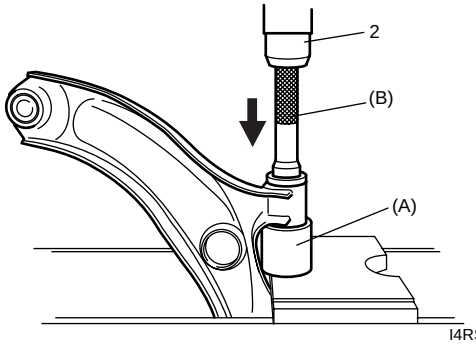
1) Cut off bushing flange (rubber) (1) with knife.



I4RS0A220029-

2) Push out bushing by using hydraulic press (2) and special tools.

Special tool
(A): 09943–76310
(B): 09913–75821



I4RS0A220030-

Assembly

1) Front bushing
Press-fit front bushing (1) by using special tools and press (2).

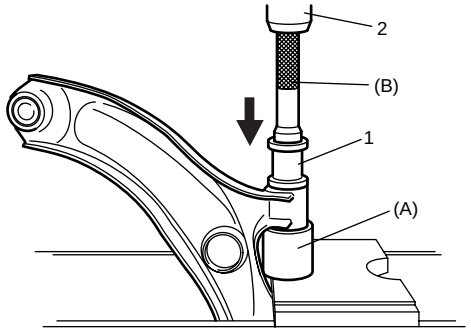
Special tool
(A): 09943–76310
(B): 09913–75821

CAUTION:

Be sure to use new bushing.

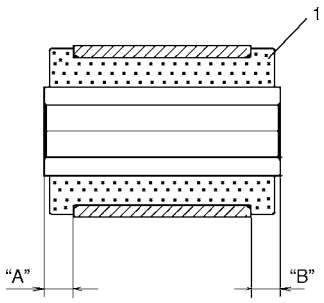
NOTE:

- **Before installing bushing, apply soap water on its circumference to facilitate installation.**



I4RS0A220032-

2) Press-fit bushing (1) so that dimensions and in figure become equal.

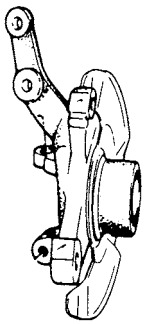


I4RS0A220033-

Suspension Control Arm / Steering Knuckle Check

S4RS0A2206015

Inspect for cracks, deformation or damage.
If defective, replace.

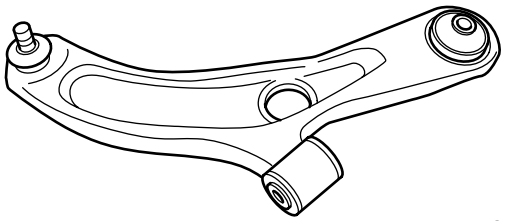


I2RH01220005-

Suspension Control Arm Bushing Check

S4RS0A2206016

Inspect for damage, wear or deterioration.
If defective, replace.



I4RS0A220035-

Suspension Control Arm Joint Check

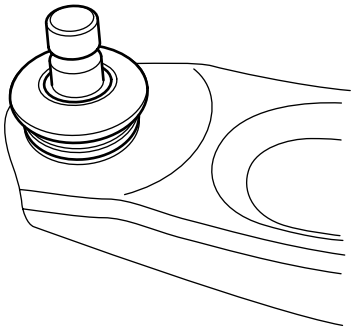
S4RS0A2206017

- Check for smooth rotation.
- Inspect ball stud for damage.
- Inspect dust cover for damage.

NOTE:

Suspension control arm and arm joint cannot be separated.

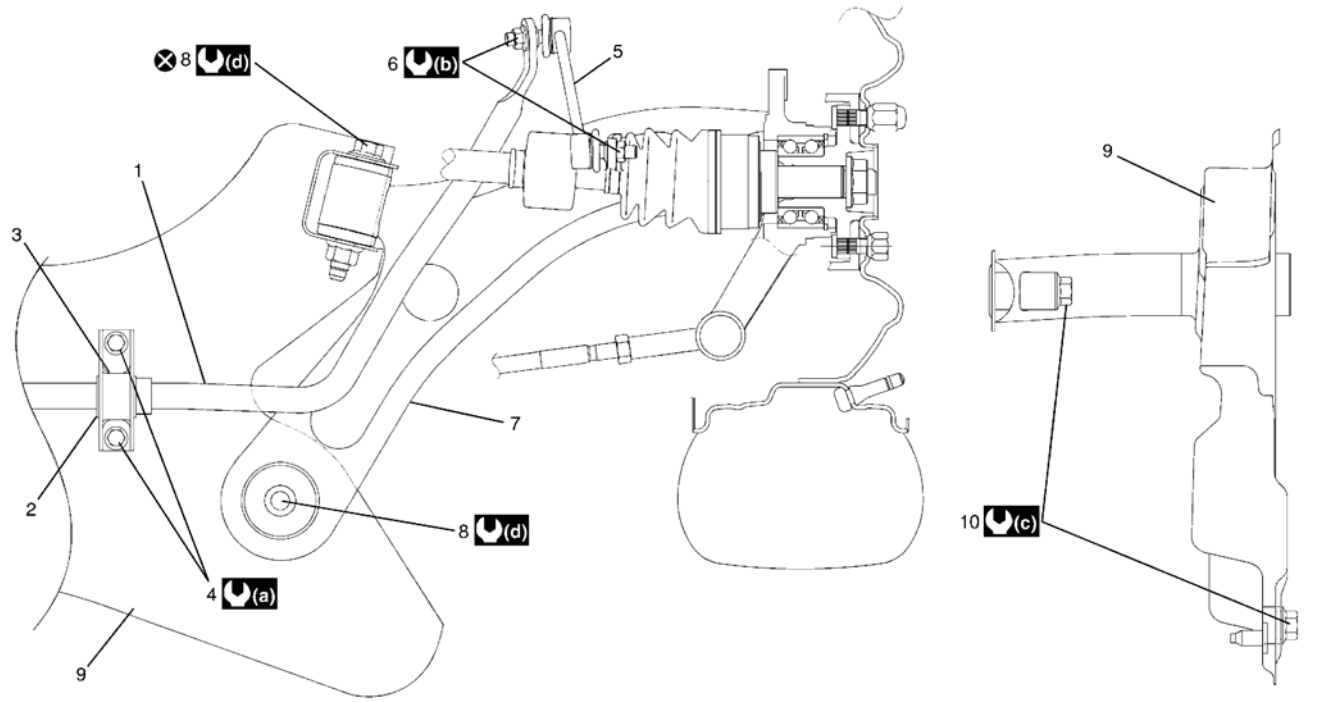
If there is any damage to either, control arm assembly must be replaced as a complete unit.



I4RS0A220036-

Front Suspension Frame, Stabilizer Bar and/or Bushings Components

S4RS0A2206018



I4RS0A220037-

1. Stabilizer bar	5. Stabilizer joint	9. Suspension frame	(c) : 150 N·m (15.0 kg-m, 108.5 lb-ft)
2. Stabilizer bushing	6. Stabilizer joint nut	10. Suspension frame mounting bolt	(d) : 170 N·m (17.0 kg-m, 123.0 lb-ft)
3. Stabilizer mounting bracket	7. Suspension control arm	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)	: Do not reuse.
4. Stabilizer bar mounting bracket bolt	8. Control arm mounting bolt	(b) : 50 N·m (5.0 kg-m, 36.5 lb-ft)	

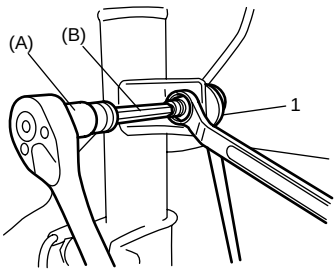
Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation

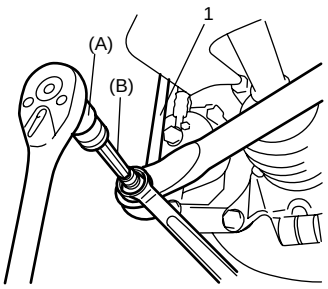
S4RS0A2206019

Removal

1) Hoist vehicle and remove wheels (right & left).
2) Remove suspension control arm referring to “Suspension Control Arm / Bushing Removal and Installation: ”.
3) Remove stabilizer joints (1).
   When loosening joint nut, hold stud with special tools.

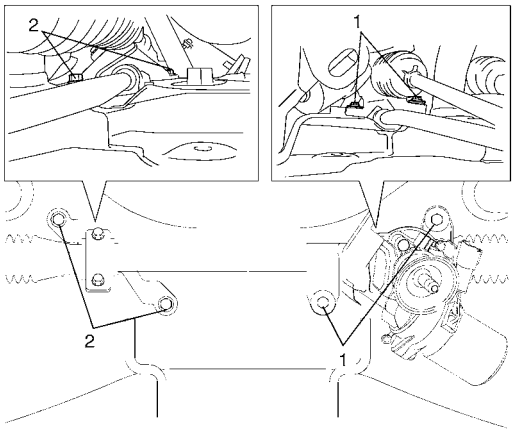
   Special tool
   (A): 09900–00411 (socket)
   (B): 09900–00413 (5 mm)





I4RS0A220038-

4) Support engine assemble by using supporting device referring to “Engine Supporting Points: in Section 0A”.
5) Remove steering gear case No.1 bolts (1) and No.2 bolts (2).



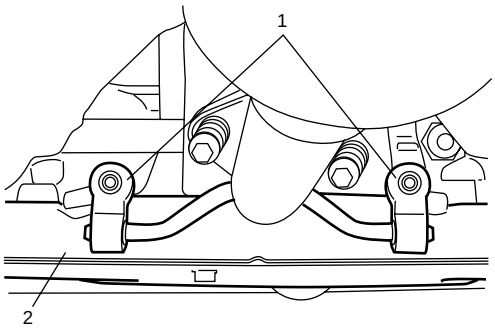
I4RS0A220039-

3. Suspension frame

6) Disconnect muffler No.1 mounting (1) from suspension frame (2).

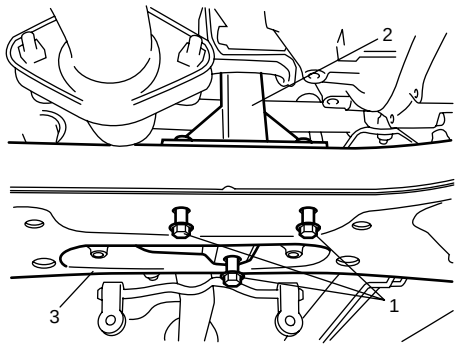
WARNING:

To avoid danger of being burned, do not touch exhaust system when it is still hot. Any service on exhaust system should be performed when it is cool.



I4RS0A220040-

7) Remove engine rear mounting bolts (1) from engine rear mounting (2).



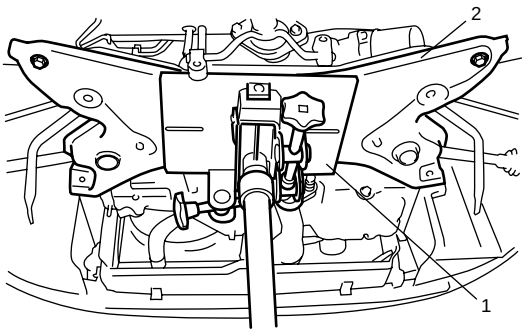
I4RS0A220041-

3. Suspension frame

8) Support suspension frame by using mission jack (1) under suspension frame (2).

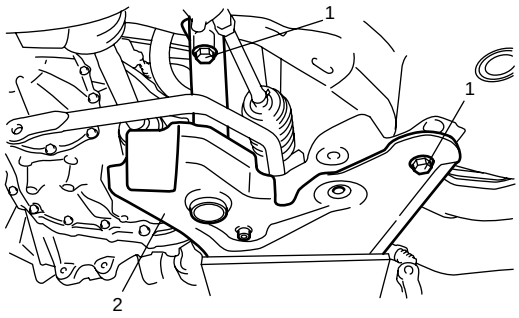
WARNING:

When removing suspension frame, be sure to apply some supporting equipment (such as jack) under it at well-balanced position in the center section so as to prevent suspension frame dropping.



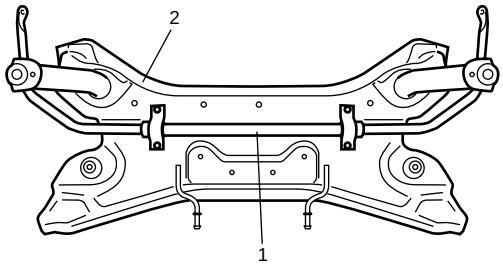
I4RS0A220042-

9) Remove suspension frame mounting bolts (1), and then lower mission jack and remove suspension frame (2) with stabilizer bar.



I4RS0A220043-

10) Remove stabilizer bar (1) and bushing from suspension frame (2).



I4RS0A220044-

Installation

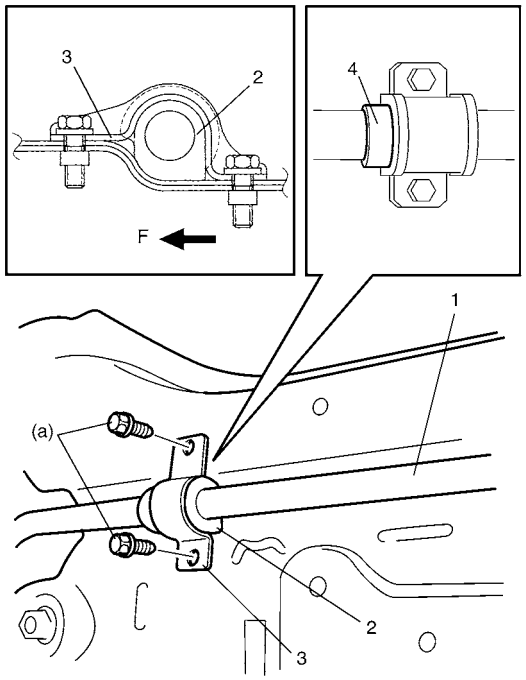
1) When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side.
2) Install stabilizer bar (1), stabilizer bushing (2) and stabilizer mounting bracket (3) to suspension frame as shown in figure.

NOTE:

For correct installation of stabilizer bar, side-to-side, be sure that stopper ring (4) on stabilizer bar aligns with mount bush, both right and left, as shown in figure.

3) Tighten stabilizer bar mounting bracket bolts to specified torque.

Tightening torque
Stabilizer bar mounting bracket bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



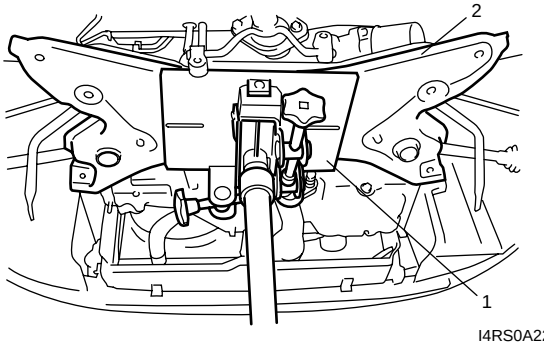
I4RS0A220055-

F: Forward

4) Support suspension frame (2) with stabilizer bar by using mission jack (1), and jack up it.

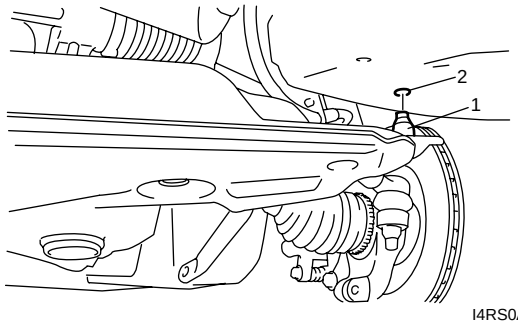
WARNING:

When mounting suspension frame, be sure to apply some supporting equipment (such as jack) under it at well-balanced position in the center section so as to prevent suspension frame dropping.



I4RS0A220046-

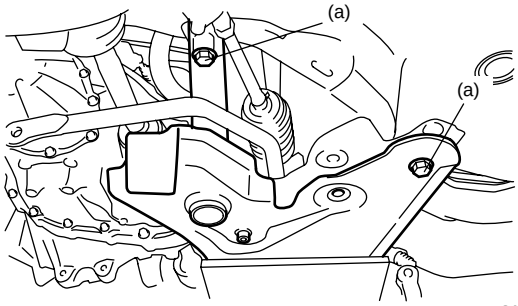
5) Align lugs (1) (right and left) of suspension frame with holes (2) in vehicle body respectively.



I4RS0A220047-

6) Install suspension frame mounting bolts (a) to specified torque.

Tightening torque
Suspension frame mounting bolt (a): 150 N·m (15.0 kg-m, 108.5 lb-ft)

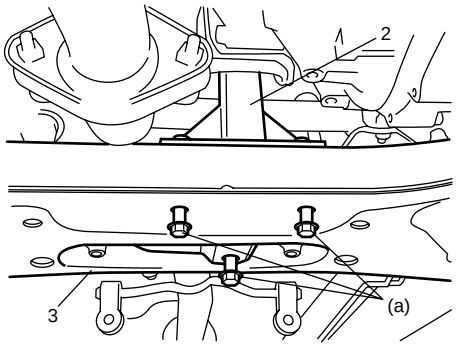


I4RS0A220048-

7) Lower mission jack.

8) Install engine rear mounting bolts (a) to specified torque.

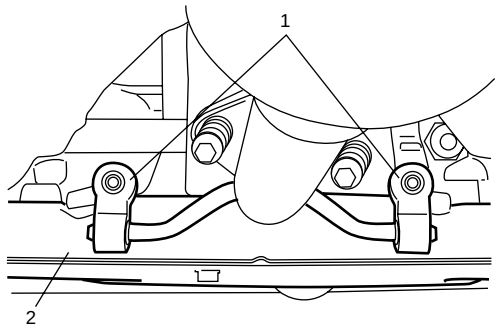
Tightening torque
Engine rear mounting bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)



I4RS0A220049-

2. Engine rear mounting
3. Suspension frame

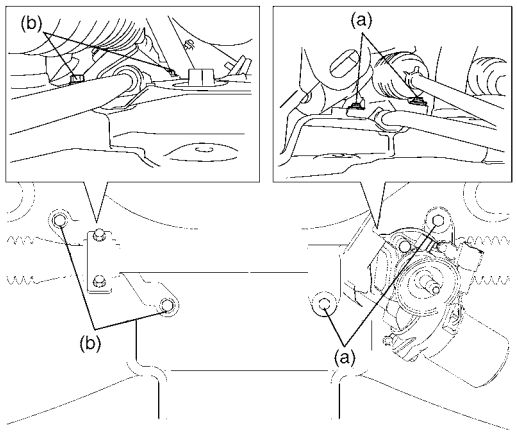
9) Connect muffler No.1 mounting (1) to suspension frame (2).



I4RS0A220040-

10) Install steering gear case No.1 bolts (a) and No.2 bolts (b) to specified torque

Tightening torque
Steering gear case No.1 bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
Steering gear case No.2 bolt (b): 55 N·m (5.5 kg-m, 40.0 lb-ft)



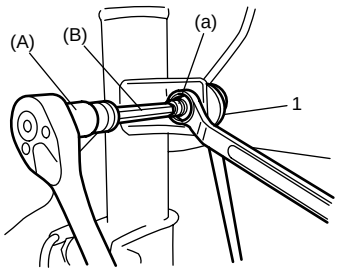
I4RS0A220050-

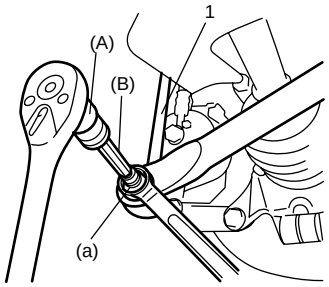
11) Remove supporting device from engine.

12) Install stabilizer joints (1), and tighten nuts to specified torque.
When tightening, hold stud with special tools.

Special tool
(A): 09900–00411 (socket)
(B): 09900–00413 (5 mm)

Tightening torque
Stabilizer joint nut (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)





I4RS0A220051-

13) Install suspension control arm referring to "Suspension Control Arm / Bushing Removal and Installation: ".

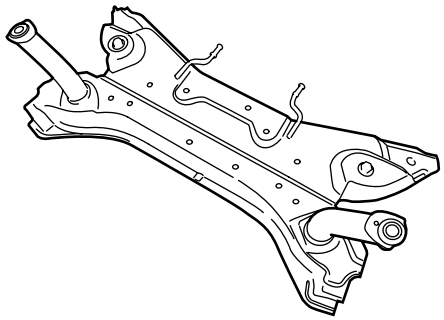
14) Install wheels (right & left) and lower hoist.

15) Confirm front wheel alignment referring to "Front Wheel Alignment Inspection and Adjustment: ".

Front Suspension Frame Check

S4RS0A2206020

Inspect for cracks, deformation or damage.
If defective, replace.



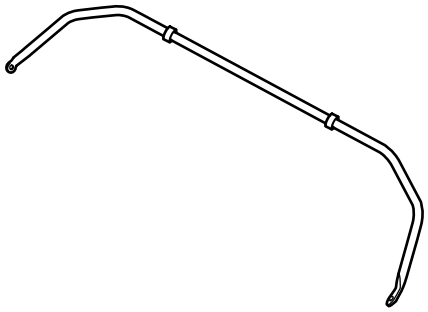
I4RS0A220054-

Front Stabilizer Bar, Bushing and/or Joint Check

S4RS0A2206022

Stabilizer Bar

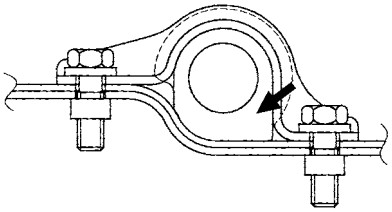
Inspect for damage or deformation.
If defective, replace.



I4RS0A220052-

Stabilizer Bushing

Inspect for damage, wear or deterioration.
If defective, replace.



I4RS0A220056-

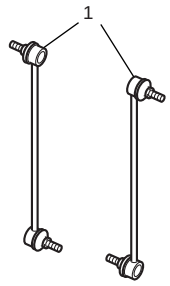
Stabilizer Joint

1) Check for smooth rotation.
2) Inspect ball stud for damage.
3) Inspect dust cover for damage.

NOTE:

Stabilizer joint (1) cannot be disassembled.

If there is any damage to either, stabilizer joint assembly must be replaced as a complete unit.



I4RH01220007-

Front Suspension Fasteners Check

S4RS0A2206021

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque, referring to “Front Suspension Construction: ”.

Specifications

Tightening Torque Specifications

S4RS0A2207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Tie-rod end lock nut	45	4.5	32.5	☞
Strut bracket nut	105	10.5	76.0	☞ / ☞
Brake hose mounting bolt	25	2.5	18.0	☞
Stabilizer joint nut	50	5.0	36.5	☞ / ☞
Strut nut	50	5.0	36.5	☞
Wheel nut	85	8.5	61.5	☞ / ☞ / ☞
Strut support lower nut	50	5.0	36.5	☞
Suspension arm ball joint nut	60	6.0	43.5	☞ / ☞
ABS wheel speed sensor mounting bolt	25	2.5	18.0	☞
Tie-rod end nut	45	4.5	32.5	☞
Caliper carrier bolt	85	8.5	61.5	☞
Drive shaft nut	175	17.5	126.5	☞
Control arm mounting bolt	170	17.0	123.0	☞
Stabilizer bar mounting bracket bolt	23	2.3	17.0	☞
Suspension frame mounting bolt	150	15.0	108.5	☞
Engine rear mounting bolt	55	5.5	40.0	☞
Steering gear case No.1 bolt	55	5.5	40.0	☞
Steering gear case No.2 bolt	55	5.5	40.0	☞

NOTE:

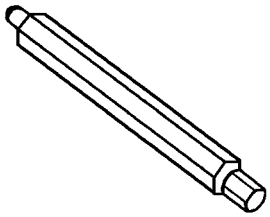
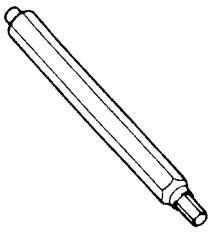
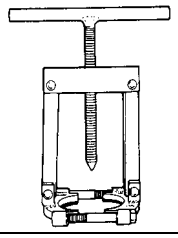
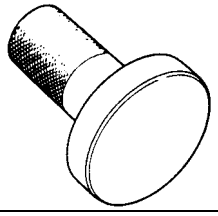
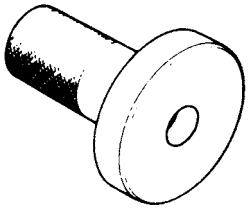
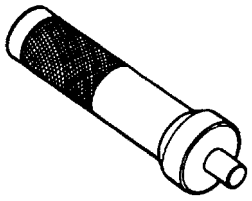
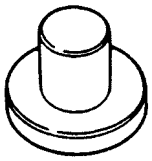
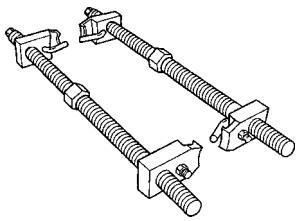
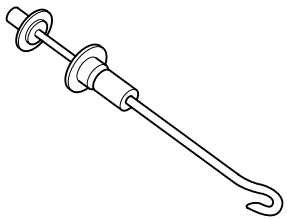
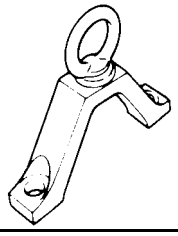
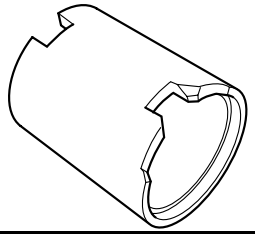
The specified tightening torque is also described in the following.
“Front Suspension Construction: ”
“Front Strut Assembly Components: ”
“Front Wheel Hub and Steering Knuckle Components: ”
“Front Suspension Frame, Stabilizer Bar and/or Bushings Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A2208001

09900–00411 Hexagon bit socket ☞ / ☞ / ☞ / ☞ / ☞ 	09900–00413 Hexagon bit (5 mm) ☞ / ☞ / ☞ 
09900–00414 Hexagon bit (6 mm) ☞ / ☞ 	09913–65810 Crankshaft bearing puller ☞ 
09913–75510 Bearing installer ☞ 	09913–75520 Bearing installer ☞ / ☞ 
09913–75821 Bearing installer attachment ☞ / ☞ 	09913–85230 Bearing remover tool ☞ 
09940–71431 Suspension spring compressor ☞ 	09942–15511 Sliding hammer ☞ 
09943–17912 Wheel hub remover ☞ 	09943–76310 Bush remover ☞ / ☞ 

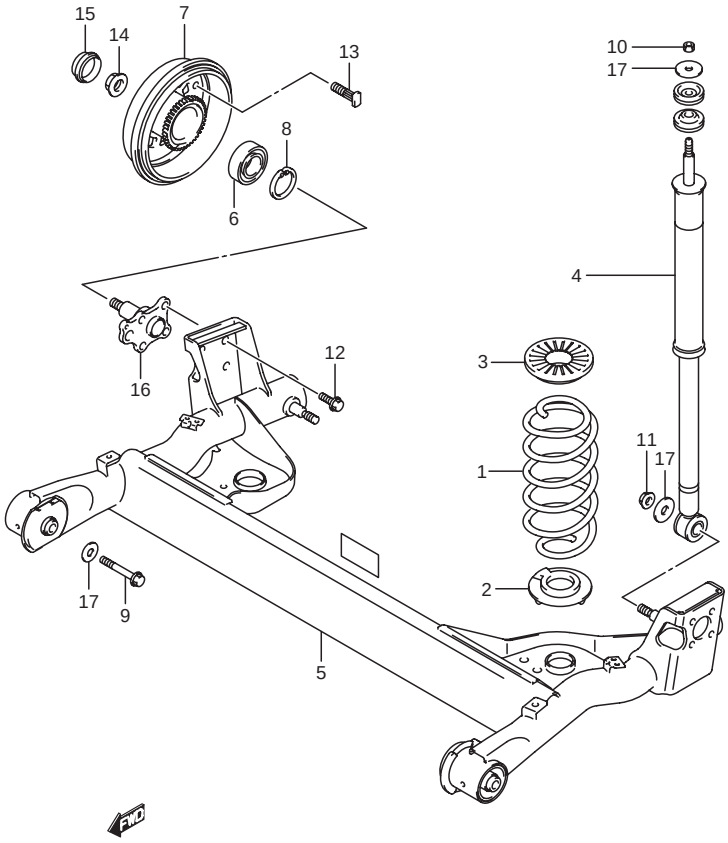
Rear Suspension

General Description

Rear Suspension Construction

S4RS0A2301001

2WD Vehicle



I4RS0A230001-

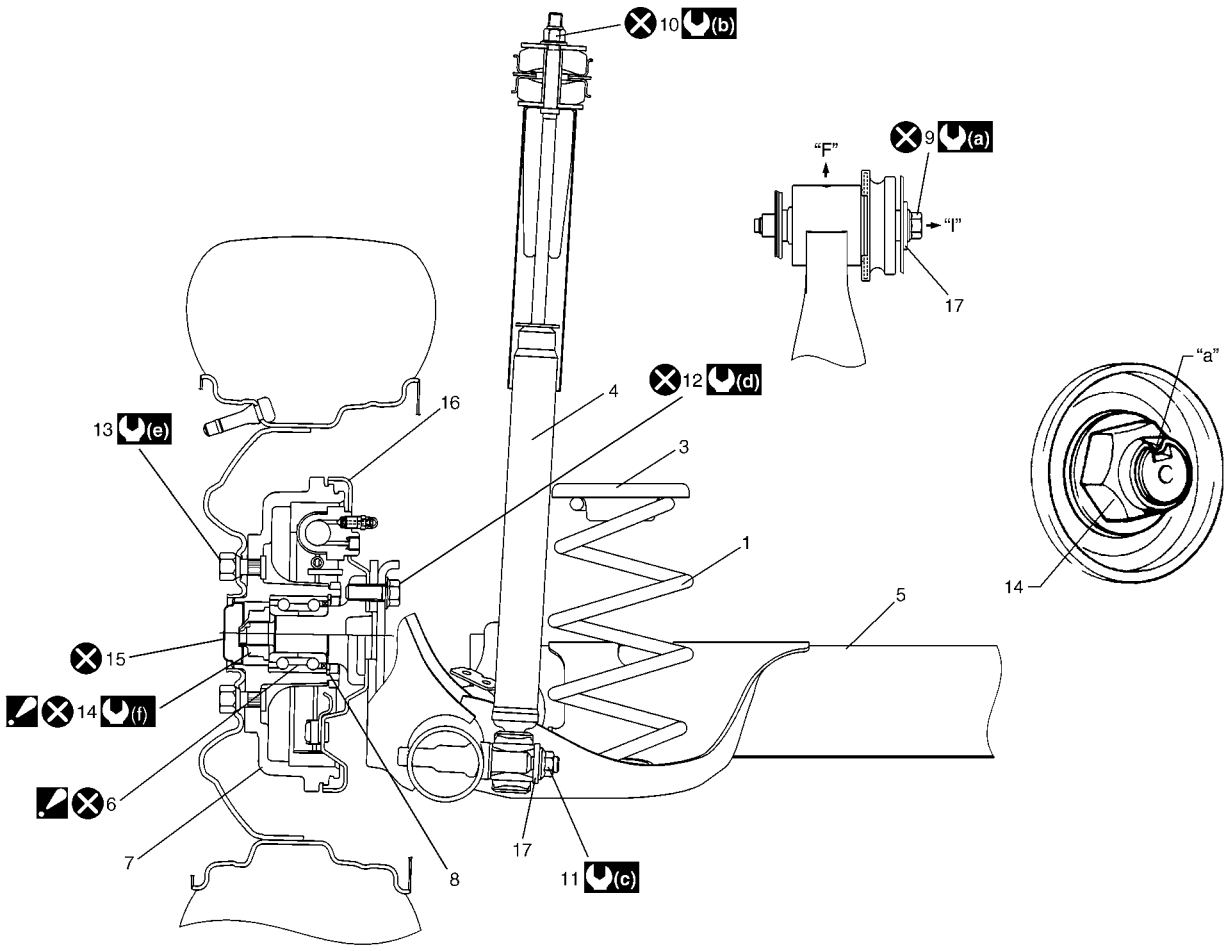
1. Rear coil spring	6. Wheel bearing	11. Rear shock absorber lower nut	16. Rear spindle
2. Rear spring lower seat	7. Brake drum	12. Rear spindle bolt	17. Washer
3. Rear spring upper seat	8. Circlip	13. Wheel stud bolt	
4. Rear shock absorber	9. Rear trailing arm bolt	14 Rear spindle nut	
5. Rear axle	10. Rear shock absorber upper nut	15. Spindle cap	

Component Location

Rear Suspension Component Location

S4RS0A2303001

2WD Vehicle



I4RS0A230002-

1. Rear coil spring	8. Circlip	15. Spindle cap	(c) : 90 N·m (9.0 kg-m, 65.0 lb-ft)
2. Blank	9. Rear trailing arm bolt	16. Brake back plate	(d) : 75 N·m (7.5 kg-m, 54.0 lb-ft)
3. Rear spring upper seat	10. Rear shock absorber upper nut	17. Washer	(e) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
4. Rear shock absorber	11. Rear shock absorber lower nut	"F"?: Front side	(f) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
5. Rear axle	12. Rear spindle bolt	"I"?: Body inside	: Do not reuse.
6. Wheel bearing : Seal side of bearing comes brake back plate side.	13. Wheel nut	(a) : 75 N·m (7.5 kg-m, 54.5 lb-ft)	
7. Brake drum	14. Rear spindle nut : Caulk spindle nut as shown "a"?.	(b) : 25 N·m (2.5 kg-m, 18.0 lb-ft)	

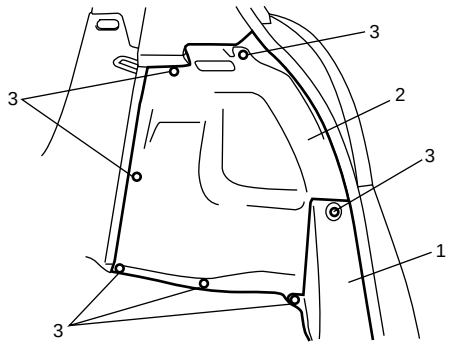
Repair Instructions

Rear Shock Absorber Removal and Installation

S4RS0A2306028

Removal

1) Hoist vehicle.
2) Remove tail end member trim (1) and quarter inner trim (2).



I4RS0A230003-

3. Clip

3) Support rear axle by using floor jack to prevent it from lowering.
4) Remove absorber lower nut.
5) Remove absorber upper nut. Then remove shock absorber.

Installation

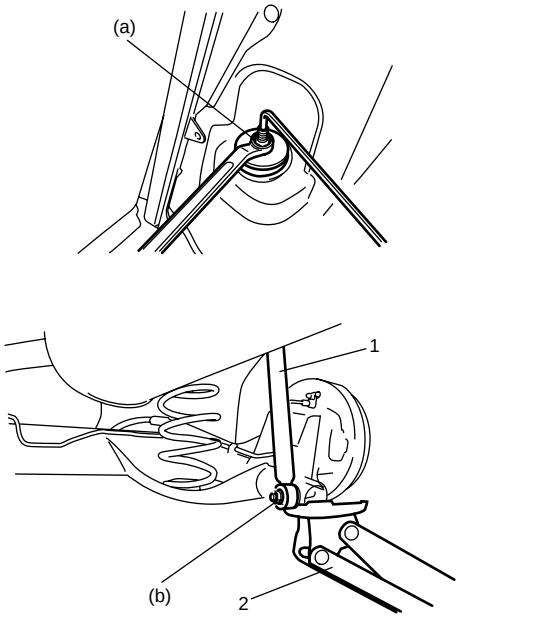
1) Install shock absorber (1).
   Tighten new rear shock absorber upper nut and lower nut temporarily at this step.

   CAUTION:

   Never reuse the removed rear shock absorber upper nut.

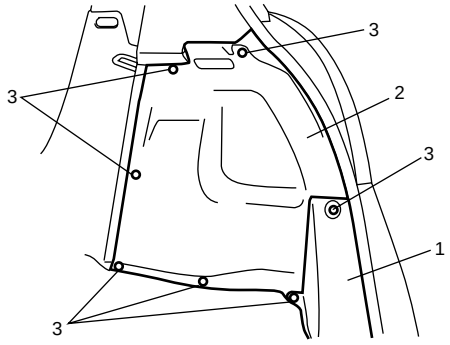
2) Remove floor jack (2) from rear axle and lower hoist.
3) Tighten nuts to specified torque.

   Tightening torque
   Rear shock absorber upper nut (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
   Rear shock absorber lower nut (b): 90 N·m (9.0 kg-m, 65.0 lb-ft)



I4RS0A230004-

4) Install tail end member trim (1) and quarter inner trim (2).



I4RS0A230003-

3. Clip

Rear Shock Absorber Inspection

S4RS0A2306029

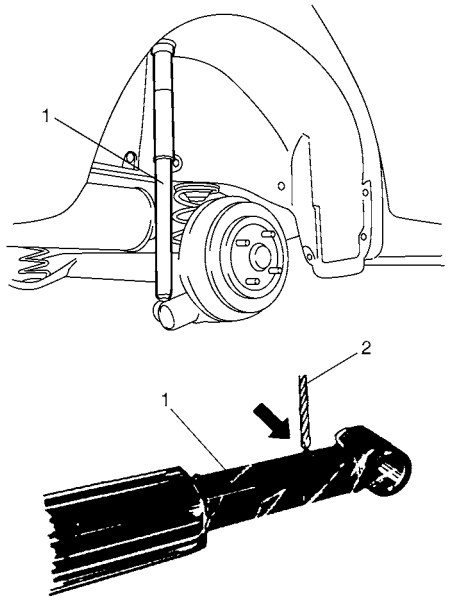
- Inspect for deformation or damage.
- Inspect bushings for wear or damage.
- Inspect for evidence of oil leakage.

Replace any defective part.

WARNING:

When handling rear shock absorber (1) in which high-pressure gas is sealed, make sure to observe the following precautions.

- **Don't disassemble it.**
- **Don't put it into the fire.**
- **Don't store it where it gets hot.**
- **Before disposing it, be sure to drill a hole (approximately 3 mm (0.12 in.) diameter) (2) in it where shown by an arrow in the figure and let gas and oil out.**
  Lay it down sideways for this work. The gas itself is harmless but it may issue out of the hole together with chips generated by the drill. Therefore, be sure to wear goggle.



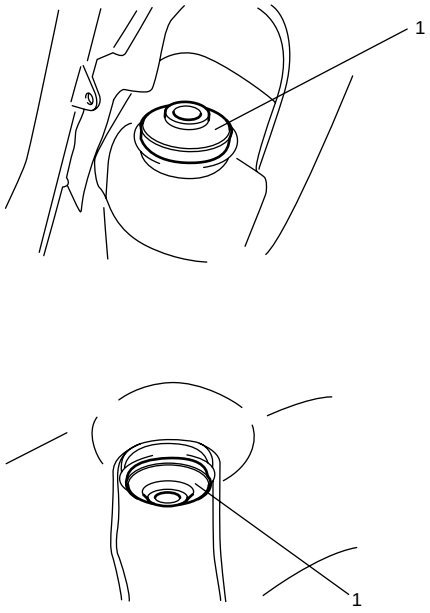
I4RS0A230005-

Rear Shock Absorber Bush Removal and Installation

S4RS0A2306040

Removal

1) Remove rear shock absorber referring to "Rear Shock Absorber Removal and Installation: ".
2) Remove rear shock absorber bushes (1).



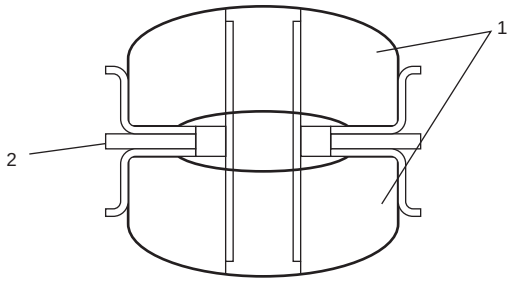
I4RS0A230006-

Installation

1) Install rear shock absorber bushes (1).

NOTE:

For proper installing direction of shock absorber bushes (1), refer to the figure.



I4RS0A230007-

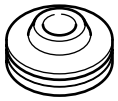
2. Body panel

2) Install rear shock absorber referring to "Rear Shock Absorber Removal and Installation: ".

Rear Shock Absorber Bush Inspection

S4RS0A2306041

Inspect for cracks, deformation or damage. Replace any defective part.



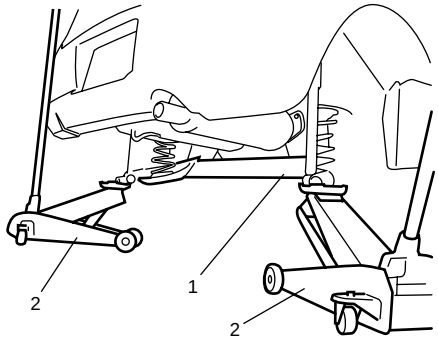
I4RS0A230008-

Coil Spring Removal and Installation

S4RS0A2306030

Removal

1) Hoist vehicle and remove rear wheels.
2) Support rear axle (1) by using two floor jacks (2) to prevent it from lowering.



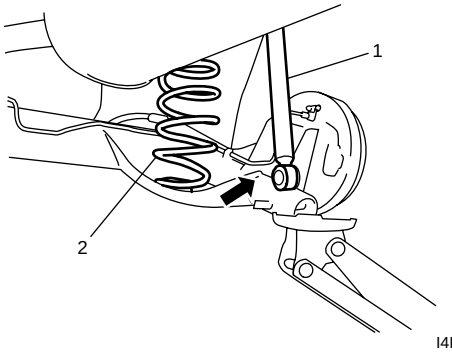
I4RS0A230009-

3) Detach shock absorbers (1) lower side (right & left) from rear axle.
4) Lower rear axle gradually as far down as where coil spring (2) can be removed.

CAUTION:

Be careful not to let rear axle down too much. It may cause damage to brake flexible hose, wheel speed sensor lead wire and parking brake cable.

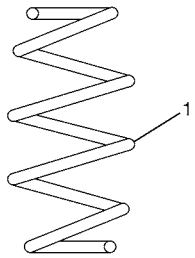
5) Remove coil spring (2).

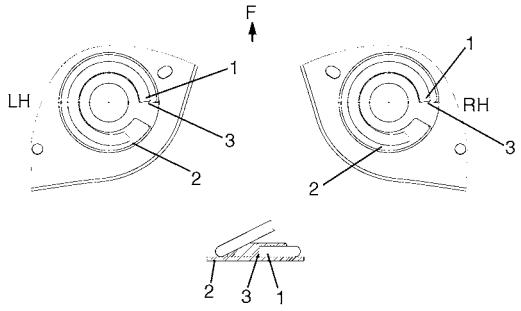


I4RS0A230010-

Installation

1) Install coil spring (1) on spring seat (2) of rear axle and mate spring open end with stepped part (3) of spring lower seat and raise rear axle.

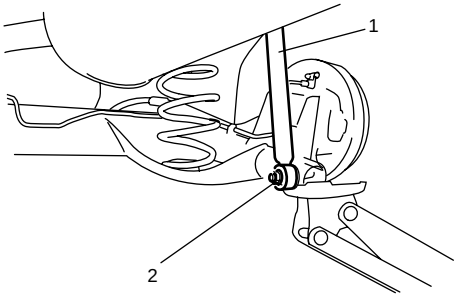




I4RS0A230011-

F: Front side

2) Install shock absorbers (1) lower side (right & left) to rear axle.
Tighten shock absorber lower nuts (2) temporarily by hand at this step.

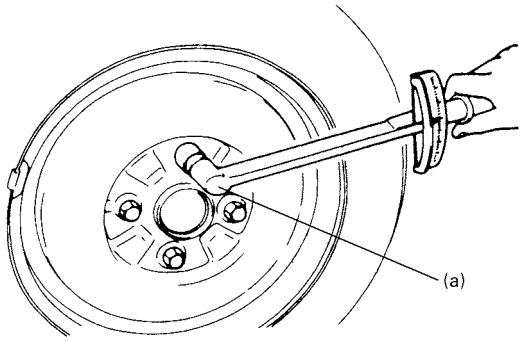


I4RS0A230012-

3) Remove floor jacks from rear axle.

4) Install wheels and tighten wheel nuts to specified torque.

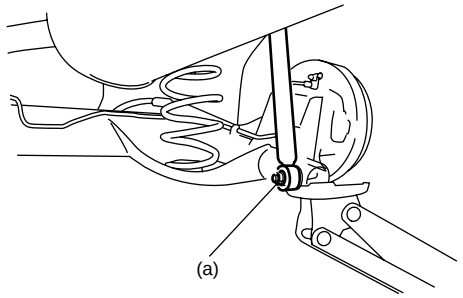
Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01220009-

5) Lower hoist and vehicle in non-loaded condition, tighten absorber lower nuts (a) to specified torque.

Tightening torque
Rear shock absorber lower nut (a): 90 N·m (9.0 kg-m, 65.0 lb-ft)

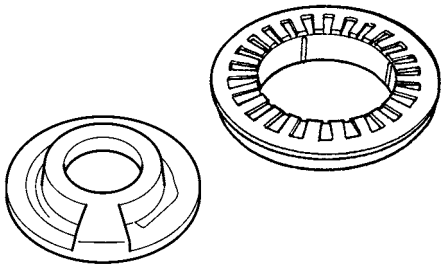


I4RS0A230013-

Spring Upper Seat / Spring Lower Seat Inspection

S4RS0A2306032

Inspect for cracks, deformation or damage. Replace any defective part.



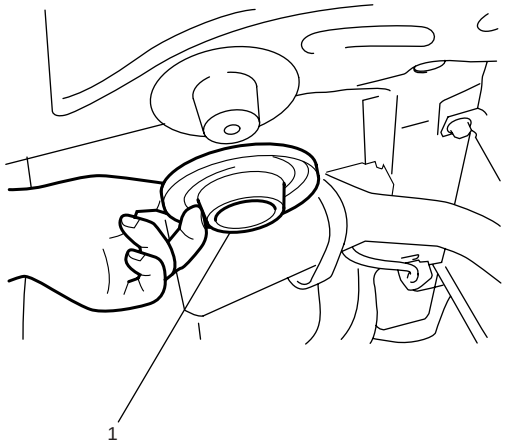
I4RS0A230015-

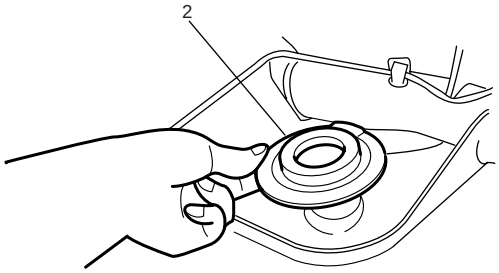
Spring Upper Seat and Lower Seat Removal and Installation

S4RS0A2306033

Removal

1) Remove coil spring referring to “Coil Spring Removal and Installation: ”.
2) Remove spring upper seat (1) and lower seat (2).





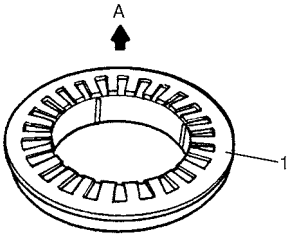
I4RS0A230016-

Installation

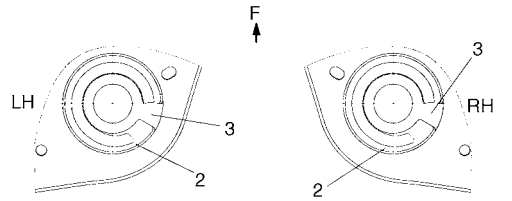
1) Install spring upper seat (1) and lower seat (2).

NOTE:

For proper installing direction of spring upper seat (1) and lower seat (2), refer to the figure.



I3RM0A230021-



I4RS0A230017-

A: Vehicle body side (Upper side)	LH: Left side
F: Front side	RH: Right side
3. Stepped part	

2) Install coil spring referring to “Coil Spring Removal and Installation: ”.

Rear Axle Removal and Installation

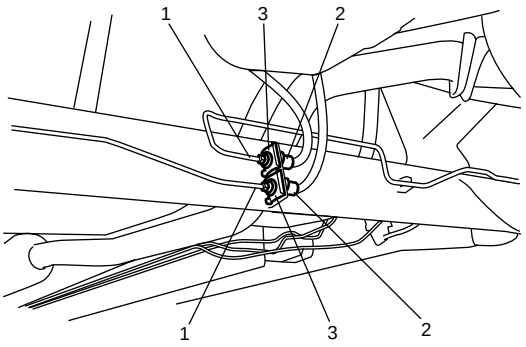
S4RS0A2306035

Removal

1) Hoist vehicle and remove rear wheels (right & left) referring to “Wheel Removal and Installation: in Section 2D”.
2) Remove rear brake drums (right & left). For details, refer to Steps 2) to 6) of “Rear Brake Drum Removal and Installation: in Section 4C”.
3) Disconnect brake pipes (1) from brake hoses (2) and remove E-rings (3).

CAUTION:

Do not allow brake fluid to get on painted surfaces



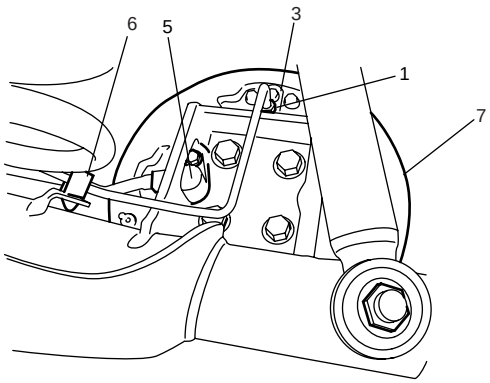
I4RS0A230018-

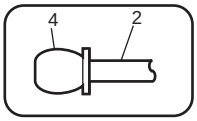
4) Disconnect brake pipe flare nuts (1) from wheel cylinders (3) (right & left) and put bleeder plug cap (4) onto pipe (2) to prevent fluid from spilling.

CAUTION:

Do not allow brake fluid to get on painted surfaces.

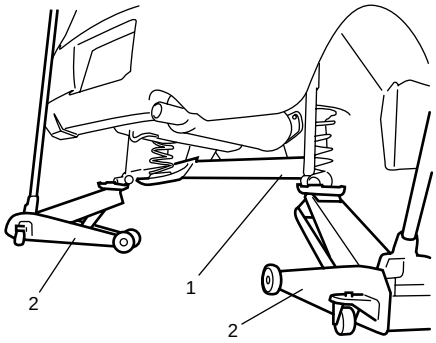
5) Disconnect wheel speed sensors (5) and lead wire clamps (6) (right & left) (if equipped).
6) Remove brake back plates (7) and spindles (right & left) from rear axle and hang removed brake back plate with a wire hook.





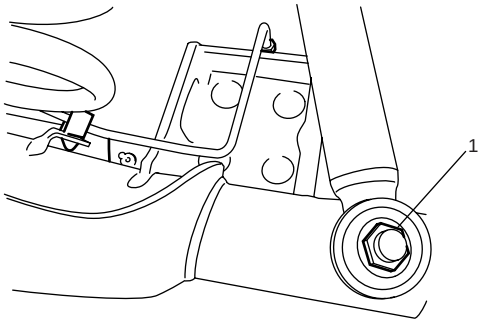
I4RS0A230043-

7) Support rear axle (1) by using two floor jacks (2).



I4RS0A230009-

8) Remove shock absorber lower washers and nuts (1) (right & left).



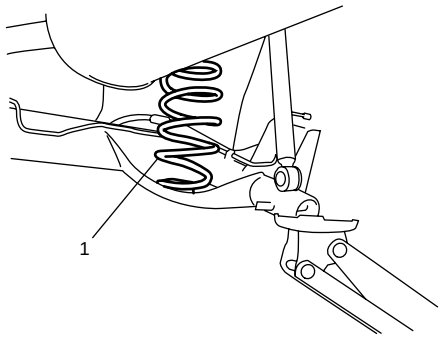
I4RS0A230019-

9) Lower rear axle gradually as far down as where coil springs (1) (right & left) can be removed.

CAUTION:

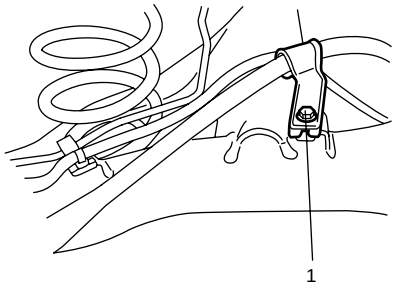
Be careful not to let rear axle down too much. It may cause damage to brake flexible hose, wheel speed sensor lead wire and parking brake cable.

10) Remove coil springs (1) (right & left).



I4RS0A230020-

11) Disconnect wheel speed sensor clamp and parking brake cable clamp from rear axle.

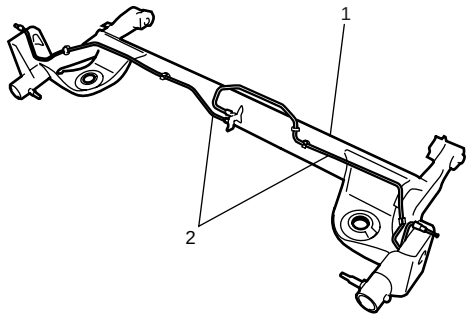


I4RS0A230021-

1. Parking brake cable clamp bolt

12) While supporting rear axle (1) at both ends (right & left), remove rear trailing arm bolts and then remove rear axle from chassis by lowering floor jack gradually.

13) Remove brake pipes (2) from rear axle (1) if necessary.

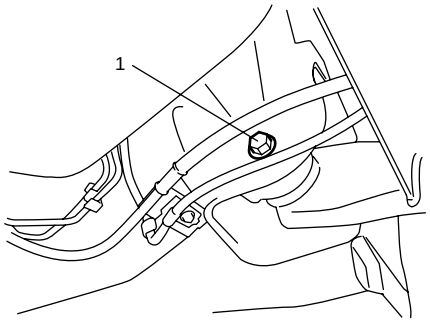


I4RS0A230022-

Installation

1) Install brake pipes to rear axle.

2) Place rear axle on floor jacks.
Then install trailing arm and new trailing arm bolts (1) (right & left) and tighten bolts temporarily by hand.

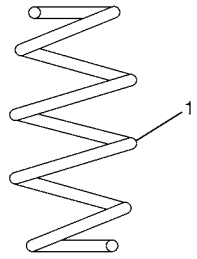


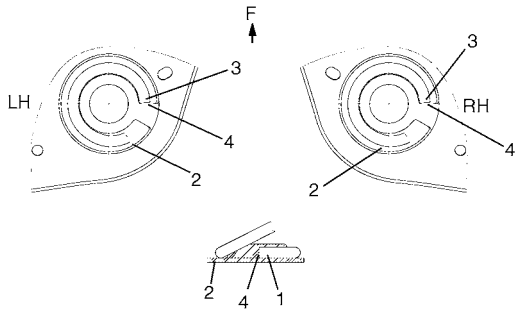
I4RS0A230023-

3) Install coil springs (1) (right & left) on spring seats (2) of rear axle as shown in the figure and then raise rear axle.

NOTE:

When seating coil spring (1), mate spring open end (3) with stepped part (4) of rear axle spring seat as shown.



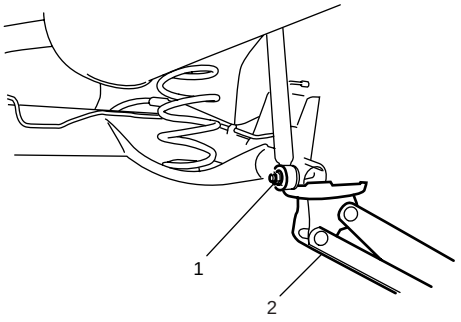


I4RS0A230044-

F: Front side

4) Tighten shock absorber lower nuts (1) (right & left) temporarily by hand.

5) Remove floor jacks (2) from rear axle.



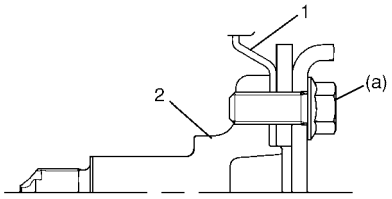
I4RS0A230024-

6) Install brake back plates (1), spindles (2) and new spindle bolts (a) and then tighten spindle bolts (a) to specified torque.

CAUTION:

Do not reuse (reinstall) removed rear spindle bolts (a).

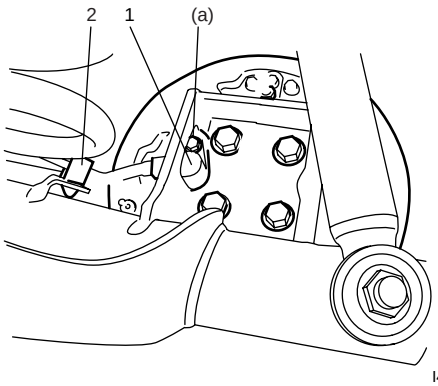
Tightening torque
Rear spindle bolt (a): 75 N·m (7.5 kg-m, 54.0 lb-ft)



I4RS0A230025-

7) Connect wheel speed sensors (1) and lead wire clamps (2) (right & left) (if equipped with ABS).

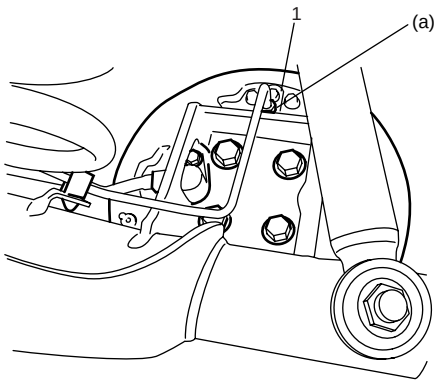
Tightening torque
Wheel speed sensor bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A230026-

8) Connect brake pipes to wheel cylinders (1) (right & left) and tighten brake pipe flare nuts (a) to specified torque.

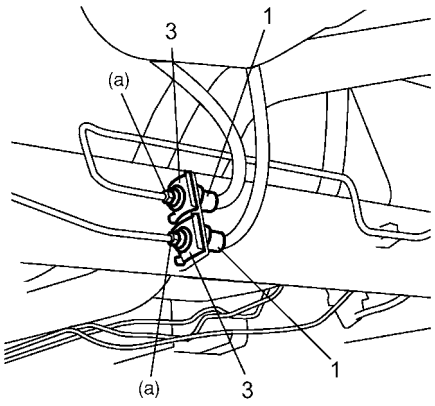
Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)



I4RS0A230027-

9) Connect brake flexible hoses (1) to bracket on rear axle with E-rings (3) (right & left) and tighten brake pipe flare nuts (a) to specified torque.

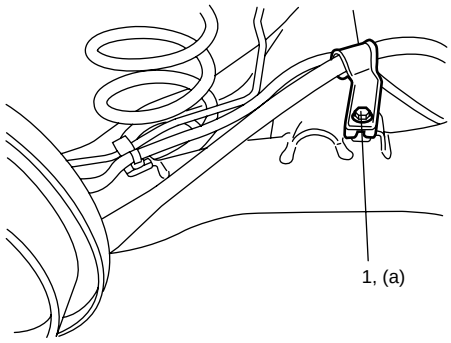
Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)



I4RS0A230028-

10) Install wheel speed sensor clamp and parking brake clamp and tighten parking brake clamp bolts (1) to specified torque.

Tightening torque
Parking brake cable clamp bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



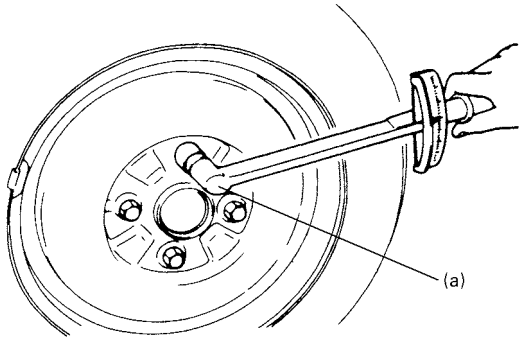
I4RS0A230029-

11) Install brake drums (right & left). For details, refer to Steps 2) – 7) of “Rear Brake Drum Removal and Installation: in Section 4C”.

12) Fill reservoir with brake fluid and bleed brake system. For bleeding operation, see “Air Bleeding of Brake System: in Section 4A”.

13) Install wheel and tighten wheel nuts to specified torque.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01220009-

14) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 Ibs) load three to five times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable. For adjustment, refer to “Parking Brake Inspection and Adjustment: in Section 4D”.

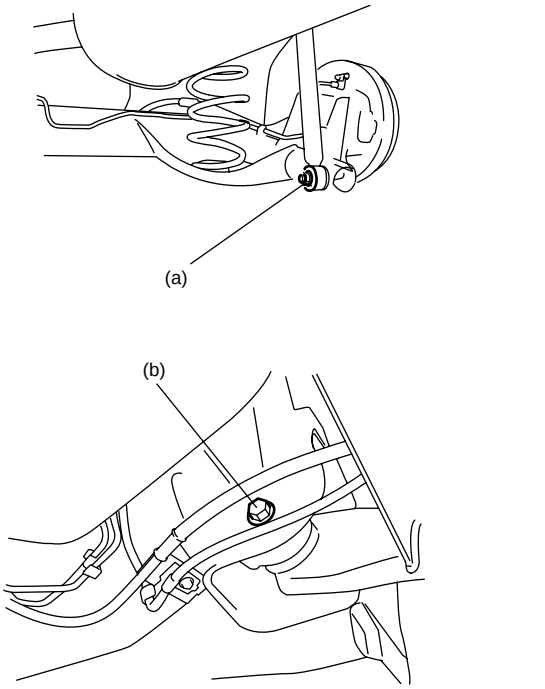
15) Lower hoist and bounce vehicle up and down several times to stabilize suspension.

16) Tighten shock absorber lower nuts (a) and rear trailing arm bolts (b) to specified torque.

NOTE:

When tightening these nuts and bolts, be sure that vehicle is off hoist and in non loaded condition.

Tightening torque
Rear shock absorber lower nut (a): 90 N·m (9.0 kg-m, 65.0 lb-ft)
Rear trailing arm bolt (b): 75 N·m (7.5 kg-m, 54.5 lb-ft)



I4RS0A230030-

17) Check to ensure that brake drum is free from dragging and proper braking is obtained.

18) Perform brake test (foot brake and parking brake).

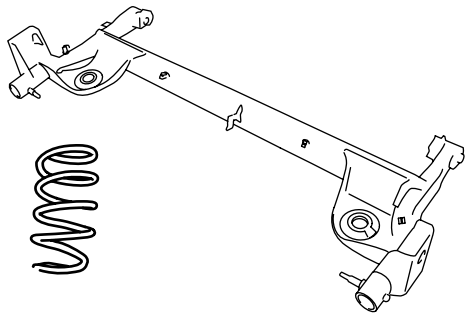
19) Check each installed part for fluid leakage.

Trailing Arm, Rear Axle and Coil Spring Inspection

S4RS0A2306027

- Inspect for cracks, deformation or damage.
- Inspect bushing for damage, wear or breakage.

Replace any defective part.



I4RS0A230031-

Rear Axle Bush Inspection

S4RS0A2306043

Inspect for cracks, deformation or damage. Replace any defective part.

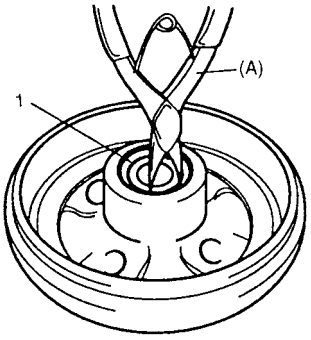
Wheel Bearing and Wheel Stud Bolt Removal and Installation

S4RS0A2306036

Removal

1) Remove rear brake drum referring to “Rear Brake Drum Removal and Installation: in Section 4C”.
2) Remove circlip (1).

Special tool
(A): 09900–06108



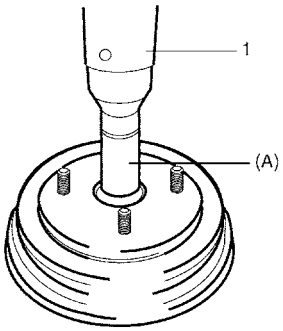
I3RM0A230046-

3) Remove wheel bearing by using special tool and hydraulic press (1).

Special tool
(A): 09913–76010

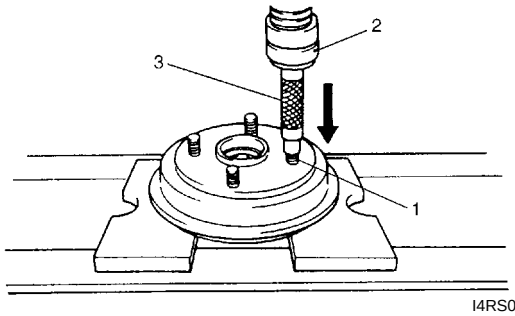
CAUTION:

Never reuse wheel bearing.
Reused bearing should have excessive play.



I4RS0A230035-

4) Remove wheel stud bolts (1) using hydraulic press (2) and general rod (3).



I4RS0A230036-

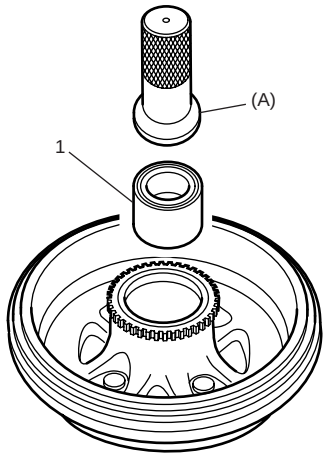
Installation

1) Install new wheel bearing (1) by using special tool and hydraulic press.

NOTE:

Seal side of bearing comes brake back plate side.

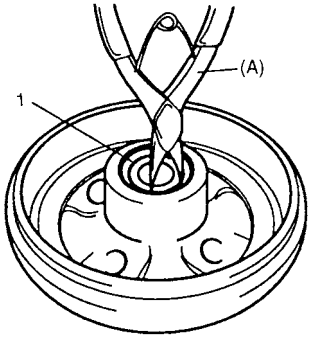
Special tool
(A): 09925–15410



I4RS0A230037-

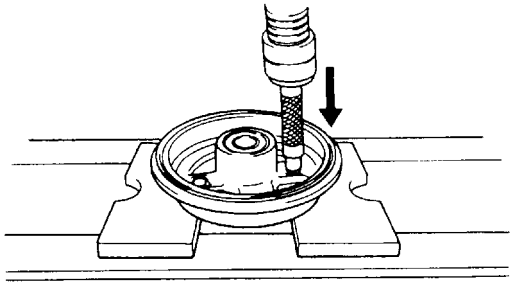
2) Install circlip (1).

Special tool
(A): 09900–06108



I3RM0A230046-

3) Insert new stud in drum hole and rotate it slowly to assure serrations are aligned with those made by replaced bolt.



I4RS0A230038-

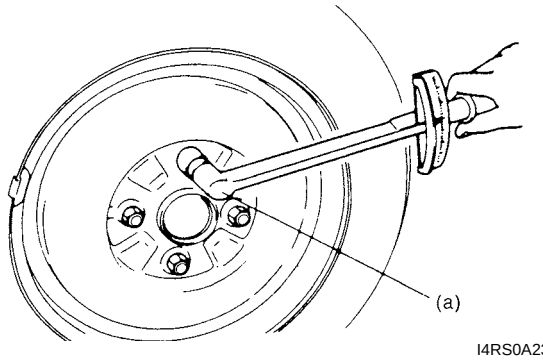
4) Install brake drum and wheel, referring to Steps 2) – 10) of “Rear Brake Drum Removal and Installation: in Section 4C”.

Rear Wheel Disc, Nut and Bearing Inspection

S4RS0A2306021

- Check wheel nuts for tightness and, as necessary, retighten to specification.
- Check wheel bolt press-fitted into brake drum for wear, damage, poor thread condition, and looseness. Replace defective bolt with a new one.
  When bolt installation is found loose, replace both bolt and brake drum with new ones.
- Check wheel disc for deformation, damage, crack, etc.
  Replace defective disc with a new one.
- Check installation face inside of wheel disc for rust. As rust affects adversely, remove it thoroughly.

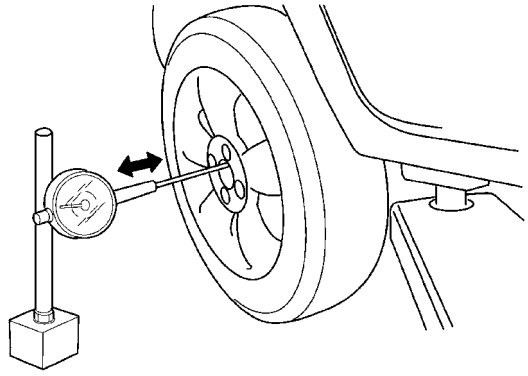
Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I4RS0A230039-

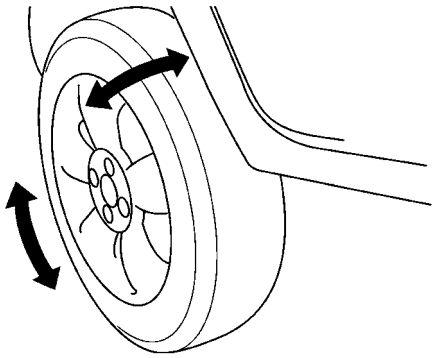
- Check wheel bearings for wear. When measuring thrust play, apply a dial gauge to axle shaft center. When measurement exceeds limit, replace bearing.

Thrust play limit
"a": 0.1 mm (0.004 in.)



I3RM0A230049-

- By rotating wheel actually, check wheel bearing for noise and smooth rotation. If it is defective, replace bearing.



I3RM0A230050-

Spindle Removal and Installation

S4RS0A2306044

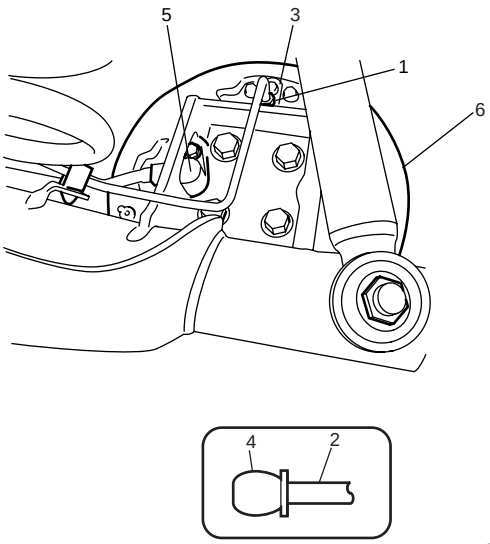
Removal

1) Remove brake drum referring to "Rear Brake Drum Removal and Installation: in Section 4C".
2) Disconnect brake pipe flare nut (1) from wheel cylinder (3) and put bleeder plug cap (4) onto pipe (2) to prevent fluid from spilling.

CAUTION:

Do not allow brake fluid to get on painted surfaces.

3) Disconnect wheel speed sensor (5).
4) Remove brake back plate (6) and spindle from rear axle and hang removed brake back plate with a wire hook.



I4RS0A230040-

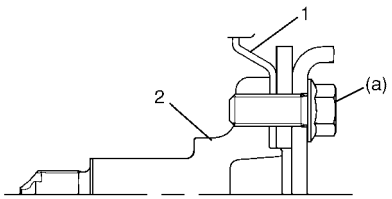
Installation

1) Install brake back plate (1), spindle (2) and new spindle bolts (a) and then tighten spindle bolts (a) to specified torque.

CAUTION:

Do not reuse (reinstall) removed rear spindle bolts (a).

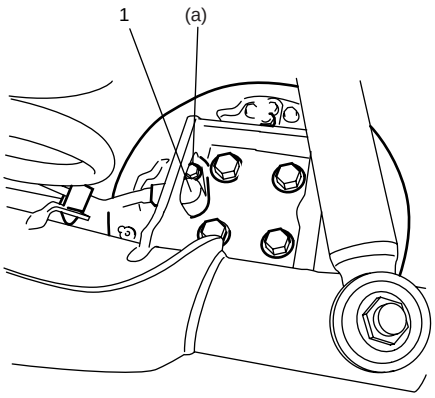
Tightening torque
Rear spindle bolt (a): 75 N·m (7.5 kg-m, 54.0 lb-ft)



I4RS0A230025-

2) Connect wheel speed sensor (1) and tighten wheel speed sensor bolt (a) to specified torque.

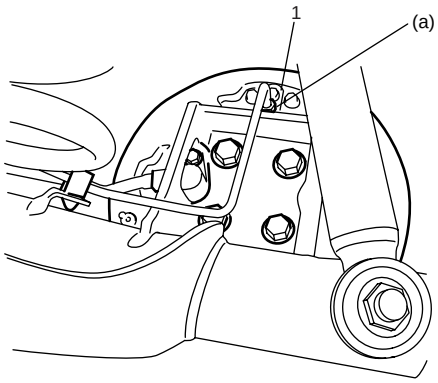
Tightening torque
Wheel speed sensor bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A230041-

3) Connect brake pipes to wheel cylinder (1) and tighten brake pipe flare nut (a) to specified torque.

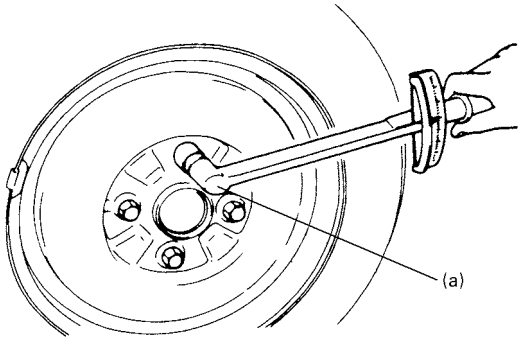
Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)



I4RS0A230027-

4) Install brake drum referring to Steps 2) – 7) of “Rear Brake Drum Removal and Installation: in Section 4C”.
5) Fill reservoir with brake fluid and bleed brake system. For bleeding operation, see “Air Bleeding of Brake System: in Section 4A”.
6) Install wheel and tighten wheel nuts to specified torque.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



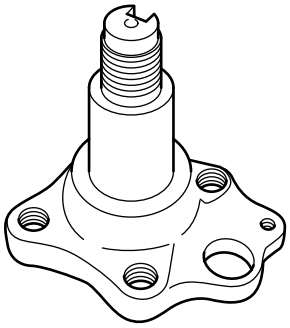
I2RH01220009-

7) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable. For adjustment, see “Parking Brake Inspection and Adjustment: in Section 4D”.
8) Check to ensure that brake drum is free from dragging and proper braking is obtained.
9) Perform brake test (foot brake and parking brake).
10) Check each installed part for fluid leakage.

Spindle Inspection

S4RS0A2306045

- Inspect for cracks, deformation or damage. Replace any defective part.



I4RS0A230042-

Rear Suspension Fasteners Inspection

S4RS0A2306025

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque referring to the figure in “Rear Suspension Component Location: ”.

Specifications

Tightening Torque Specifications

S4RS0A2307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Rear shock absorber upper nut	25	2.5	18.0	☞
Rear shock absorber lower nut	90	9.0	65.0	☞ / ☞ / ☞
Wheel nut	85	8.5	61.5	☞ / ☞ / ☞ / ☞
Rear spindle bolt	75	7.5	54.0	☞ / ☞
Wheel speed sensor bolt	11	1.1	8.0	☞ / ☞
Brake pipe flare nut	16	1.6	11.5	☞ / ☞ / ☞
Parking brake cable clamp bolt	11	1.1	8.0	☞
Rear trailing arm bolt	75	7.5	54.5	☞

NOTE:

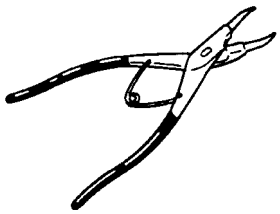
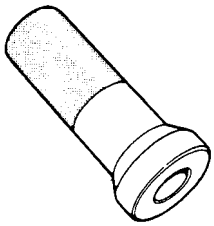
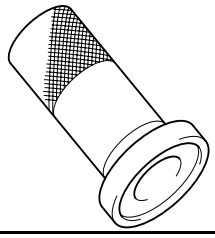
The specified tightening torque is also described in the following.
“Rear Suspension Component Location: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A2308001

09900–06108 Snap ring pliers (closing type) ☞ / ☞		09913–76010 Bearing installer ☞	
09925–15410 Oil seal installer ☞			

Wheels and Tires

General Description

Tires Description

S4RS0A2401001

The tire is of tubeless type. The tire is designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressures.
Correct tire pressures and driving habits have an important influence on tire life. Heavy cornering, excessively rapid acceleration, and unnecessary sharp braking increase tire wear.

Tire Placard
The “Tire Placard” is located on the right door lock pillar and should be referred to tire information.
The placard lists the maximum load, tire size and cold tire pressure where applicable.

NOTE:

Whether rim size and/or maximum load are listed or not depends on regulations of each country.

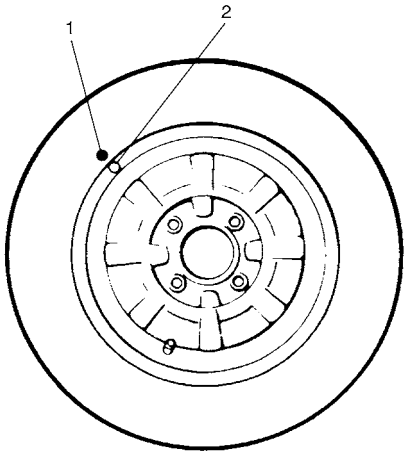
Inflation of Tires
The pressure recommended for any model is carefully calculated to give a satisfactory ride, stability, steering, tread wear, tire life and resistance to bruises.
Tire pressure, with tires cold, (after vehicle has set for 3 hours or more, or driven less than one mile) should be checked monthly or before any extended trip. Set to the specifications on the “Tire Placard” located on the left door lock pillar.
It is normal for tire pressure to increase when the tires become hot during driving.
Do not bleed or reduce tire pressure after driving. Bleeding reduces the “Cold Inflation Pressure”.

Higher than recommended pressure can cause:
- Hard ride
- Tire bruising or carcass damage
- Rapid tread wear at center of tire

Unequal pressure on same axle can cause:
- Uneven braking
- Steering lead
- Reduced handling
- Swerve on acceleration

Lower than recommended pressure can cause:
- Tire squeal on turns
- Hard Steering
- Rapid and uneven wear on the edges of the tread
- Tire rim bruises and rupture
- Tire cord breakage
- High tire temperature
- Reduced handling
- High fuel consumption

Matched Tires and Wheels (Steel Type)
Tires and wheels are match mounted at the assembly plant.
This means that the radially stiffest part of the tire, or “high spot”, is matched to the smallest radius or “low spot” of the wheel.
This is done to provide the smoothest possible ride.
The “high spot” of the tire is originally marked by paint dot (1) on the outboard sidewall. This paint dot will eventually wash off the tire.
The “low spot” of the wheel is originally marked by paint dot (2) on the wheel rim-flange. Properly assembled, the wheel rims’ paint dot should be aligned with the tires’ paint dot as shown in figure.



I2RH01240001-

Whenever a tire is dismounted from its wheel, it should be remounted so that the tire and wheel are matched. If the tire’s paint dot cannot be located, a line should be scribed on the tire and wheel before dismounting to assure that it is remounted in the same position.

Replacement Tires
When replacement is necessary, the original equipment type tire should be used. Refer to the Tire Placard.
Replacement tires should be of the same size, load range and construction as those originally on the vehicle. Use of any other size or type tire may affect ride, handling, speedometer / odometer calibration, vehicle ground clearance and tire or snow chain clearance to the body and chassis.
It is recommended that new tires be installed in pairs on the same axle. If necessary to replace only one tire, it should be paired with the tire having the most tread, to equalize braking traction.

WARNING:

Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because handling may be seriously affected and may result in loss of control.

The metric term for tire inflation pressure is the kilo pascal (kPa). Tire pressures is usually printed in both kPa and kgf/cm^2 on the “Tire Placard”.
Metric tire gauges are available from tool suppliers. The chart, shown the table, converts commonly used inflation pressures from kPa to kgf/cm^2 and psi.

	kPa	kgf/cm^2	psi
Conversion:	160	1.6	23
1 psi = 6.895 kPa	180	1.8	26
1 kgf/cm^2 = 98.066 kPa	200	2.0	29
	220	2.2	32
	240	2.4	35
	260	2.6	38
	280	2.8	41
	300	3.0	44

Wheels Description

S4RS0A2401002

Wheel Maintenance

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

Replacement Wheels

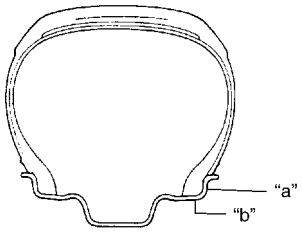
Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, air leak through welds, have elongated bolt holes, if lug nuts won’t stay tight, or if they are heavily rusted. Wheels with greater runout than shown in the following may cause objectional vibrations.
Replacement wheels must be equivalent to the original equipment wheels in load capacity, diameter, rim with offset and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer / odometer calibration, vehicle ground clearance and tire clearance to body and chassis.

How to Measure Wheel Runout

To measure the wheel runout, it is necessary to use an accurate dial indicator. The tire may be on or off the wheel. The wheel should be installed to the wheel balancer of the like for proper measurement.
Take measurements of both lateral runout “a” and radial runout “b” at both inside and outside of the rim flange. With the dial indicator set in place securely, turn the wheel one full revolution slowly and record every reading of the indicator.
When the measured runout exceeds the specification and correction by the balancer adjustment is impossible, replace the wheel. If the reading is affected by welding, paint or scratch, it should be ignored.

Lateral runout limit
“a”: 1.40 mm (0.055 in.)

Radial runout limit
“b”: 1.14 mm (0.045 in.)



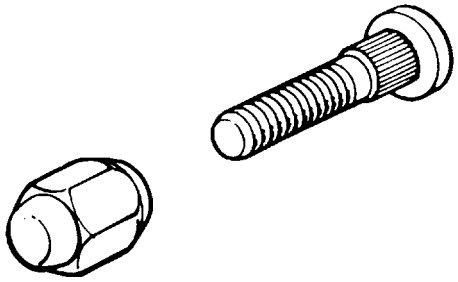
I4RS0A240001-

Metric Lug Nuts and Wheel Studs

All models use metric lug nuts and wheel studs.

Metric lug nuts and wheel studs size
M12 x 1.25

If a broken stud is found, see “Front Wheel Hub, Disc, Nut and Bearing Check: in Section 2B”, “Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation: in Section 2B”, “Rear Suspension Component Location: in Section 2C”, “Rear Brake Drum Removal and Installation: in Section 4C”and “Wheel Bearing and Wheel Stud Bolt Removal and Installation: in Section 2C” for Note and Replacement procedure.



I2RH01240003-

Irregular and/or Premature Wear Description

S4RS0A2401003

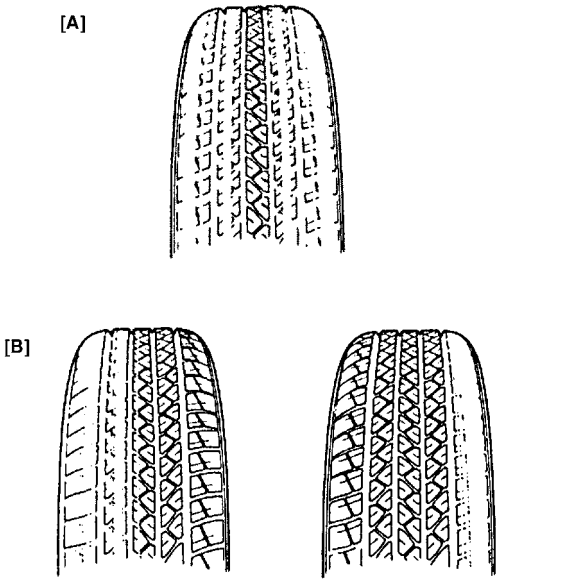
Irregular and premature wear has many causes. Some of them are: incorrect inflation pressures, lack of tire rotation, driving habits, improper alignment.
If the following conditions are noted, rotation is necessary:

- Front tire wear is different from rear.
- Uneven wear exists across the tread of any tire.
- Front tire wear is unequal between the right and left.
- Rear tire wear is unequal between the right and left.
- There is cupping, flat spotting, etc.

A wheel alignment check is necessary if following conditions are noted:

- Front tire wear is unequal between the right and left.
- Wear is uneven across the tread of any front tire.

- Front tire treads have scuffed appearance with “feather” edges on one side of tread ribs or blocks.



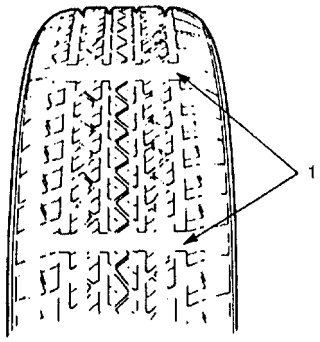
I3RH0A240002-

[A]:	Hard Cornering, under inflation or lack of tire rotation
[B]:	Incorrect wheel alignment, tire construction not uniform or wheel heavy acceleration

Wear Indicators Description

S4RS0A2401004

Original equipment tires have built-in tread wear indicators (1) to show when they need replacement. These indicators (1) will appear as 12 mm (0.47 in) wide bands when the tire tread depth becomes 1.6 mm (0.063 in).
When the indicators (1) appear in 3 or more grooves at 6 locations, tire replacement is recommended.

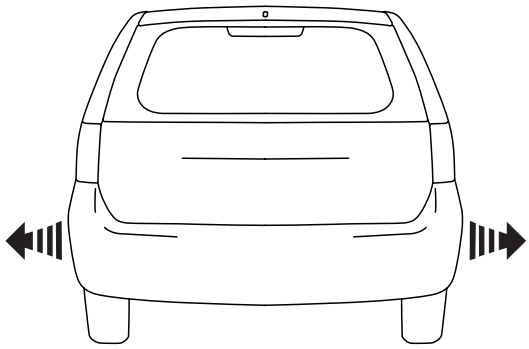


I2RH01240005-

Radial Tire Waddle Description

S4RS0A2401005

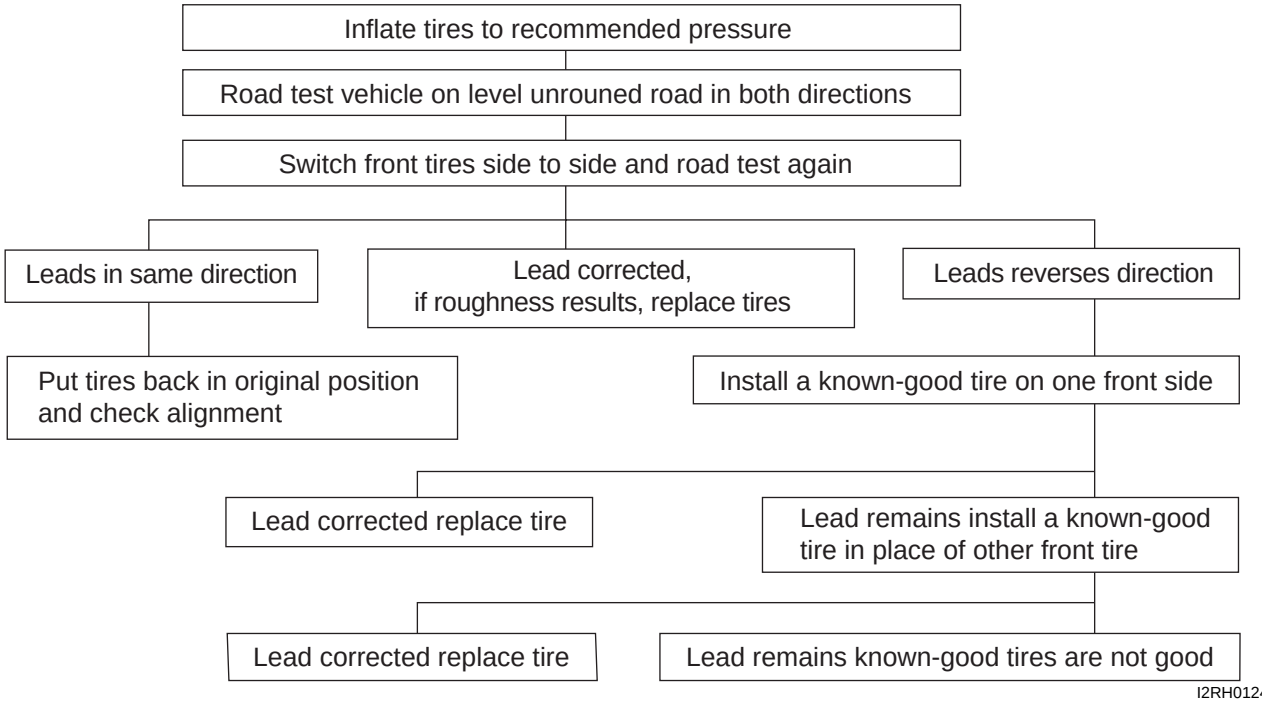
Waddle is side to side movement at the front and/or rear of the vehicle. It is caused by the steel belt not being straight within the tire. It is most noticeable at a low speed, 8 to 48 kph (5 to 30 mph).
It is possible to locate the faulty tire by road testing the vehicle. If it is on the rear, the rear end of the vehicle shakes from side to side or “waddles”. To the driver in the seat, it feels as though someone is pushing on the side of vehicle. If the faulty tire is on the front, waddling is more visual. The front sheet metal appears to be moving back and forth and the driver feels as though he is at the pivot point in vehicle.
Waddle can be quickly diagnosed by using Tire Problem Detector (TPD) and following the equipment manufacture’s recommendations.
If TPD is not available, an alternative method of substituting known-good tire / wheel assemblies can be used as follows, although it takes a longer time.



I2RH01240006-

1) Ride vehicle to determine whether the front or rear waddles.
2) Install tires and wheels that are known to be good (on similar vehicle) in place of those on waddling end of vehicle. If waddling end cannot be identified, substitute rear ones.
3) Road test again. If improvement is noted, reinstall originals one at a time till waddle causal tire is found. If no improvement is noted, install known-good tires in place of all four. Then reinstall originals in the same manner.

Equipment manufacture's recommendations



I2RH01240007-

Radial Tire Lead / Pull Description

S4RS0A2401006

"Lead / Pull" is the deviation of the vehicle from a straight path on a level road even with no pressure on the steering wheel.
Lead is usually caused by the following conditions.

- Improper tire and wheel alignment.
- Uneven brake assemblies.
- Tire construction.

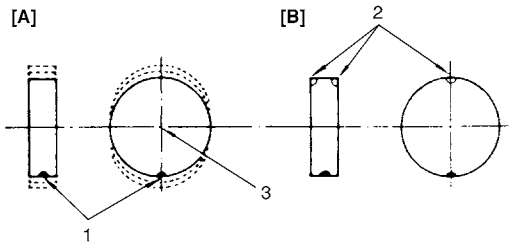
The way in which a tire is built can produce lead in a vehicle. An example of this is placement of the belt. Off center belts on radial tires can cause the tire to develop a side force while rolling straight down the road. If one side of the tire has a little larger diameter than the other, the tire will tend to roll to one side. This will develop a side force which can produce vehicle lead.
The procedure in the figure (Lead Diagnosis) should be used to make sure that wheel alignment is not mistaken for tire lead.

- Part of the lead diagnosis procedure is different from the proper tire rotation pattern currently in the owner and service manuals. If a medium to high mileage tire is moved to the other side of the vehicle, be sure to check that ride roughness has not developed
- Rear tires will not cause lead.

Balancing Wheels Description

S4RS0A2401007

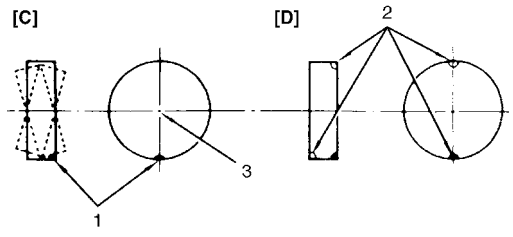
There are two types of wheel and tire balance: static and dynamic. Static balance, as shown in figure, is the equal distribution of weight around the wheel. Wheels that are statically unbalanced cause a bouncing action called tramp. This condition will eventually cause uneven tire wear.



I2RH01240008-

1. Heavy spot wheel tramp	[A]: Before correction
2. Balance weights addition point	[B]: Corrective weights
3. C/L of spindle	

Dynamic balance, as shown in figure, is the equal distribution of weight on each side of the wheel centerline so that when the tire spins there is no tendency for the assembly to move from side to side. Wheels that are dynamically unbalanced may cause shimmy.



I2RH01240009-

1. Heavy spot wheel shimmy	[C]: Before correction
2. Balance weights addition point	[D]: Corrective weights
3. C/L of spindle	

Repair Instructions

General Balance Procedures

S4RS0A2406001

Deposits of mud, etc. must be cleaned from inside of rim.

WARNING:

Stones should be removed from the tread in order to avoid operator injury during spin balancing and to obtain good balance.

Each tire should be inspected for any damage, then balanced according to equipment manufacturer's recommendation.

Off-Vehicle Balancing

Most electronic off-vehicle balancers are more accurate than the on-vehicle spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-vehicle spin balancing, this is overcome by their accuracy, usually to within 1/8 ounce.

On-Vehicle Balancing

On-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

WARNING:

Wheel spin should be limited to 35 mph (55 km/h) as indicated on speedometer.
This limit is necessary because speedometer only indicates one-half of actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped.
Unless care is taken in limiting drive wheel spin, spinning wheel can reach excessive speeds. This can result in possible tire disintegration or differential failure, which could cause serious personal injury or extensive vehicle damage.

CAUTION:

For vehicle equipped with ABS, using on-vehicle balancing method with ignition switch ON may set malfunction diagnostic trouble code (DTC) of ABS even when system is in good condition.
Never turn ignition switch ON while spinning wheel.

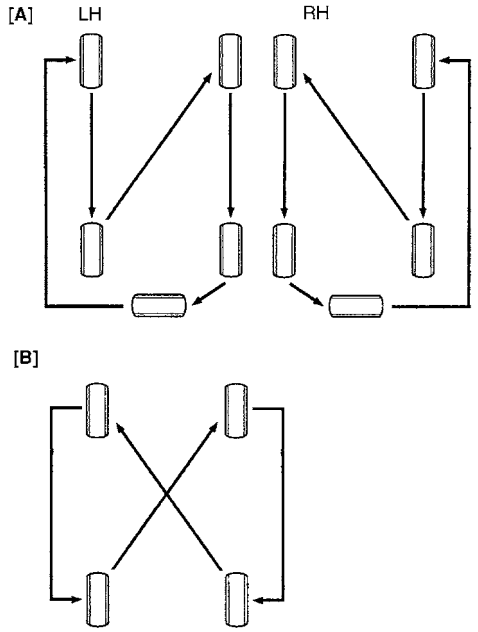
Tire Rotation

S4RS0A2406002

To equalize wear, rotate tires according to figure. Radial tires should be rotated periodically. Set tire pressure.

NOTE:

Due to their design, radial tires tend to wear faster in the shoulder area, particularly in front positions. This makes regular rotation especially necessary.



I3RH0A240001-

[A]: 5-tire rotation

NOTE:

Applicable to vehicles equipped with 5 tires including spare tire all of which are identical in size

[B]: 4-tire rotation

LH: Left-hand drive

RH: Right-hand drive

Wheel Removal and Installation

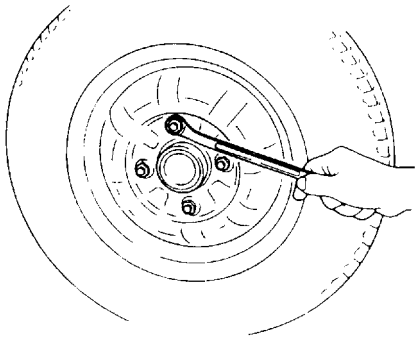
S4RS0A2406003

Removal

1) Loosen wheel nuts by approximately 180 ° (half a rotation).
2) Hoist vehicle.
3) Remove wheel.

CAUTION:

Never use heat to loosen tight wheel because application of heat to wheel can shorten life of wheel and damage wheel bearings.



I2RH01240010-

Installation

For installation, reverse removal procedure, noting the following.

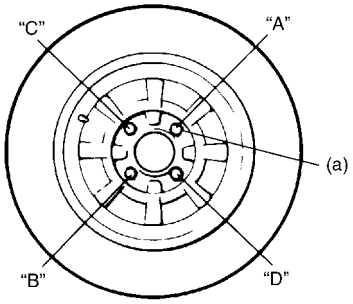
- Wheel nuts must be tightened in sequence and to proper torque to avoid bending wheel or brake disc.

NOTE:

Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel nuts to loosen, which can later allow a wheel to come off while vehicle is moving.

Tightening order
"A" – "B" – "C" – "D"

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01240011-

Tire Mounting and Dismounting

S4RS0A2406004

Use a tire changing machine to mount or dismount tires. Follow equipment manufacturer's instructions. Do not use hand tools or tire irons alone to change tires as they may damage tire beads or wheel rim.
Rim bead seats should be cleaned with a wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or dismounting a tire, bead area should be well lubricated with approved tire lubricant.
After mounting, inflate to specified pressure shown on tire placard so that beads are completely seated.

WARNING:

Do not stand over tire when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury.
Do not exceed specified pressure when inflating. If specified pressure will not seat beads, deflate, re-lubricate and reinflate.
Over inflation may cause bead to break and cause serious personal injury.

Install valve core and inflate to proper pressure.

Tire Repair

S4RS0A2406005

There are many different materials and techniques on the market to repair tires. As not all of these work on all types of tires, tire manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from each tire manufacturer.

Specifications

Wheels and Tires Specifications

S4RS0A2407001

Tire size (Standard)
185/60R15 84H

Wheel size (Standard)
15 x 5 1/2 JJ (for 185/60R15)

Tightening torque
Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

NOTE:

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner's manual which came with the vehicle.**

Tightening Torque Specifications

S4RS0A2407002

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Wheel nut	85	8.5	61.5	☞ / ☞

Reference:
For the tightening torque of fastener not specified in this section, refer to "Fasteners Information: in Section 0A".

Section 3

Driveline / Axle

CONTENTS

Drive Shaft / Axle 3A-1
General Description 3A-1
Front Drive Shaft Construction 3A-1
Component Location 3A-1
Front Drive Shaft Assembly Components Location 3A-1
Diagnostic Information and Procedures 3A-2
Front Drive Shaft Symptom Diagnosis 3A-2
Repair Instructions 3A-2
Front Drive Shaft Components 3A-2
Front Drive Shaft Assembly On-Vehicle Inspection 3A-3
Front Drive Shaft Assembly Removal and Installation 3A-3
Front Drive Shaft Disassembly and Assembly 3A-4
Center Shaft and Center Bearing Support Disassembly and Assembly 3A-7
Front Drive Shaft Inspection 3A-9
Specifications 3A-9
Tightening Torque Specifications 3A-9
Special Tools and Equipment 3A-10
Recommended Service Material 3A-10
Special Tool 3A-10

Drive Shaft / Axle

General Description

Front Drive Shaft Construction

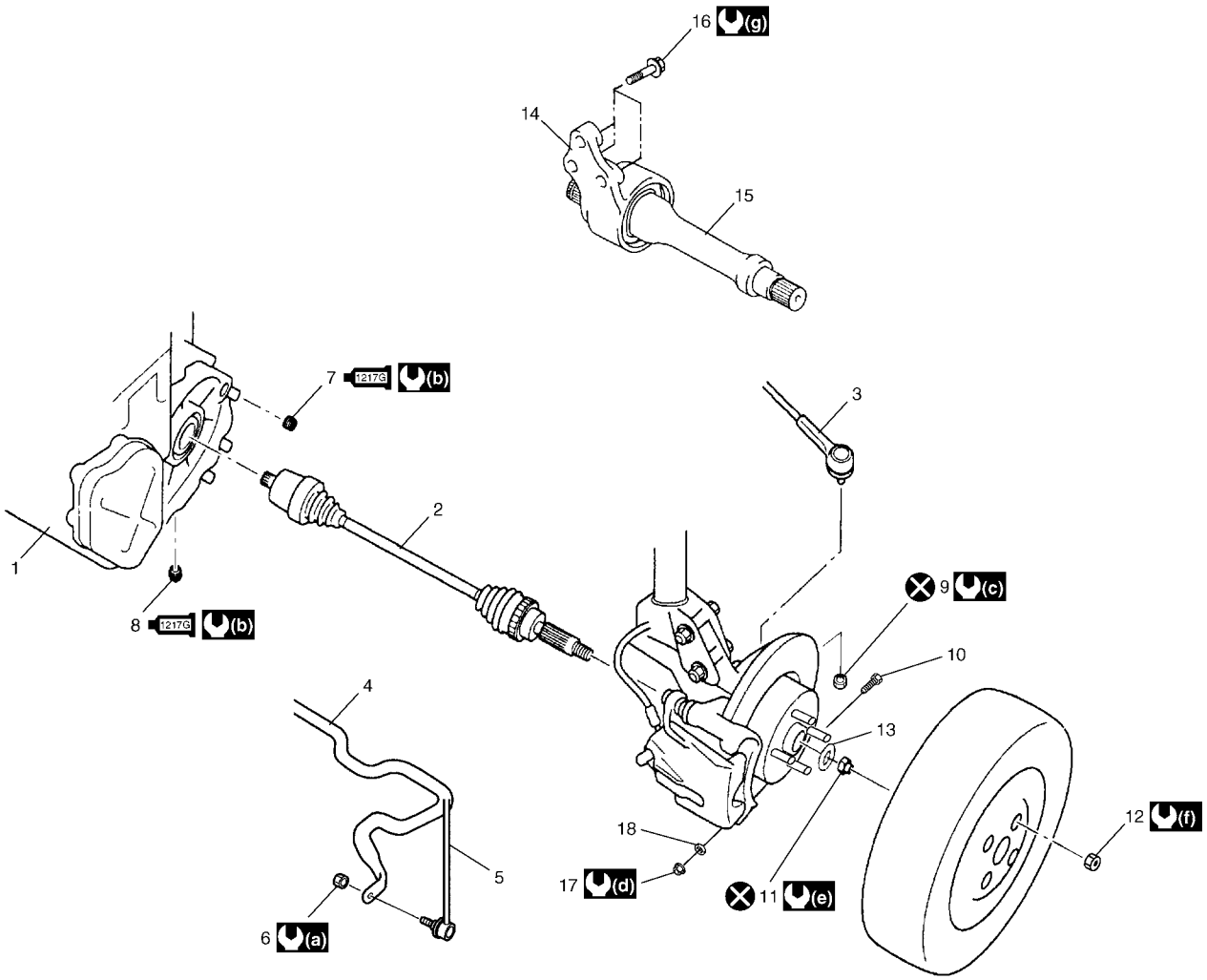
S4RS0A3101001

A constant velocity tripod joint is used on the differential side of both right and left side drive shaft assemblies. A constant velocity ball joint is used on the wheel side of both right and left side drive shaft assemblies. The drive shaft can slide through the tripod joint in the extension/contraction direction.

Component Location

Front Drive Shaft Assembly Components Location

S4RS0A3103001



I4RS0A310001-

1. Transaxle	10. Ball stud bolt	(a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)
2. Drive shaft assembly	11. Drive shaft nut	(b) : 21 N·m (2.1 kg-m, 15.5 lb-ft)
3. Tie-rod end	12. Wheel nut	(c) : 45 N·m (4.5 kg-m, 32.5 lb-ft)
4. Stabilizer	13. Drive shaft washer	(d) : 60 N·m (6.0 kg-m, 43.5 lb-ft)
5. Stabilizer joint	14. Center bearing support	(e) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
6. Stabilizer joint nut	15. Center shaft	(f) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
1217G 7. Oil filler/level plug : Apply sealant 99000-31260 to plug thread.	16. Center bearing support bolts	(g) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
1217G 8. Oil drain plug : Apply sealant 99000-31260 to plug thread.	17. Ball stud nut	: Do not reuse.
9. Tie-rod end nut	18. Ball stud washer	

Diagnostic Information and Procedures

Front Drive Shaft Symptom Diagnosis

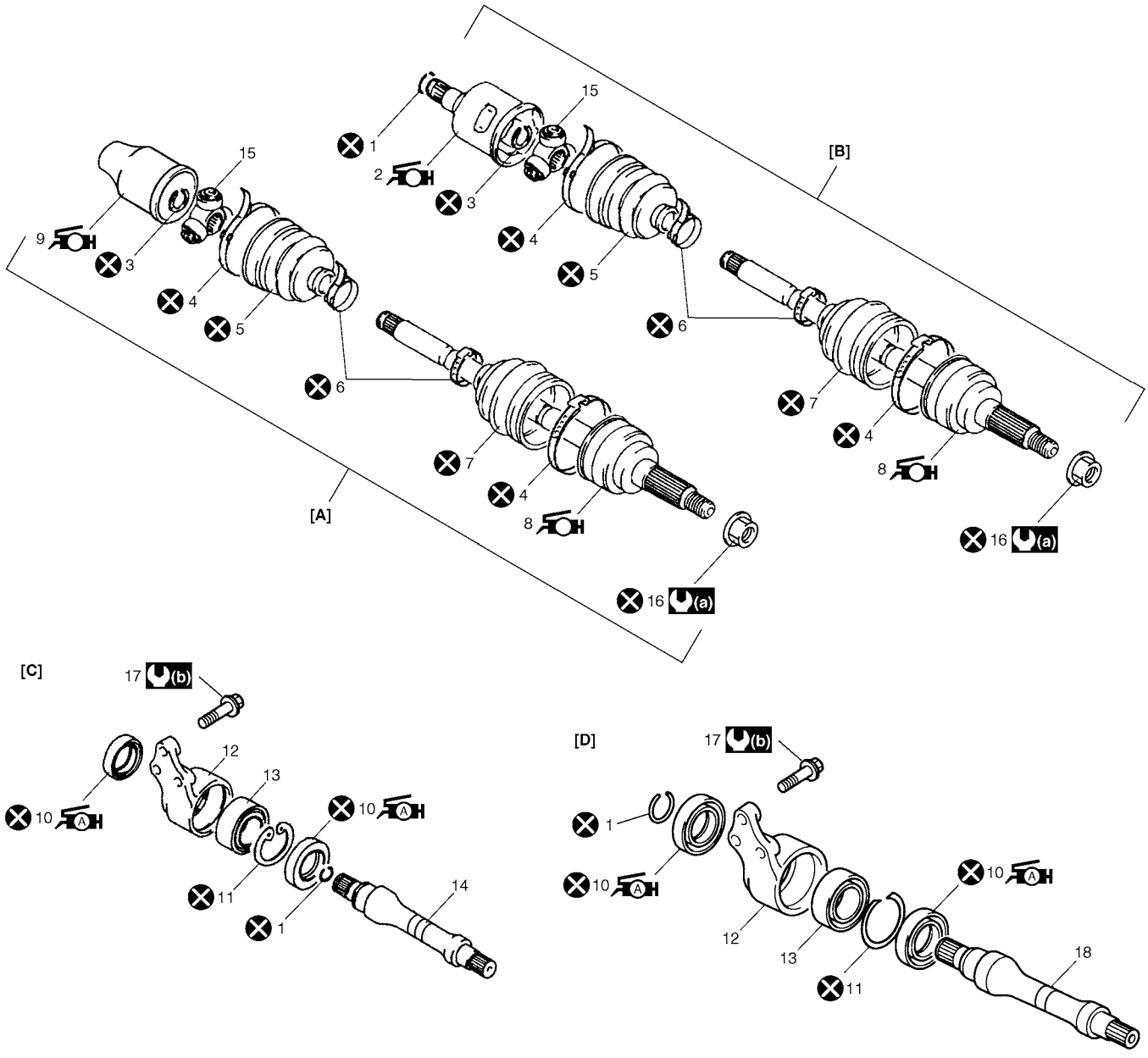
S4RS0A3104001

Condition	Possible cause	Correction / Reference Item
Abnormal noise	Worn or breakage of the drive shaft joint	*Replace.*
	Worn or breakage of the center bearing	*Replace.*

Repair Instructions

Front Drive Shaft Components

S4RS0A3106001



I4RS0A310002-

[A]: Right side drive shaft assembly	9. Center shaft side joint (Constant velocity tripod joint) : Apply dark gray grease included in spare part to joint.
[B]: Left side drive shaft assembly	10. Oil seal : Apply grease 99000-25010 to oil seal lip.
[C]: Type A (This type has 3 lines on this center shaft)	11. Center bearing support circlip
[D]: Type B (This type has 2 lines on this center shaft)	12. Center bearing support

1. Circlip	13. Center bearing
2. Differential side joint (Constant velocity tripod joint) : Apply dark gray grease included in spare part to joint.	14. Center shaft
3. Snap ring	15. Tripod joint spider
4. Boot band (Large)	16. Drive shaft nut
5. Boot (Differential or center shaft side)	17. Center bearing support bolt
6. Boot band (Small)	(a) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
7. Boot (Wheel side)	(b) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
8. Wheel side joint (Constant velocity ball joint) : Apply black grease included in spare part to joint.	: Do not reuse.

Front Drive Shaft Assembly On-Vehicle Inspection

S4RS0A3106002

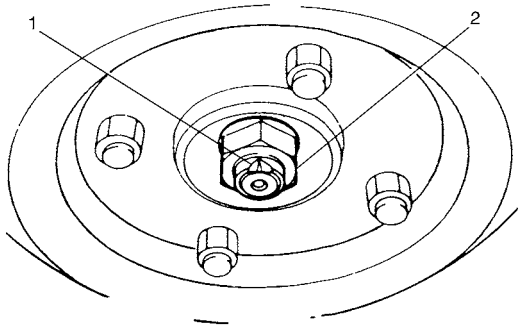
- Check boots for breakage or deterioration.
- Check wheel side joint for rattle or smooth rotation.
- Check differential side (or center shaft side) joint for smooth rotation.
  If any abnormality is found, replace.

Front Drive Shaft Assembly Removal and Installation

S4RS0A3106003

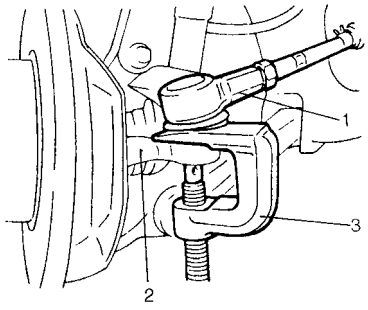
Removal

1) Undo caulking (1) and remove drive shaft nut (2).



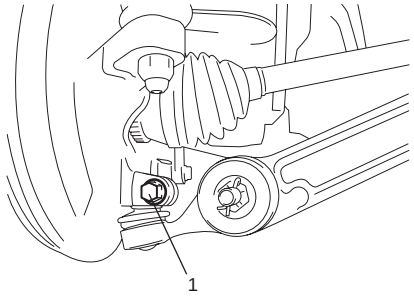
I4RS0A310003-

2) Remove wheel.
3) Drain transaxle oil referring to “Manual Transaxle Oil Change: in Section 5B” or “A/T Fluid Change: in Section 5A”.
4) Disconnect tie-rod end (1) from steering knuckle (2) using puller (3).



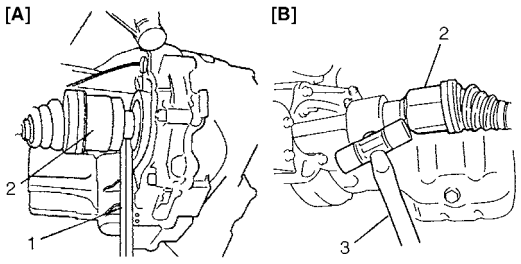
I3RM0A310003-

5) Remove stabilizer joint referring to “Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B”.
6) Remove brake hose mounting bolt.
7) Remove wheel speed sensor and suspension control arm ball joint bolt (1).



I4RS0A310004-

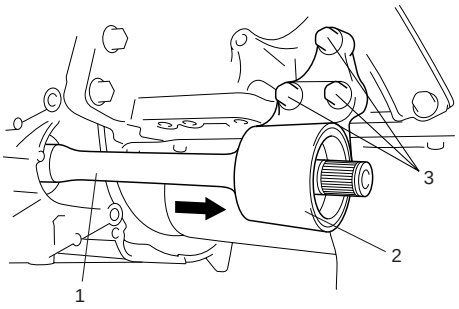
8) Disconnect front suspension control arm ball joint stud from steering knuckle.
9) Pull out drive shaft joint (2) as follows.
   - For left side shaft:
     Using tire lever (1), pull out drive shaft joint (2) so as to release snap ring fitting of joint spline at differential side.
   - For right side shaft:
     Using plastic hammer (3), drive out drive shaft joint (2) so as to release snap ring fitting of joint spline at center shaft.



I4RS0A310005-

[A]:	Left side
[B]:	Right side

10) Remove drive shaft assembly.
11) Remove center bearing support bolts (3) and remove center bearing support (2) with center shaft (1) from differential side gear.



I2RH01310007-

Installation

CAUTION:

- **Be careful not to damage oil seals and boots when installing drive shaft.**
- **Do not hit joint boot with hammer. Inserting joint only by hands is allowed.**
- **Make sure that differential side joint is inserted fully and its snap ring is seated as it was.**

Install drive shaft assembly by reversing removal procedure and noting the following points.

- Tighten each bolt and nut to the specified torque referring to “Front Drive Shaft Assembly Components Location: ”.
- Install stabilizer joint referring to “Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B”.
- Tighten brake hose mounting bolt to specified torque.

  Tightening torque
  Brake hose mounting bolt: 25 N·m (2.5 kg-m, 18.0 lb-ft)

- Fill transaxle with oil as specified referring to “Manual Transaxle Oil Change: in Section 5B” or “A/T Fluid Change: in Section 5A”.
- Check toe setting referring to “Front Wheel Alignment Inspection and Adjustment: in Section 2B” and adjust as required.

Front Drive Shaft Disassembly and Assembly

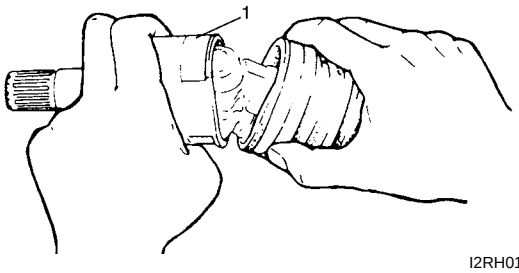
S4RS0A3106007

Disassembly

CAUTION:

- **Disassembly of wheel side joint is not allowed. If any noise or damage exists in it, replace it as assembly.**
- **Do not disassemble tripod joint spider. If any malcondition is found in it, replace it as differential side joint assembly.**

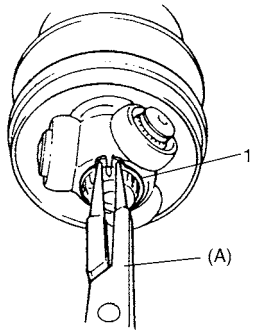
1) Remove differential side (or center shaft side) boot big band, and then take out joint housing (1).



I2RH01310008-

2) Wipe off grease from shaft and take off snap ring (1) using special tool.

Special tool
(A): 09900–06107

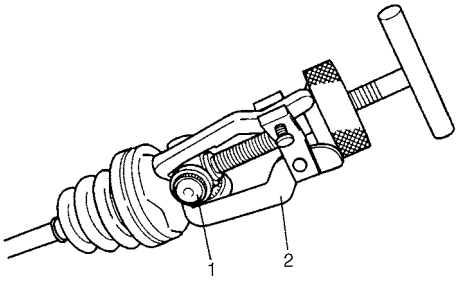


I3RH0A311009-

3) Remove tripod joint spider (1) using 3 arms puller (2).

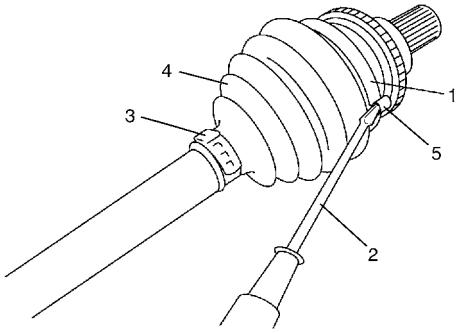
CAUTION:

To prevent any problem caused by washing solution, do not wash tripod joint except its housing. Degreasing of tripod joint with cloth is allowed.



I3RH0A311004-

4) Remove differential side (or center shaft side) boot small band, and then pull out differential side (or center shaft side) boot from shaft.
5) Undo caulking (5) of wheel side boot big band (1) and small band (3) using flat end rod (2) or the like, then pull out wheel side boot (4) from shaft.



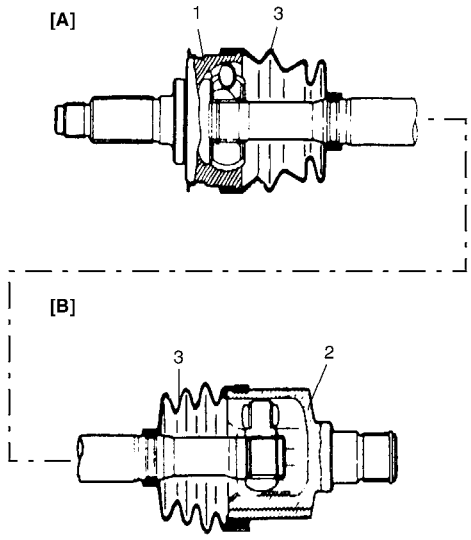
I4RS0A310006-

Assembly

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly.
Make sure that wheel side joint assembly (1) and tripod joint housing (2) are washed thoroughly and air dried.
Replace boot(s) (3) with new one(s).

CAUTION:

- **Do not wash boots in degreaser such as gasoline or kerosene. etc. Washing in degreaser causes deterioration of boot.**
- **To ensure full performance of joint as designed, be sure to distinguish between two types of grease in repair set and apply specified volume to respective joint referring to the followings for identification of the grease.**



I4RS0A310007-

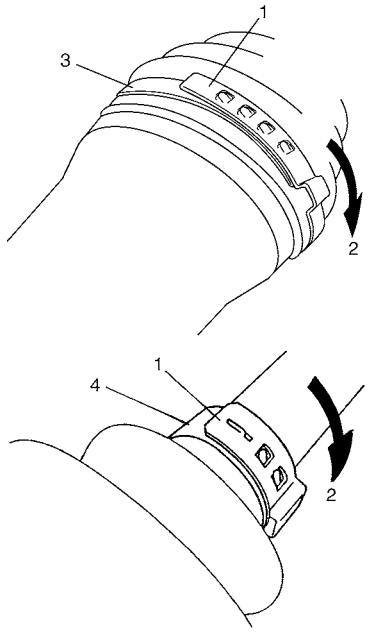
[A]:	Wheel side
[B]:	Differential side (or center shaft side)

1) Wash disassembled parts (except boots). After washing, dry parts completely by blowing air.
2) Clean boots with cloth.
3) Apply grease to wheel side joint. Use specified grease in tube in wheel side boot set.

Grease color
: Black

Amount
: 55 – 75 g (1.9 – 2.6 oz)

4) Install wheel side boot on shaft.
5) Fill up boot inside with specified grease.
6) Place new wheel side boot big band (3) and small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



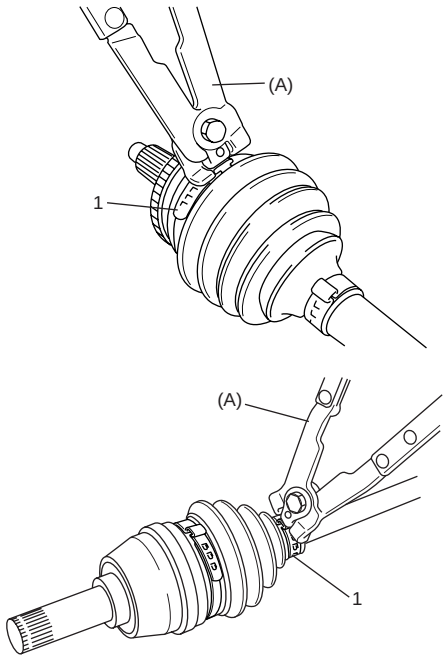
I4RS0A310009-

7) Fasten boot band (1) securely using special tool.

CAUTION:

Do not squeeze or distort boot when fastening it with bands.
Distorted boot caused by squeezing air may reduce its durability.

Special tool
(A): 09943–57010

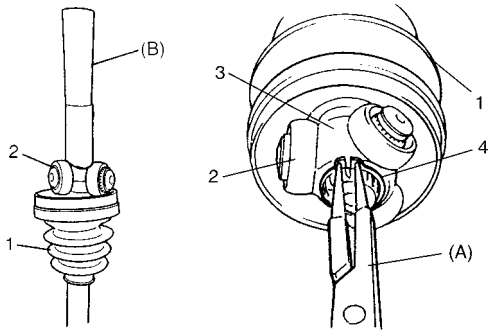


I4RS0A310010-

8) Set new differential side (or center shaft side) small band and new differential side (or center shaft side) boot (1) on shaft temporarily, and then apply grease to tripod joint (2). Use specified grease in tube included in spare parts.

9) Install tripod joint spider (3) on shaft using special tool with hammer, directing its chamfered spline toward wheel side, and then fasten it with new snap ring (4).

Special tool
(A): 09900–06107
(B): 09925–98220

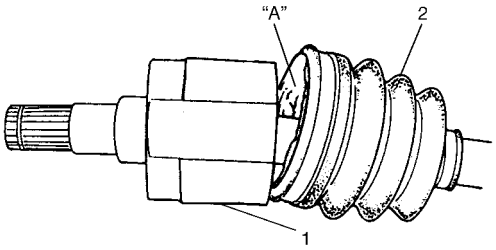


I3RH0A311006-

10) Apply grease in the supplied parts to inside of tripod joint housing (1), joint it with tripod joint and fit boot (2) to tripod joint housing.

Grease color
"A": Dark gray

Amount
"A": 70 – 90 g (2.5 – 3.2 oz)

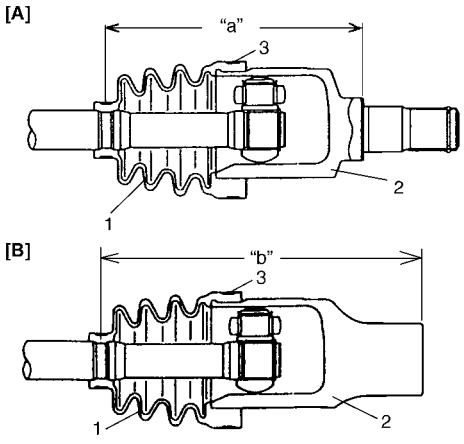


I4RS0A310011-

11) Insert screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

12) When fixing boot (1) to tripod joint housing (2) with differential side (or center shaft side) big band (3), adjust so that measured dimensions become as indicated in the following.

Drive shaft boot fixing position (distance between reference position and small boot band)
Left side drive shaft of M/T model "a": 142.0 mm (5.59 in.)
Left side drive shaft of A/T model "a": 141.7 mm (5.58 in.)
Right side drive shaft "b": 176.0 mm (6.93 in.)

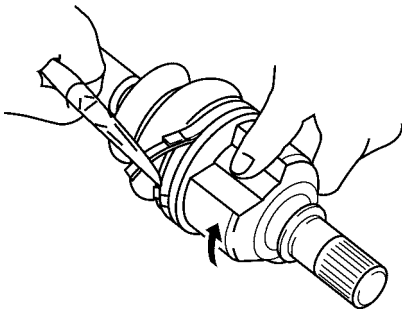


I4RS0A310012-

[A]:	Left side
[B]:	Right side

CAUTION:

- **Bend each boot band against forward rotation.**
- **Do not squeeze or distort boot when fastening it with bands. Distorted boot caused by squeezing air may reduce its durability.**



I2RH01310030-

Center Shaft and Center Bearing Support Disassembly and Assembly

S4RS0A3106006

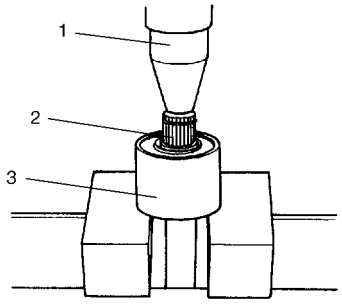
NOTE:

Be sure to identify center shaft as type A or type B referring to "Front Drive Shaft Components: ".

Type A

Disassembly

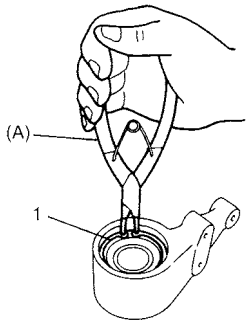
1) Using hydraulic press (1), draw out center shaft (2) from center bearing.
2) Remove oil seals from center bearing support (3).



I3RM0A310012-

3) Remove bearing support circlip (1) using special tool.

Special tool
(A): 09900–06108



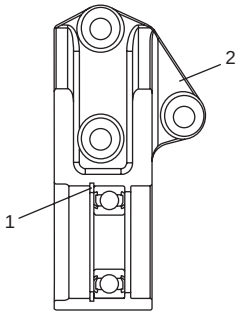
I3RH0A311005-

4) Remove center bearing from center bearing support.

Assembly

Install center shaft by reversing removal procedure and noting the following points.

- When installing bearing support circlip (1), make sure that if fits in circlip groove in center bearing support (2) securely as shown.



I4RS0A310013-

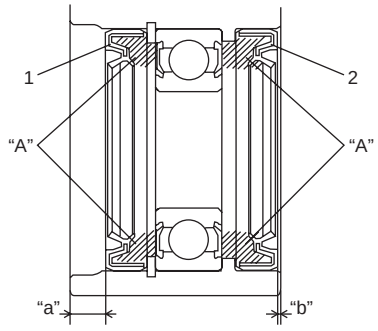
- When installing left oil seal (1) and right oil seal (2) using special tool, use care so that oil seals in proper direction and position as shown in the figure.

Special tool
: 09925–15410

Distance
"a": 7 – 8 mm (0.28 – 0.31 in.)
"b": 0 – 1 mm (0 – 0.04 in.)

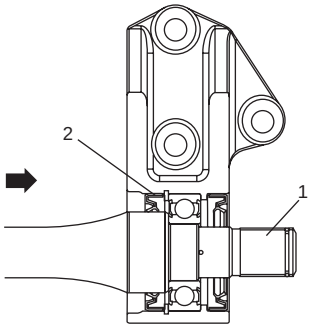
- Be sure to apply grease to oil seal lip and bearing side space indicated in the figure.

"A": Grease 99000–25010



I4RS0A310014-

- Press-fit center shaft (1) from left oil seal (2) side.

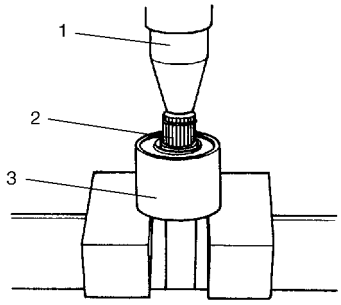


I4RS0A310015-

Type B

Disassembly

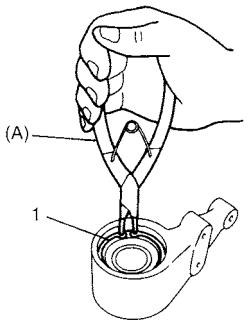
1) Remove wheel side oil seal and circlip from center bearing support (3).
2) By using hydraulic press (1), draw out center shaft (2) from center bearing.
3) Remove oil seal from center bearing support (3).



I3RM0A310012-

4) Remove bearing support circlip (1) using special tool.

Special tool
(A): 09900–06108

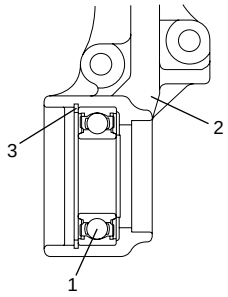


I3RH0A311005-

5) Remove center bearing from center bearing support.

Assembly

1) Install center bearing (1) to center bearing support (2), and then install circlip (3) into groove of bearing support as shown in figure.

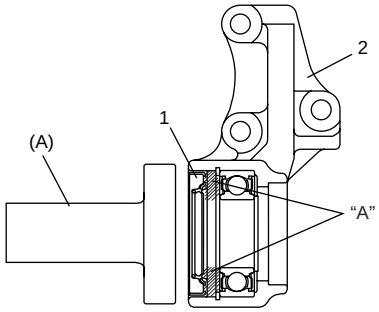


I4RS0A310016-

2) Install left oil seal (1) to center bearing support (2) until it become flush with bearing support using special tool, and then apply grease to oil seal lip.

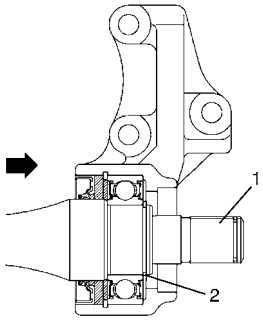
"A": Grease 99000–25010

Special tool
(A): 09913–75510



I4RS0A310017-

3) Press-fit center shaft (1) from left oil seal side, and then install circlip (2) into groove of center shaft as shown in figure.

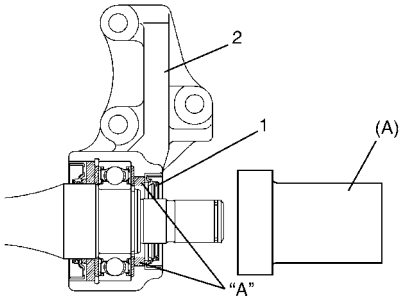


I4RS0A310018-

4) Install right oil seal (1) to center bearing support (2) until it become flush with bearing support using special tool, and then apply grease to oil seal lip.

“A”: Grease 99000–25010

Special tool
(A): 09913–85210



I4RS0A310019-

Front Drive Shaft Inspection

S4RS0A3106005

- Check shaft and joint for damage, wear or bend. Replace them as necessary.
- Check retaining ring and snap ring for breakage or deformation. Replace as necessary.
- Check boots for breakage or deterioration.

Specifications

Tightening Torque Specifications

S4RS0A3107001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Brake hose mounting bolt	25	2.5	18.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Drive Shaft Assembly Components Location: ”
“Front Drive Shaft Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A3108001

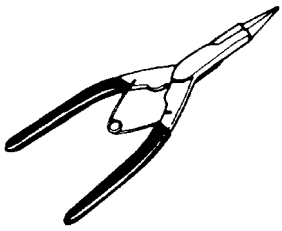
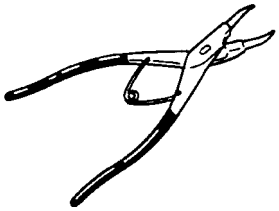
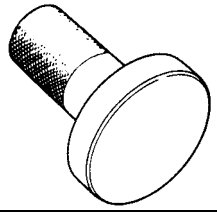
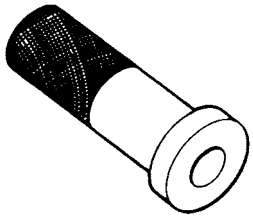
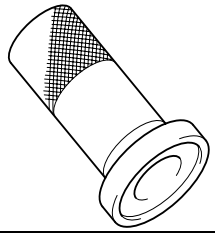
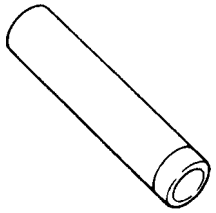
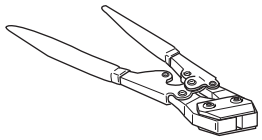
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞

NOTE:

Required service material is also described in the following.
“Front Drive Shaft Assembly Components Location: ”
“Front Drive Shaft Components: ”

Special Tool

S4RS0A3108002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ 	09900–06108 Snap ring pliers (closing type) ☞ / ☞ 
09913–75510 Bearing installer ☞ 	09913–85210 Bearing installer ☞ 
09925–15410 Oil seal installer ☞ 	09925–98220 Bearing installer ☞ 
09943–57010 Band compressor ☞ 	

Section 4

Brakes

CONTENTS

Precautions 4-1
Precautions 4-1
Precautions for Brakes 4-1

Brake Control System and Diagnosis ... 4A-1
Precautions 4A-1
Precautions on Brake 4A-1
General Description 4A-1
Brakes Construction 4A-1
Front Brake Hose / Pipe Construction 4A-2
Rear Brake Hose / Pipe Construction 4A-3
Diagnostic Information and Procedures 4A-3
Brakes Diagnosis Note 4A-3
Brakes Symptom Diagnosis 4A-4
Repair Instructions 4A-6
Brake Pedal Free Height Inspection 4A-6
Brake Pedal Play Inspection 4A-6
Excessive Pedal Travel Inspection 4A-6
Master Cylinder and Brake Fluid Level Inspection 4A-7
Stop Light Switch Adjustment 4A-7
Air Bleeding of Brake System 4A-7
Front Brake Hose / Pipe Removal and Installation 4A-8
Rear Brake Hose / Pipe Removal and Installation 4A-9
Brake Hose and Pipe Inspection 4A-9
Master Cylinder Components 4A-9
Master Cylinder Reservoir Removal and Installation 4A-10
Master Cylinder Assembly Removal and Installation 4A-11
Master Cylinder Assembly Disassembly and Assembly 4A-12
Master Cylinder Assembly Inspection 4A-13
Brake Booster Components 4A-13
Booster Operation Inspection 4A-14
Brake Booster Removal and Installation 4A-15
Brake Booster Inspection and Adjustment 4A-16
Specifications 4A-16
Tightening Torque Specifications 4A-16
Special Tools and Equipment 4A-16
Recommended Service Material 4A-16

Front Brakes 4B-1
Repair Instructions 4B-1
Front Disc Brake Components 4B-1
Front Disc Brake Pad On-Vehicle Inspection 4B-2
Front Disc Brake Pad Removal and Installation 4B-2
Front Disc Brake Pad Inspection 4B-3
Front Disc Brake Caliper Removal and Installation 4B-3
Front Disc Brake Caliper Disassembly and Assembly 4B-4
Front Disc Brake Caliper Inspection 4B-6
Front Brake Disc Removal and Installation 4B-6
Front Brake Disc Inspection 4B-7
Specifications 4B-8
Tightening Torque Specifications 4B-8
Special Tools and Equipment 4B-8
Recommended Service Material 4B-8
Special Tool 4B-8

Rear Brakes 4C-1
Repair Instructions 4C-1
Rear Drum Brake Components 4C-1
Rear Brake Drum Removal and Installation 4C-1
Rear Brake Drum and Shoe Inspection 4C-3
ABS Sensor Ring Removal and Installation (If Equipped) 4C-3
ABS Sensor Ring Inspection 4C-4
Rear Brake Shoe Removal and Installation 4C-4
Rear Brake Shoe Inspection 4C-5
Wheel Cylinder Removal and Installation 4C-5
Wheel Cylinder Inspection 4C-6
Brake Back Plate Removal and Installation 4C-6
Specifications 4C-8
Tightening Torque Specifications 4C-8
Special Tools and Equipment 4C-8
Recommended Service Material 4C-8
Special Tool 4C-8

Parking Brake 4D-1
General Description 4D-1
Parking Brake Cable Construction 4D-1
Repair Instructions 4D-2
Parking Brake Inspection and Adjustment 4D-2
Parking Brake Cable Removal and Installation 4D-3
Parking Brake Lever Removal and Installation 4D-3
Specifications 4D-4
Tightening Torque Specifications 4D-4

ABS 4E-1
Precautions 4E-1
Precautions in Diagnosing Troubles 4E-1
Precautions in On-Vehicle Service 4E-1
General Description 4E-2
ABS Description 4E-2
ABS Hydraulic Unit / Control Module Assembly Description 4E-2
Schematic and Routing Diagram 4E-3
ABS Schematic 4E-3
ABS Wiring Circuit Diagram 4E-4
Component Location 4E-5
ABS Components Location 4E-5
Front Wheel Speed Sensor Components Location 4E-6
Rear Wheel Speed Sensor Components Location 4E-6
Diagnostic Information and Procedures 4E-7
ABS Check 4E-7
ABS Warning Lamp Check 4E-9
EBD Warning Lamp (Brake Warning Lamp) Check 4E-9
DTC Check 4E-9
DTC Table 4E-10
DTC Clearance 4E-10
Scan Tool Data 4E-10
ABS Warning Lamp Does Not Come ON at Ignition Switch ON 4E-11
ABS Warning Lamp Comes ON Steady 4E-12
ABS Warning Lamp Flashes Continuously while Ignition Switch Is ON 4E-14
EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady 4E-15
Serial Data Link Circuit Check 4E-16
DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Sensor Ring 4E-18
DTC C1041 / C1045 / C1051 / C1055, DTC C1042 / C1046 / C1052 / C1056: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Circuit, Right-Front / Left-Front / Right-Rear / Left-Rear Outlet Solenoid Circuit 4E-20
DTC C1057: Power Source Circuit 4E-21
DTC C1061: ABS Pump Motor and/or Motor Driver Circuit 4E-22
DTC C1063: Solenoid Valve Power Supply Driver Circuit 4E-23
DTC C1071: ABS Control Module 4E-24
Repair Instructions 4E-25
ABS Hydraulic Unit Operation Check 4E-25
ABS Hydraulic Unit / Control Module Assembly Components 4E-25
ABS Hydraulic Unit / Control Module Assembly On-Vehicle Inspection 4E-26
ABS Hydraulic Unit / Control Module Assembly Removal and Installation 4E-26
Front Wheel Speed Sensor On-Vehicle Inspection 4E-28
Front Wheel Speed Sensor Removal and Installation 4E-28
Front Wheel Speed Sensor Inspection 4E-29
Rear Wheel Speed Sensor On-Vehicle Inspection 4E-29
Rear Wheel Speed Sensor Removal and Installation 4E-30
Rear Wheel Speed Sensor Inspection 4E-31
Front Wheel Speed Sensor Ring On-Vehicle Inspection 4E-31
Front Wheel Speed Sensor Ring Removal and Installation 4E-32
Rear Wheel Speed Sensor Ring On-Vehicle Inspection 4E-32
Rear Wheel Speed Sensor Ring Removal and Installation 4E-32
Specifications 4E-32
Tightening Torque Specifications 4E-32
Special Tools and Equipment 4E-33
Special Tool 4E-33

Precautions

Precautions

Precautions for Brakes

S4RS0A4000001

Suspension Caution
Refer to “Suspension Caution: in Section 00”.

Wheels and Tires Caution
Refer to “Wheels and Tires Caution: in Section 00”.

Brake Caution
Refer to “Brake Caution: in Section 00”.

General Precautions
Refer to “General Precautions: in Section 00”.

Vehicle Lifting Points
Refer to “Vehicle Lifting Points: in Section 0A”.

Fastener Caution
Refer to “Fastener Caution: in Section 00”.

Fastener Information
Refer to “Fasteners Information: in Section 0A”.

Brake Control System and Diagnosis

Precautions

Precautions on Brake

S4RS0A4100001

Air Bag Warning
Refer to “Air Bag System Service Warning: in Section 00”.

Brakes Diagnosis Note
Refer to “Brakes Diagnosis Note: ”.

General Description

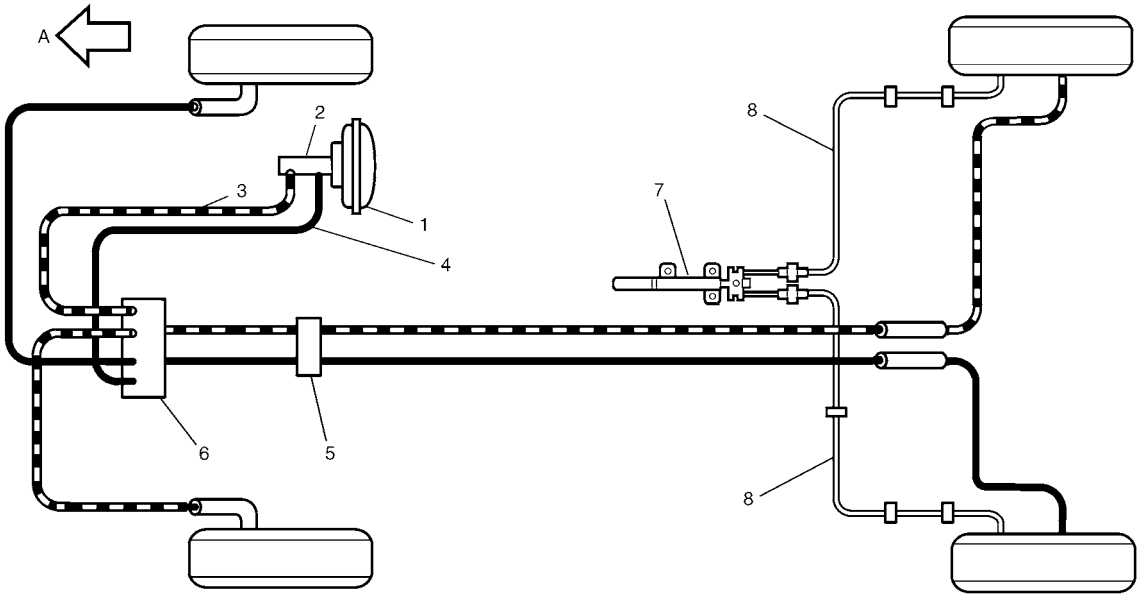
Brakes Construction

S4RS0A4101001

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and four in rear).
The master cylinder is a tandem master cylinder. Brake pipes are connected to the master cylinder and they make two independent circuits. One connects front right & rear left brakes and the other connects front left & rear right brakes.
In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading / trailing shoes) for the rear brake.
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

NOTE:

The figures shows RH steering vehicle.



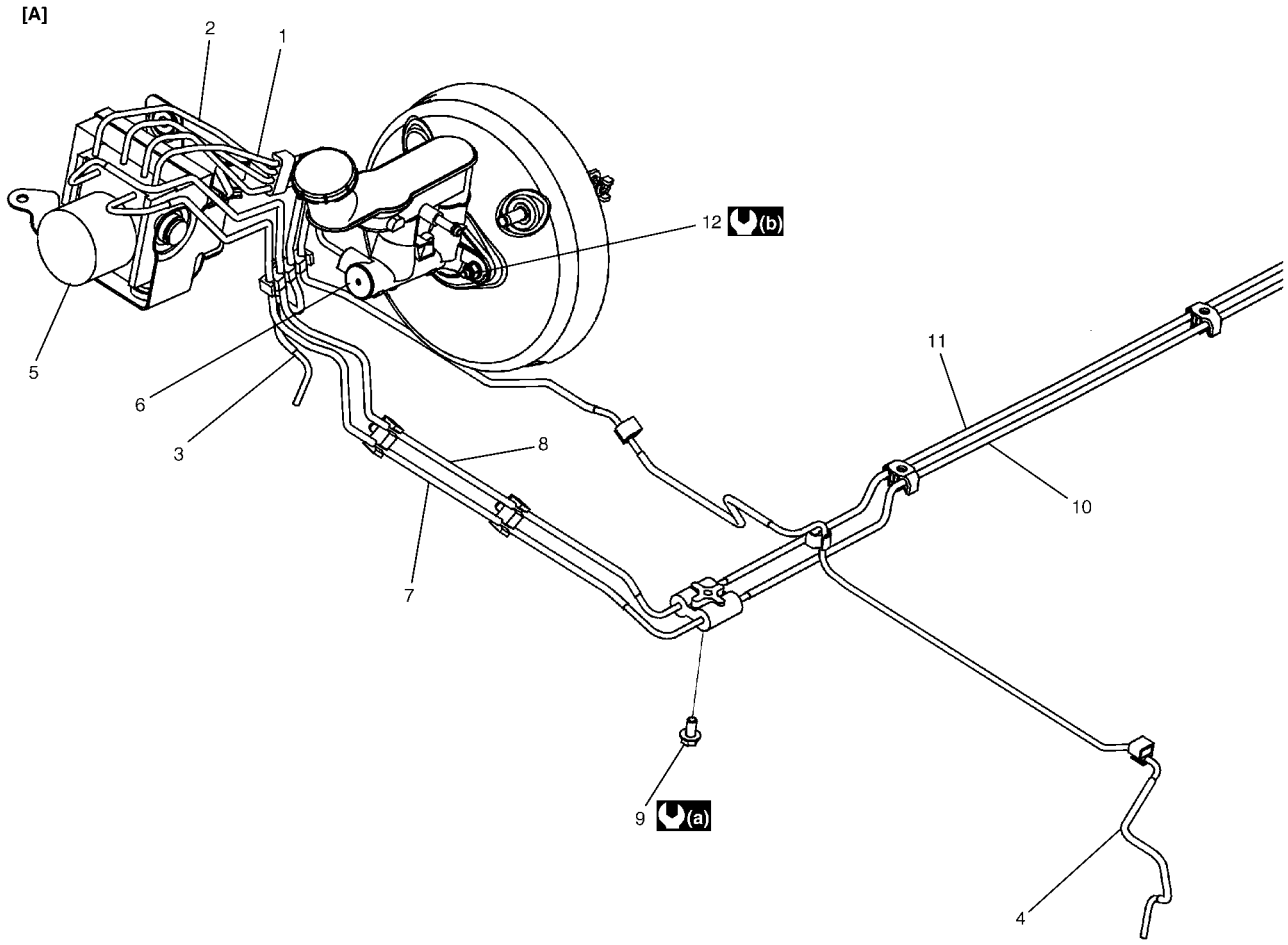
I4RS0A410001-

1. Brake booster	4. Primary side	7. Parking brake lever
2. Master cylinder	5. 4-way joint	8. Parking brake cable
3. Secondary side	6. ABS hydraulic unit / control module assembly	A: Forward

Front Brake Hose / Pipe Construction

S4RS0A4101002

For Vehicle with ABS

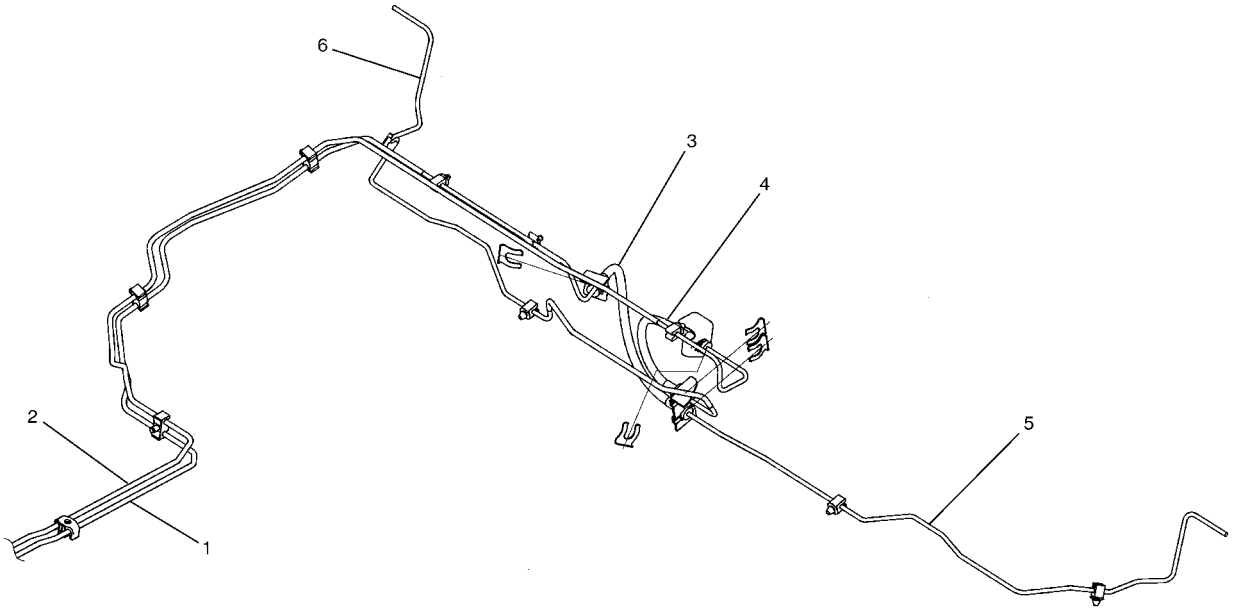


I4RS0A410002-

[A]: For RH steering vehicle	5. ABS hydraulic unit	10. 4-way joint to left rear brake hose
1. From master cylinder primary to ABS hydraulic unit	6. Master cylinder	11. 4-way joint to right rear brake hose
2. From master cylinder secondary to ABS hydraulic unit	7. From ABS hydraulic unit to 4-way joint	12. Master cylinder fixing nut
3. From ABS hydraulic unit to right front brake	8. From ABS hydraulic unit to 4-way joint	(a) : 11 N·m (1.1 kg-m, 8.0 lb-ft)
4. From ABS hydraulic unit to left front brake	9. 4-way joint bolt	(b) : 15 N·m (1.5 kg-m, 11.0 lb-ft)

Rear Brake Hose / Pipe Construction

S4RS0A4101003



I4RS0A410003-

1. 4-way joint to left rear brake hose	4: Right rear brake hose
2. 4-way joint to right rear brake hose	5: Left rear brake hose to left brake
3. Left rear brake hose	6: Right rear brake hose to right brake

Diagnostic Information and Procedures

Brakes Diagnosis Note

S4RS0A4104001

Road Testing Brakes

Brakes should be tested on dry, clean, smooth and reasonably level roadway which is not crowned. Road test brakes by making brake applications with both light and heavy pedal forces at various speeds to determine if the vehicle stops evenly and effectively. Also drive vehicle to see if it leads to one side or the other without brake application. If it does, check the tire pressure, front wheel alignment and front suspension attachments for looseness. See diagnosis table for other causes.

Brake Fluid Leaks

Check the master cylinder fluid levels. While a slight drop in reservoir level does result from normal lining wear, an abnormally low level indicates a leak in the system. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

Substandard or Contaminated Brake Fluid

Improper brake fluid, mineral oil or water in the fluid may cause the brake fluid to boil or the rubber components in the hydraulic system to deteriorate.

If primary piston cups are swollen, then rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston cups on the drum brake wheels.

If deterioration of rubber is evident, disassemble all hydraulic parts and wash with alcohol. Dry these parts with compressed air before assembly to keep alcohol out of the system. Replace all rubber parts in the system, including hoses. Also, when working on the brake mechanisms, check for fluid on the linings.

If excessive fluid is found, replace the pads.

If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If leakage is not found, drain fluid, flush with brake fluid, refill and bleed system.

The system must be flushed if there is any doubt as to the grade of fluid in the system or if fluid has been used which contained parts that have been subjected to contaminated fluid.

Brakes Symptom Diagnosis

S4RS0A4104002

Condition	Possible cause	Correction / Reference Item
Not enough braking force	Brake oil leakage from brake lines	*Locate leaking point and repair.*
	Brake disc or pads stained with oil	*Clean or replace.*
	Overheated brakes	*Determine cause and repair.*
	Poor contact of shoes on brake drum	*Repair for proper contact.*
	Brake shoes linings stained with oil or wet with water	*Replace.*
	Badly worn brake pad linings	*Replace.*
	Defective wheel cylinders	*Repair or replace.*
	Malfunctioning caliper assembly	*Repair or replace.*
	Air in system	*Bleed system.*
	Maladjusted sensor spring length of LSPV, if equipped	*Check or adjust.*
	Broken sensor spring of LSPV, if equipped	*Replace.*
	Defective LSPV, if equipped	*Replace.*
	Malfunctioning ABS (Antilock brake system), if equipped	*Check system and replace as necessary.*
Brake pull (Brakes not working in unison)	Pad linings and/or shoe linings are wet with water or stained with oil in some brakes	*Replace.*
	Drum-to-shoe clearance out of adjustment in some brakes (Malfunctioning auto adjusting mechanism)	*Check for inoperative auto adjusting mechanism.*
	Disc and/or drum is out of round in some brakes	*Replace.*
	Tires are inflated unequally	*Inflate equally.*
	Malfunction in wheel cylinders	*Repair or replace.*
	Disturbed front wheel alignment	*Adjust as prescribed.*
	Unmatched tires on same axle	*Tires with approximately the same amount of tread should be used on the same axle.*
	Restricted brake pipes or hoses	*Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.*
	Malfunctioning caliper assembly	*Caliper should slide. Check for stuck or sluggish pistons and proper lubrication of caliper slide pin.*
	Loose suspension parts	*Check all suspension mountings.*
	Loose calipers	*Check and torque bolts to specifications.*
Noise (high pitched squeak without brake applied)	Front lining worn out	*Replace linings.*
	Contact wear indicator to brake disc	*Replace pads.*
Rear brake locked prematurely	Maladjusted sensor spring length of LSPV, if equipped	*Check or adjust.*
	Malfunction LSPV assembly, if equipped	*Replace assembly.*
Excessive pedal travel (Pedal stroke too large)	Partial brake system failure	*Check brake systems and repair as necessary.*
	Insufficient fluid in master cylinder reservoirs	*Check warning light. Bleed system if required. Check for leaks and air in brake system. Fill reservoirs with approved brake fluid.*
	Air in system (soft / spongy pedal)	*Bleed system.*
	Rear brake system not adjusted (malfunctioning auto adjusting mechanism)	*Adjust rear brakes. Repair auto adjusting mechanism.*
	Bent brake shoes	*Replace brake shoes.*
	Worn rear brake shoes	*Replace brake shoes.*
Brake locked (For vehicle equipped with ABS)	Malfunctioning ABS	*Check system referring to “ABS Check: in Section 4E”.*

Condition	Possible cause	Correction / Reference Item
Dragging brakes (A very light drag is present in all brakes immediately after pedal is released)	Master cylinder pistons not returning correctly	*Replace master cylinder.*
	Restricted brake pipes or hoses	*Check for soft hoses or damaged pipes and replace with new hoses and/or new brake piping.*
	Incorrect parking brake adjustment on rear brakes	*Check and adjust to correct specifications.*
	Weakened or broken return springs in the brake	*Replace.*
	Sluggish parking brake cables or linkage	*Repair or replace.*
	Wheel cylinder or caliper piston sticking	*Repair as necessary.*
	Badly worn piston seal in caliper	*Replace piston seal.*
	Improper brake pedal free height	*Check brake pedal free height.*
Pedal pulsation (Pedal pulsates when depressed for braking)	Damaged or loose wheel bearings	*Replace wheel bearings.*
	Distorted steering knuckle or rear wheel spindle	*Replace knuckle or rear wheel spindle.*
	Excessive disc lateral runout	*Check per instructions. If not within specifications, replace or machine disc.*
	Parallelism between pad and disc not within specifications	*Check per instructions. If not within specifications, replace or machine disc.*
	Rear drums out of round	*Repair or replace drum as necessary. Check runout.*
Braking noise	Glazed shoe linings, or foreign matters stuck to linings	*Repair or replace shoe linings.*
	Worn or distorted shoe linings	*Replace shoe lining (or pad).*
	Loose front wheel bearings	*Replace wheel bearings.*
	Distorted backing plates or loose mounting bolts	*Replace or retighten securing bolts.*
	Contact wear indicator to brake disc	*Replace pads.*
Brake warning lamp lights after engine start	Parking brake applied	*Release parking brake and check that brake warning lamp turns off.*
	Insufficient amount of brake fluid	*Add brake fluid.*
	Brake fluid leaking from brake line	*Investigate leaky point, correct it and add brake fluid.*
	Brake warning lamp circuit faulty	*Repair circuit.*
	Malfunctioning EBD system, if equipped with ABS.	*Check system referring to "EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady: in Section 4E".*
Brake warning lamp turns on when brake is applied	Brake fluid leaking from brake line	*Investigate leaky point, correct it and add brake fluid.*
	Insufficient amount of brake fluid	*Add brake fluid.*
Brake warning lamp fails to turn on even when parking brake is applied	Brake warning lamp circuit faulty	*Replace bulb or repair circuit.*
ABS warning lamp turns on after engine start (If equipped)	Malfunctioning ABS	*Check system referring to "ABS Check: in Section 4E".*
ABS warning lamp turns on when brake is applied (If equipped)	Malfunctioning ABS	*Check system referring to "ABS Check: in Section 4E".*
ABS warning lamp does not turn on for 2 sec. after ignition switch has turned ON (If equipped)	Bulb burnt out	*Replace bulb.*
	Malfunctioning ABS	*Check system referring to "ABS Check: in Section 4E".*
ABS warning lamp flashes (If equipped)	New ABS hydraulic unit / control module assembly installed.	*Perform "ABS Hydraulic Unit Operation Check: in Section 4E".*

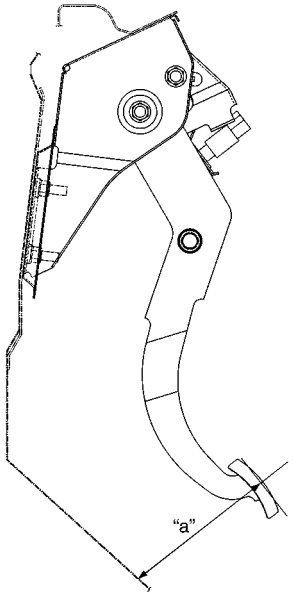
Repair Instructions

Brake Pedal Free Height Inspection

S4RS0A4106001

1) Check brake pedal free height. If it is not within specification, check and adjust following item 2) and 6).

Brake pedal free height “a” from floor panel
130 – 150 mm (5.1 – 5.9 in.)



I4RS0A410004-

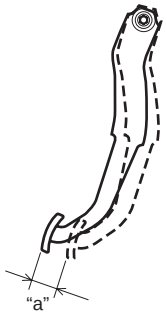
2) Check measurement between booster mounting surface and center of clevis pin hole. When booster push rod clevis has been reinstalled, it is important that the measurement is adjusted (refer to “Brake Booster Inspection and Adjustment: ”).
3) Check stop light switch position. Adjust it if it is out of specification.
4) Check pedal for dent.
5) Check brake booster for installation.
6) Check brake booster push rod for length.

Brake Pedal Play Inspection

S4RS0A4106002

Pedal play should be within the following specification. If out of specification, check stop light switch for proper installation position and adjust if necessary.
Also check pedal shaft bolt and booster clevis pin installation for looseness and replace if defective.

Brake pedal play
“a”: 1 – 8 mm (0.04 – 0.31 in.)



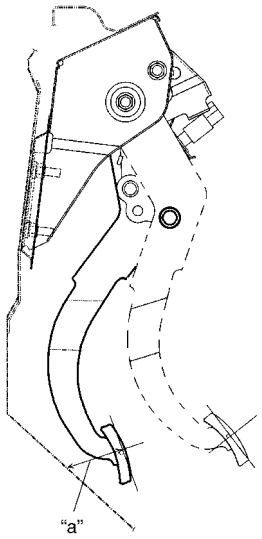
I3RH0A410010-

Excessive Pedal Travel Inspection

S4RS0A4106003

1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 300 N (30 kg, 66 lbs) load, measure brake pedal to wall (dash panel silencer) clearance “a”. If clearance “a” is less than specification, the most possible cause is either rear brake shoes are worn out beyond limit or air is in lines. Should clearance “a” remain less than specification even after replacement of brake shoes and bleeding of system, other possible but infrequent cause is malfunction of rear brake shoe adjusters or booster push rod length out of adjustment.
   - Bleed brake system. Refer to “Air Bleeding of Brake System: ”.
   - Remove brake drums for adjuster inspection. (Refer to “Rear Brake Drum Removal and Installation: in Section 4C”.) If defective, correct or replace.

Clearance “a” between brake pedal and floor panel
over 85 mm (3.34 in.)

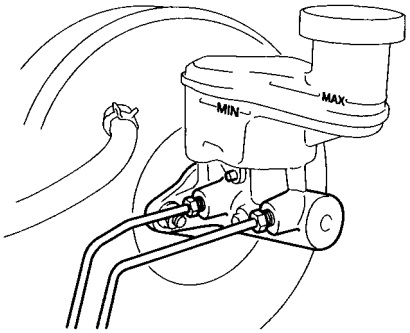


I4RS0A410005-

Master Cylinder and Brake Fluid Level Inspection

S4RS0A4106004

1) Check master cylinder, reservoir and reservoir hose (if equipped) for crack, damage and brake fluid leakage. If any faulty condition exists, correct or replace.
2) Check that brake fluid level is between MAX and MIN marks on reservoir.



I4RS0A410006-

NOTE:

Be sure to use particular brake fluid either as indicated on reservoir cap of that vehicle or recommended in owner's manual which comes along with that vehicle. Use of any other fluid is strictly prohibited.
Fluid level should be between MIN and MAX lines marked on reservoir.
When brake warning lamp lights sometimes during driving, replenish fluid to MAX level. When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

CAUTION:

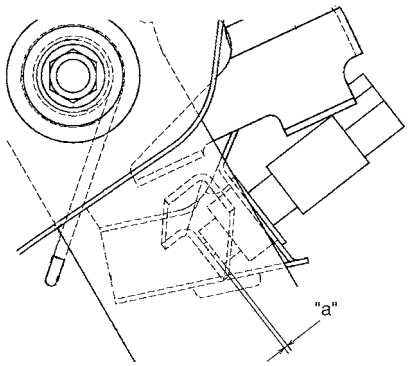
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

Stop Light Switch Adjustment

S4RS0A4106005

Adjustment should be made as follows. Pull up brake pedal toward you and while holding it there, adjust switch position so that clearance between end of thread and brake pedal is as specified. Then lock it by turning clockwise.

Clearance between brake pedal and stop light switch "a": 1.2 – 2.2 mm (0.05 – 0.08 in.)



I4RS0A410007-

Air Bleeding of Brake System

S4RS0A4106006

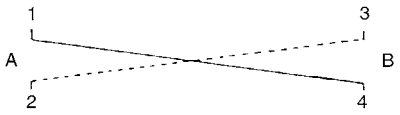
CAUTION:

Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
Hydraulic lines of brake system are based on the diagonal split system. When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder of other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be bled at all 4 wheel brakes.

NOTE:

Perform bleeding operation starting with wheel cylinder farthest from master cylinder and then at front caliper of the same brake line. Do the same on the other brake line.

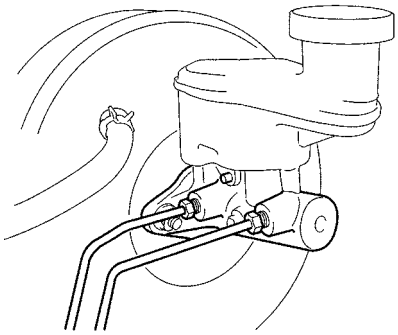


I2RH01410013-

1. Right brake caliper	4. Left wheel cylinder
2. Left brake caliper	A: FRONT
3. Right wheel cylinder	B: REAR

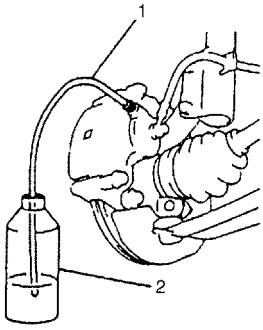
1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.

: Brake fluid (DOT 3)



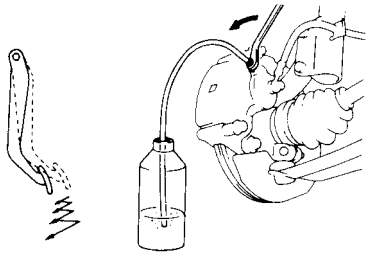
I4RS0A410008-

2) Remove bleeder plug cap. Attach a vinyl tube (1) to bleeder plug, and insert the other end into container (2).



I2RH01410015-

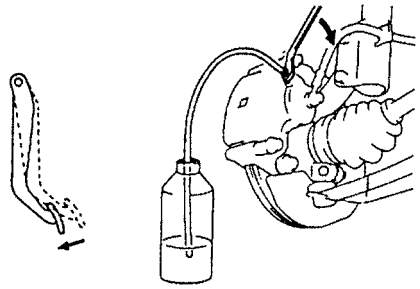
3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.
4) When fluid pressure in cylinder is almost depleted, retighten bleeder plug.
5) Repeat this operation until there are no more air bubbles in hydraulic line.



I2RH01410016-

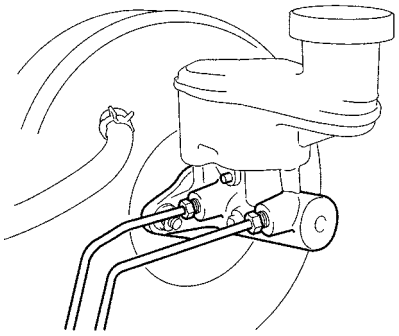
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

Tightening torque
Front brake caliper bleeder plug: 8.0 N·m (0.8 kg-m, 6.0 lb-ft)
Rear wheel cylinder bleeder plug: 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



I2RH01410017-

7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.



I4RS0A410008-

10) Check brake pedal for sponginess. If found spongy, repeat entire procedure of bleeding.

Front Brake Hose / Pipe Removal and Installation

S4RS0A4106007

Removal

1) Raise and support vehicle properly. Remove tire and wheel.

NOTE:

This operation is not necessary when removing pipes connecting master cylinder.

2) Clean dirt and foreign material from both flexible hose end and pipe end fittings.
3) Remove brake flexible hose or pipe.

Installation

Reverse brake flexible hose installation procedure, noting the following.

- Make sure that steering wheel is in straight-forward position and flexible hose has not twist or kink.
- Check to make sure that flexible hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir.
- Bleed brake system. Refer to "Air Bleeding of Brake System: ".

- Perform brake test and check installed part for fluid leakage.

Rear Brake Hose / Pipe Removal and Installation

S4RS0A4106008

Removal

1) Raise and support vehicle properly. Remove tire and wheel.
2) Clean dirt and foreign material from both flexible hose end and pipe end fittings.
3) Remove brake flexible hose or pipe.

Installation

Reverse brake flexible hose installation procedure, noting the following.

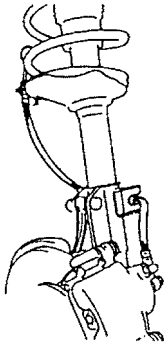
- Fill and maintain brake fluid level in reservoir.
- Bleed brake system. Refer to “Air Bleeding of Brake System: ”.
- Perform brake test and check each installed part for fluid leakage.
- Never reuse protector nut once removed. Be sure to use a new one.
- Install clamps properly referring to the figure and tighten bolts.
- When installing hose, make sure that it has no twist or kink.

Brake Hose and Pipe Inspection

S4RS0A4106009

Hose

The brake hose assembly should be checked for road hazard damage, for cracks and chafing of outer cover, for leaks and blisters. A light and mirror may be needed for an adequate inspection. If any conditions are observed on brake hose, it is necessary to replace it.



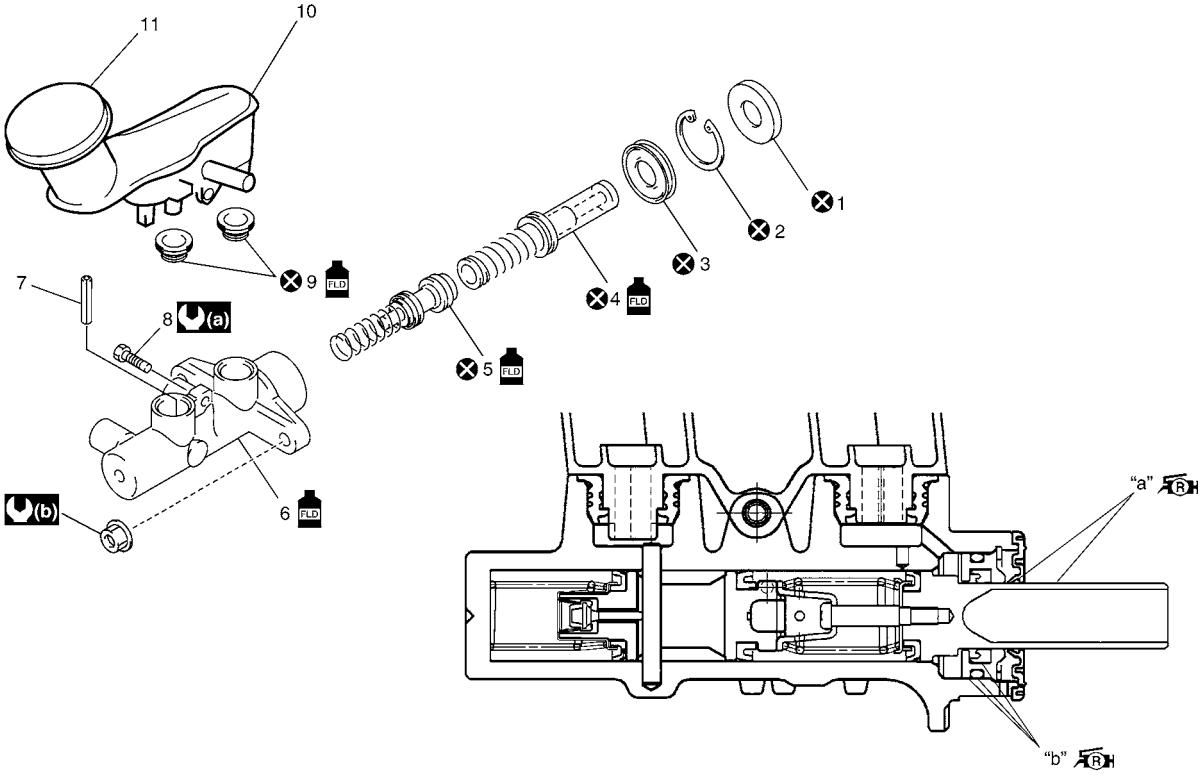
I2RH01410012-

Pipe

Inspect the pipe for damage, cracks, dents and corrosion. If any defect is found, replace it.

Master Cylinder Components

S4RS0A4106010



I4RS0A410025-

1. Master cylinder seal	7. Secondary piston stopper pin	(b) : 15 N·m (1.5 kg-m, 11.0 lb-ft)
2. Circlip	8. Reservoir bolt	"a" : Apply small amount of silicon grease (included in spare parts) to mating surfaces of rod seal and primary piston.
3. Piston guide	9. Grommet : Apply brake fluid.	"b" : Apply small amount of rubber grease (included in spare parts) to mating surfaces of O-ring and piston guide / Secondary cup and piston guide.
4. Primary piston assembly : Apply brake fluid to piston cup.	10. Reservoir	: Do not reuse.
5. Secondary piston assembly : Apply brake fluid to piston cup.	11. Reservoir cap	
6. Master cylinder body : Apply brake fluid to inside of cylinder.	(a) : 2.5 N·m (0.25 kg-m, 2.0 lb-ft)	

Master Cylinder Reservoir Removal and Installation

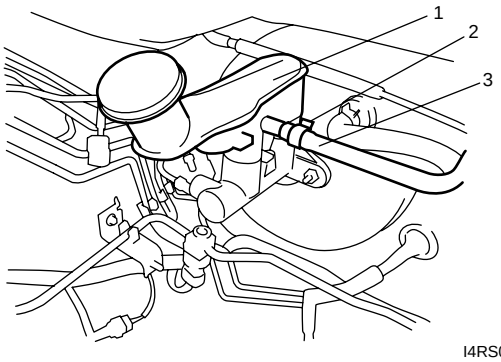
S4RS0A4106011

Removal

CAUTION:

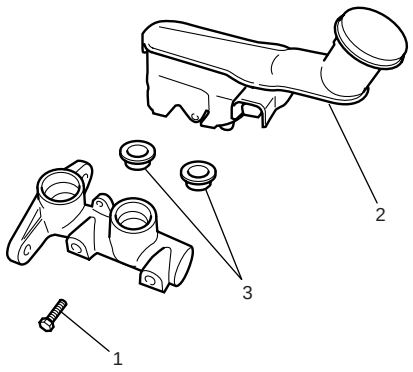
Brake fluid is extremely damaging to paint. Do not allow brake fluid to get on painted surfaces.

1) Disconnect fluid level switch coupler on reservoir.
2) Clean outside of reservoir.
3) Take out fluid with syringe or such.
4) Disconnect clutch reservoir hose clamp (2) and hose (3) from reservoir (1) for MT vehicle.



I4RS0A410010-

5) Remove reservoir bolt (1).
6) Remove reservoir (2) and grommets (3).

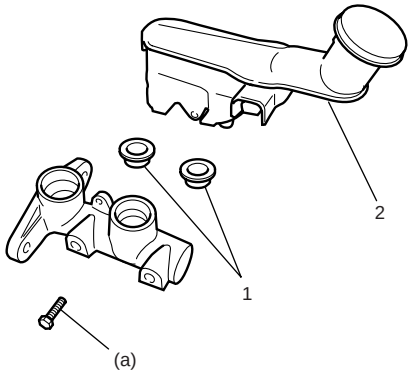


I4RS0A410011-

Installation

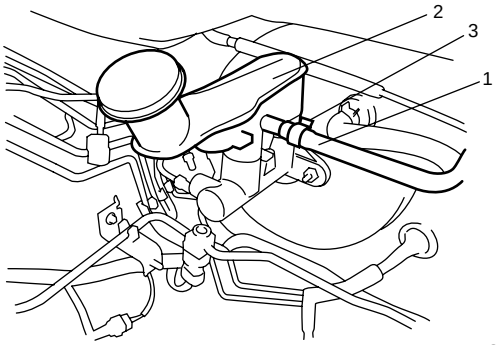
1) When using new grommets, lubricate them with the same fluid as the one to fill reservoir with. Then press-fit grommets (1) to reservoir (2). Grommets must be seated in place.
2) Install reservoir (2) to master cylinder with bolt (a).

Tightening torque
Reservoir bolt (a): 2.5 N·m (0.25 kg-m, 2.0 lb-ft)



I4RS0A410012-

3) Connect fluid level switch coupler on reservoir.
4) Connect clutch reservoir hose (1) to reservoir (2) for MT vehicle.
5) Install clutch reservoir hose clamp (3) for MT model.



I4RS0A410023-

6) Fill reservoir with special fluid.
7) Upon completion of installation, check for fluid leakage.

Master Cylinder Assembly Removal and Installation

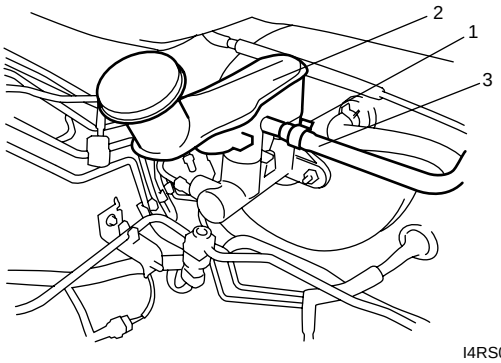
S4RS0A4106012

Removal

CAUTION:

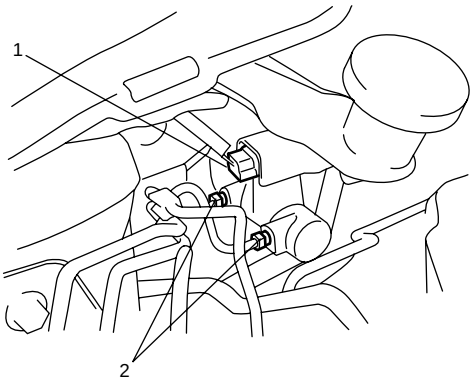
Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.

1) Clean outside of master cylinder.
2) Drain brake fluid in reservoir.
3) Remove clutch reservoir hose clamp (1) and disconnect clutch reservoir hose (3) from reservoir (2) for MT vehicle.



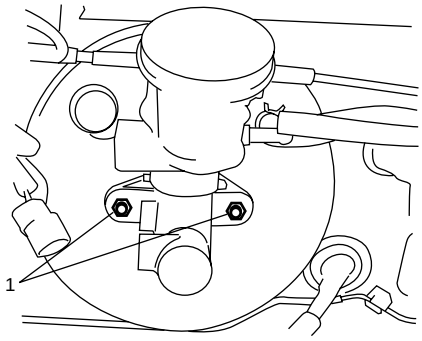
I4RS0A410026-

4) Disconnect fluid level switch coupler (1) on reservoir.
5) Disconnect brake pipes (2) connected to master cylinder.



I4RS0A410013-

6) Remove master cylinder fixing nuts (1).



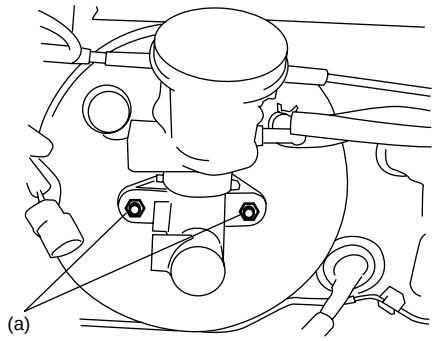
I4RS0A410014-

7) Remove master cylinder and master cylinder seal.

Installation

1) Install new master cylinder seal.
2) Install master cylinder to booster and tighten master cylinder fixing nuts (a) to specified torque.

Tightening torque
Master cylinder fixing nut (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

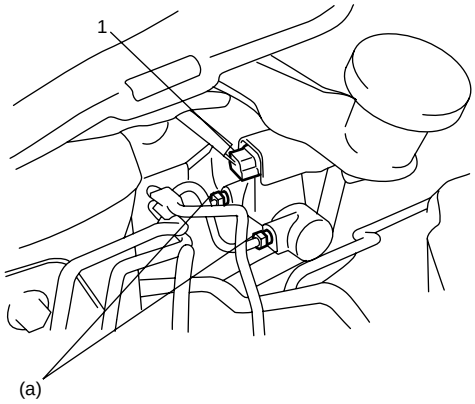


I4RS0A410015-

3) Connect brake pipe to master cylinder and tighten flare nuts (a) to specified torque.

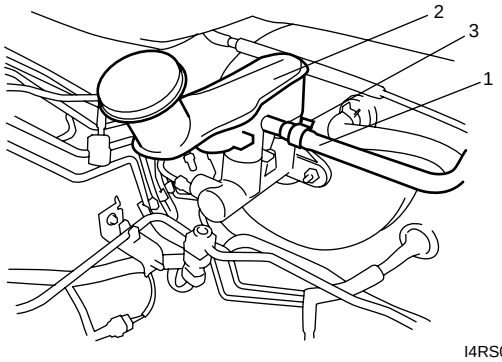
Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)

4) Connect fluid level switch connector (1) of reservoir.



I4RS0A410016-

5) Connect clutch reservoir hose (1) to reservoir (2) and install reservoir hose clamp (3) for MT vehicle.



I4RS0A410023-

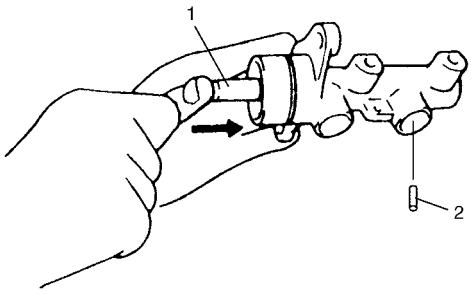
6) Fill reservoir with specified brake fluid up to its MAX mark.
7) After completing the work, bleed air referring to “Air Bleeding of Brake System: ”.
8) Check each installed parts for fluid leakage.
9) Check brake pedal for play referring to “Brake Pedal Play Inspection: ”.
10) Perform brake test and check fluid leakage.

Master Cylinder Assembly Disassembly and Assembly

S4RS0A4106013

Disassembly

1) Push in primary piston (1) to remove secondary piston stopper pin (2) from master cylinder as shown.

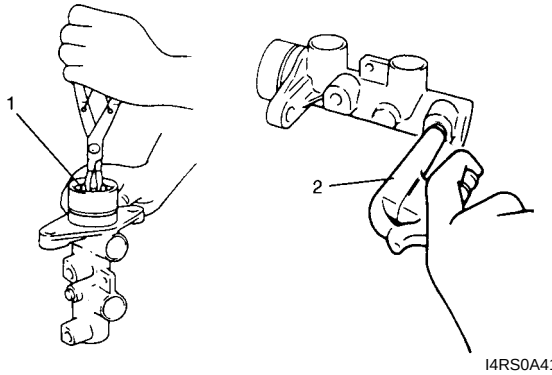


I2RH01410025-

2) Remove circlip (1).
3) Remove piston guide and primary piston. Then remove secondary piston by blowing compressed air (2) into hole. Be cautious during removal as secondary piston jumps out.

WARNING:

Do not apply too highly compressed air which will cause piston to jump out of cylinder. Place a cloth to prevent piston from damage. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.



I4RS0A410017-

Assembly

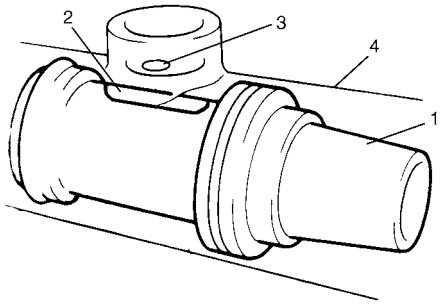
CAUTION:

- **Never use any mineral oil such as kerosene oil and gasoline when washing and assembling parts.**
- **Check inside of cylinder wall, pistons and cup seals are free from any foreign objects such as dust and dirt and use case not to cause any damage with a tool during assembly.**
- **Do not drop parts. Do not use any part which has been dropped.**

1) Apply brake fluid to inside of cylinder and contact surface of piston assembly (new piston cups, new O-ring and piston guide).
2) Install secondary return spring and secondary piston (1) into cylinder body (4).

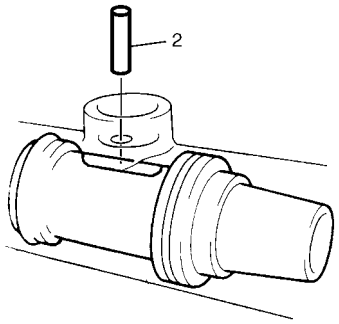
NOTE:

Align oblong hole in secondary piston (2) with stopper pin hole (3) in master cylinder body (4) when installing it.



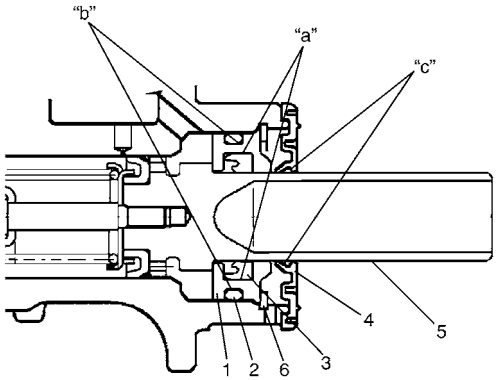
I2RH01410027-

3) Install primary piston assembly into cylinder body.
4) Install piston stopper pin (2) with pistons pushed in all the way and install it.



I4RS0A410018-

5) Apply small amount of rubber grease (included in spare parts) to mating surface of “a” (piston cup (3) and piston guide (1)) and “b” (piston guide (1) and O-ring (2)).
6) Apply small amount of silicon grease (included in spare parts) to mating surfaces of “c” (rod seal (4) and primary piston (5)).
7) Install piston guide (1) and circlip (6).



I4RS0A410024-

Master Cylinder Assembly Inspection

S4RS0A4106014

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:

- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston cups and cylinder cup.**

Inspect master cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:

Polishing bore of master cylinder with cast aluminium body with anything abrasive is prohibited, as damage to cylinder bore may occur.

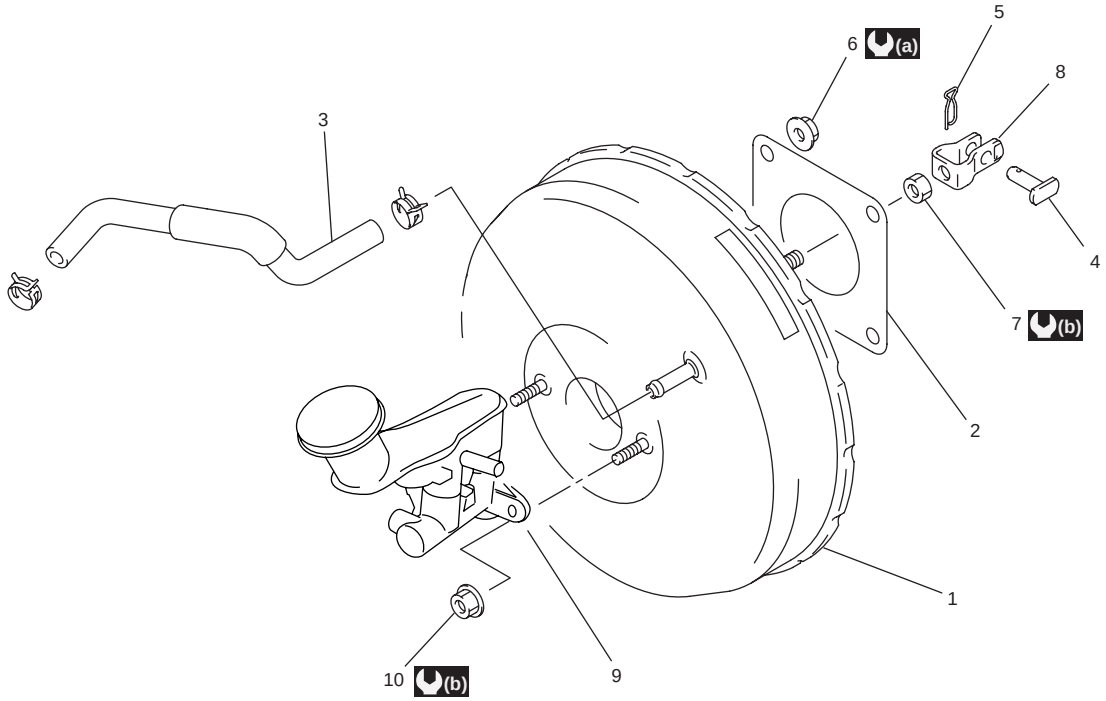
Rinse cylinder in clean brake fluid. Shake excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept from cylinder bore surfaces.

Brake Booster Components

S4RS0A4106015

CAUTION:

Never disassemble brake booster. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



I4RS0A410019-

1. Booster assembly	4. Clevis pin	7. Clevis pin lock nut	10. Master cylinder fixing nut
2. Gasket	5. Clip	8. Push rod clevis	(a) : Tighten 13 N·m (1.3 kg-m, 9.5 lb-ft) by the specified procedure.
3. Brake vacuum hose	6. Booster nut	9. Brake master cylinder	(b) : 15 N·m (1.5 kg-m, 11.0 lb-ft)

Booster Operation Inspection

S4RS0A4106016

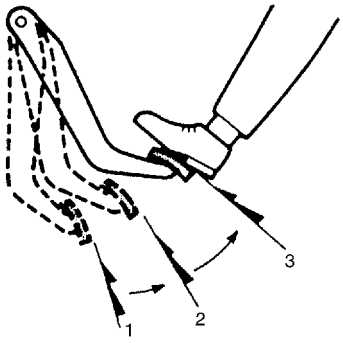
There are two ways to perform this inspection, with and without a tester. Ordinarily, it is possible to roughly determine its condition without using a tester.

NOTE:

For this check, make sure that no air is in hydraulic line.

Check Air Tightness

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.
3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.



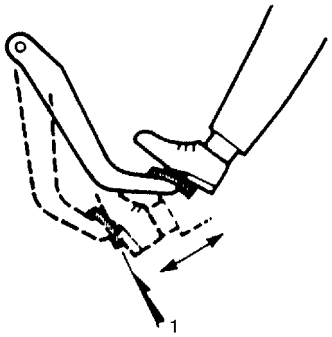
I2RH01410005-

1. 1st	2. 2nd	3. 3rd

4) If pedal travel doesn't change, air tightness isn't obtained.

NOTE:

If defective, inspect vacuum lines and sealing parts, and replace any faulty part. When this has been done, repeat the entire test.

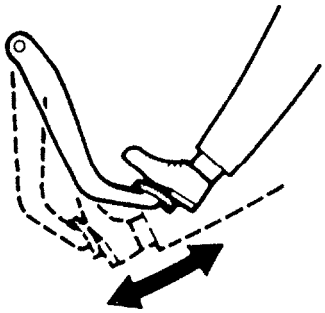


I2RH01410006-

1. 1st, 2nd, 3rd

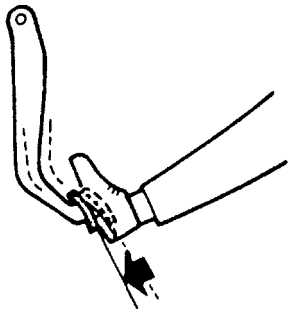
Check Operation

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.



I2RH01410007-

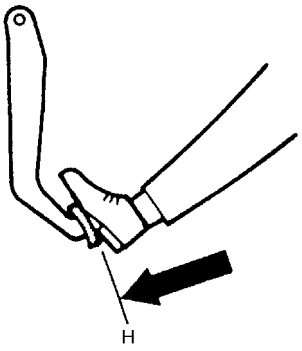
2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.



I2RH01410008-

Check Air Tightness Under Load

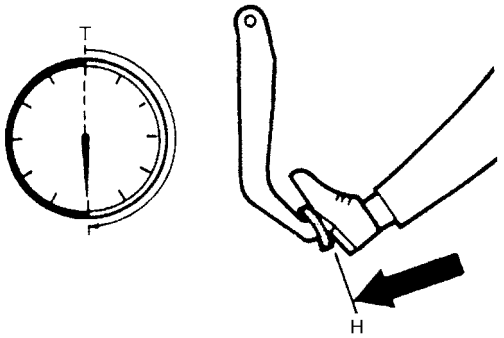
1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.



I2RH01410009-

H: Hold

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.



I2RH01410010-

H:	Hold
T:	30 seconds

Brake Booster Removal and Installation

S4RS0A4106017

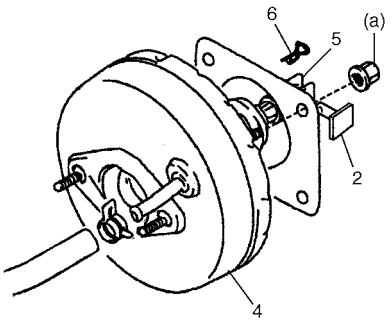
Removal

1) Recover refrigerant from A/C system by using recovery and recycling equipment referring to “Operation Procedure for Refrigerant Charge: in Section 7B”.
2) Remove master cylinder assembly from booster referring to “Master Cylinder Assembly Removal and Installation: ”.
3) Remove cowl top cover and cowl top panel referring to “Cowl Top Components: in Section 9K”.
4) Remove suction hose referring to “Major Components of A/C System: in Section 7B”.
5) Disconnect vacuum hose from booster referring to “Brake Booster Components: ”.
6) Remove push rod clevis pin and booster mounting nuts and then remove booster.

Installation

1) Loosen brake pedal bracket mounting bolt.
2) Check and adjust distance between booster installation surface (without including packing) and the center of clevis pin hole referring to “Brake Booster Inspection and Adjustment: ”.
3) Install booster (4) to dash panel. Then connect push rod clevis (5) to pedal arm with clevis pin (2) and clip (6).
4) Tighten booster mounting nuts (a) to specified torque.

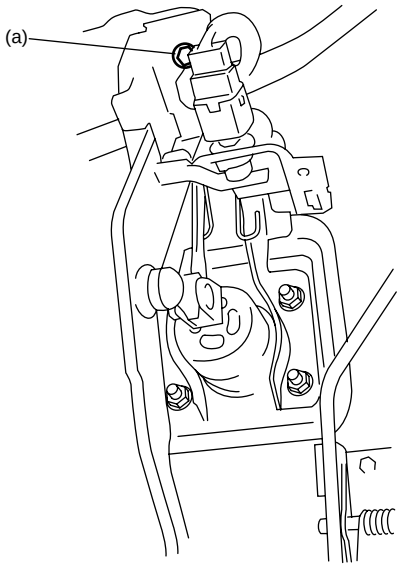
   Tightening torque
   Booster mounting nut (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I4RS0A410020-

5) Tighten brake pedal bracket mounting bolt.

   Tightening torque
   Brake pedal bracket mounting bolt (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I4RS0A410021-

6) Install suction hose referring to “Major Components of A/C System: in Section 7B”.
7) Install cowl top panel and cowl top cover referring to “Cowl Top Components: in Section 9K”.
8) Install master cylinder assembly to booster referring to “Master Cylinder Assembly Removal and Installation: ”.
9) Fill reservoir with specified fluid.
10) Bleed air from brake system.
11) Check pedal height and play referring to “Brake Pedal Free Height Inspection: ” and “Brake Pedal Play Inspection: ”.
12) Check each installed part for fluid leakage and perform brake test.
13) Evacuate and charge refrigerant by referring to “Evacuating of A/C System” and “Procedure of Charging” under “Operation Procedure for Refrigerant Charge: in Section 7B”.

Brake Booster Inspection and Adjustment

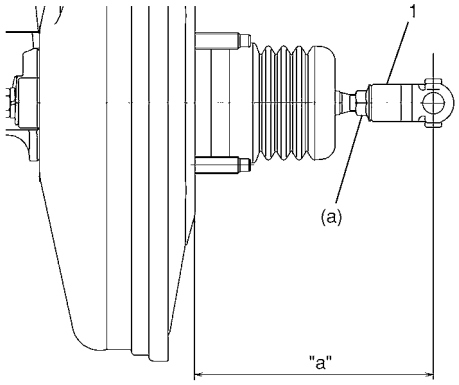
S4RS0A4106018

Installation Position of Push Rod

If push rod clevis (1) has been removed, adjust distance between booster installation surface (without including packing) and the center of clevis pin hole to standard value “a” and tighten nut (a) to specified torque.

Distance “a” between center of booster clevis pin hole and booster surface
Standard:
114.5 – 115.5 mm (4.51 – 4.54 in.)

Tightening torque
Clevis lock nut (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)



I4RS0A410022-

Specifications

Tightening Torque Specifications

S4RS0A4107001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Front brake caliper bleeder plug	8.0	0.8	6.0	☞
Rear wheel cylinder bleeder plug	7.5	0.75	5.5	☞
Reservoir bolt	2.5	0.25	2.0	☞
Master cylinder fixing nut	15	1.5	11.0	☞
Brake pipe flare nut	16	1.6	11.5	☞
Booster mounting nut	13	1.3	9.5	☞
Brake pedal bracket mounting bolt	13	1.3	9.5	☞
Clevis lock nut	15	1.5	11.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Brake Hose / Pipe Construction: ”
“Master Cylinder Components: ”
“Brake Booster Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A4108001

Material	SUZUKI recommended product or Specification		Note
Brake fluid	DOT 3	—	(DOT 3) ☞

NOTE:

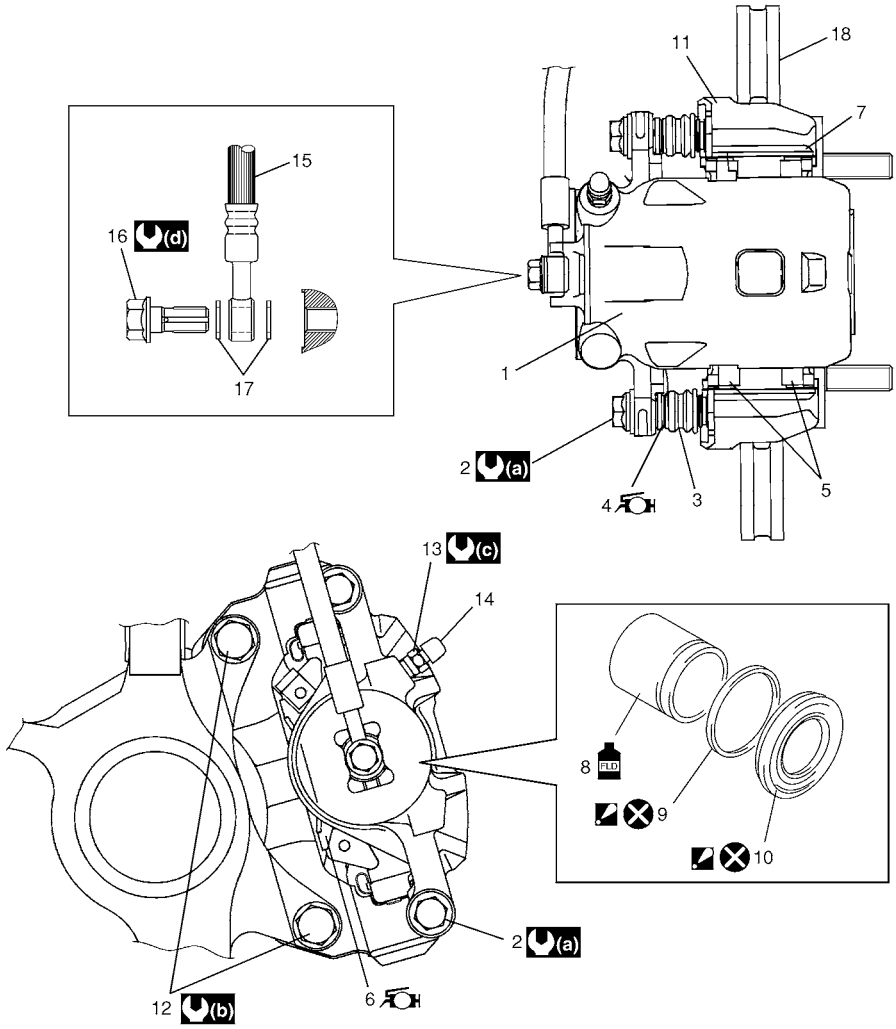
Required service material is also described in the following.
“Master Cylinder Components: ”

Front Brakes

Repair Instructions

Front Disc Brake Components

S4RS0A4206001



I4RS0A420001-

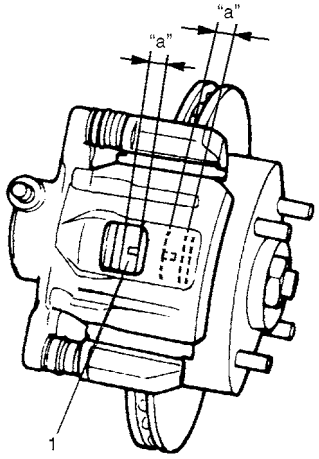
1. Caliper	9. Piston seal : Apply small amount of rubber grease (included in repair kit) to all around part of piston seal.	17. Hose washer
2. Caliper pin bolt	10. Cylinder boot : Apply small amount of rubber grease (included in repair kit).	18. Brake disk
3. Boot	11. Brake caliper carrier	(a) : 26 N·m (2.6 kg-m, 19.0 lb-ft)
4. Slide pin : Apply rubber grease (included in repair kit).	12. Caliper carrier bolt	(b) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
5. Brake pad	13. Front caliper bleeder plug	(c) : 8.0 N·m (0.8 kg-m, 6.0 lb-ft)
6. Pad shim : Apply small amount of pad grease (included in pad repair kit) to mating surfaces of brake pad and pad shim.	14. Bleeder plug cap	(d) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
7. Pad spring	15. Brake flexible hose	: Do not reuse.
8. Disk brake piston : Apply brake fluid to contact surface of cylinder.	16. Flexible hose joint bolt	

Front Disc Brake Pad On-Vehicle Inspection

S4RS0A4206002

Inspect pad linings (1) periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through each end (or hole) of caliper and check lining thickness of outside and inside pads.
If lining is worn and its thickness (“a” in figure) is less than limit, all pads must be replaced at the same time.

Front brake pad thickness “a” (lining thickness)
Standard: 10 mm (0.40 in.)
Limit: 2 mm (0.08 in.)



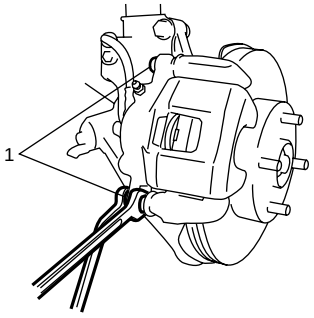
I2RH01420001-

Front Disc Brake Pad Removal and Installation

S4RS0A4206003

Removal

1) Loosen wheel nuts and with vehicle lifted up, remove wheels.
2) Remove caliper pin bolts (1).



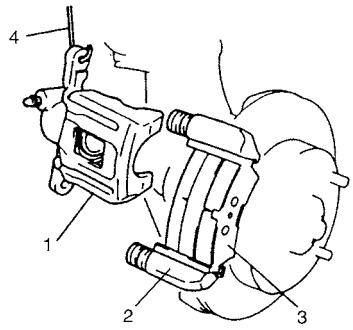
I2RH01420003-

3) Remove caliper (1) from caliper carrier (2).

NOTE:

Hang removed caliper (1) with a wire hook (4) or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don’t operate brake pedal with brake pads removed.

4) Remove brake pads (3).



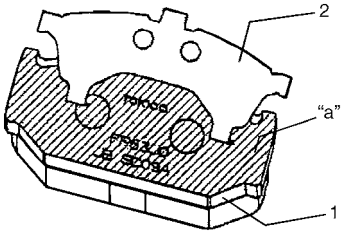
I2RH01420004-

Installation

1) Before installing brake pad shim, apply small amount of pad grease “a” (included in pad kit) to mating surfaces of brake pad (1) and pad shim (2).

WARNING:

Do not apply grease on pad lining surface.

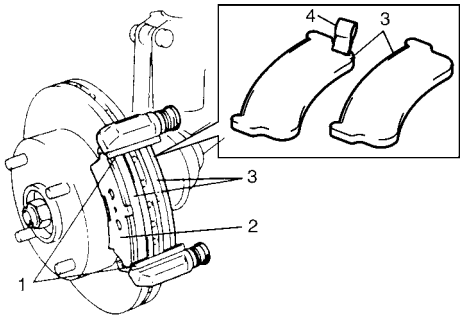


I4RS0A420005-

2) Set brake pad springs (1) and shim (2) and install brake pads (3).

NOTE:

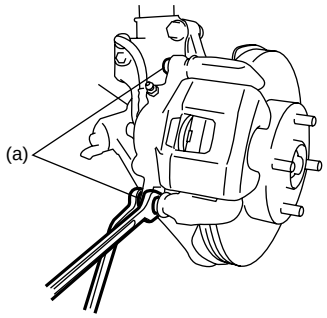
For right side brake, install pad with wear indicator (4) to vehicle center side.



I2RH01420006-

3) Install caliper and tighten caliper pin bolts (a) to specified torque.

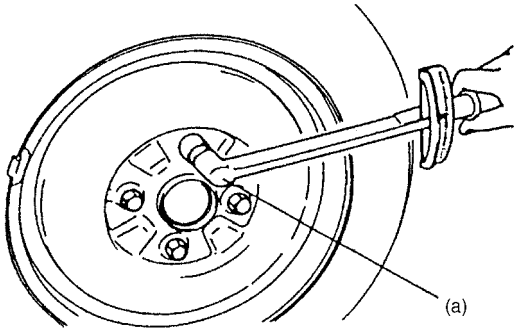
Tightening torque
Caliper pin bolt (a): 26 N·m (2.6 kg-m, 19.0 lb-ft)



I4RS0A420002-

4) Install wheel and lower lift.
5) Tighten wheel nuts to specified torque.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01420008-

6) After completion of installation, check for brake effectiveness.

Front Disc Brake Pad Inspection

S4RS0A4206004

Check pad lining for wear. When wear exceeds limit, replace with new one.

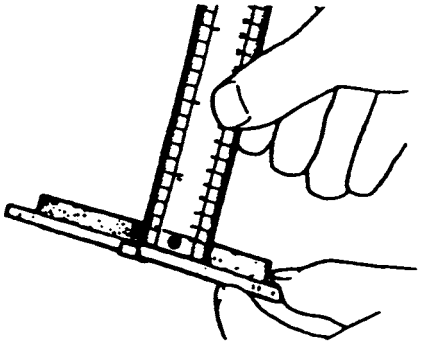
CAUTION:

Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Brake pad thickness (lining thickness)
Standard: 10 mm (0.40 in.)
Limit: 2 mm (0.08 in.)

NOTE:

When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.



I2RH01420005-

Front Disc Brake Caliper Removal and Installation

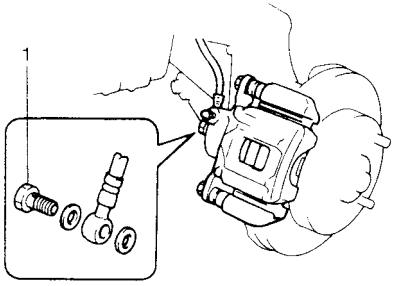
S4RS0A4206005

Removal

1) Hoist vehicle and remove wheel.
2) Loosen flexible hose joint bolt (1) a little at caliper.

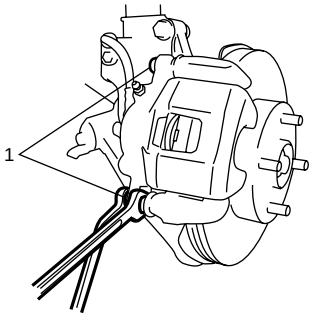
CAUTION:

Be careful not to twist flexible hose while loosening the bolt.



I2RH01420009-

3) Remove caliper pin bolts (1).



I2RH01420010-

4) Remove caliper from caliper carrier.
5) Disconnect flexible hose from caliper using care not to twist it. As this will allow brake fluid to flow out of flexible hose, have a container ready beforehand.

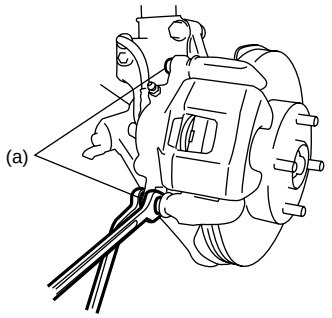
Installation

1) Apply grease to slide pin, then install caliper to caliper carrier.
2) Torque caliper pin bolts (a) to specification.

NOTE:

Make sure that boots are fit into groove securely.

Tightening torque
Caliper pin bolt (a): 26 N·m (2.6 kg-m, 19.0 lb-ft)



I4RS0A420003-

3) Connect caliper to flexible hose.
4) Torque flexible hose joint bolt to specification.

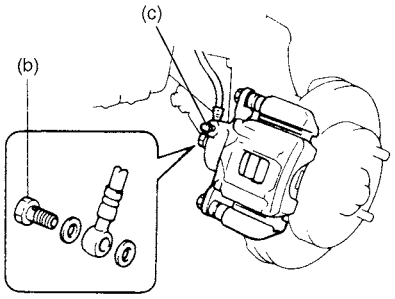
Tightening torque
Flexible hose joint bolt (b): 23 N·m (2.3 kg-m, 17.0 lb-ft)

WARNING:

Make sure that flexible hose is not twisted when tightening joint bolt. If it is twisted, reconnect it using care not to twist it.

5) Tighten bleeder plug to specified torque.

Tightening torque
Bleeder plug (c): 8.0 N·m (0.8 kg-m, 6.0 lb-ft)



I2RH01420023-

6) Lower hoist.
7) Torque wheel nuts to specifications.

Tightening torque
Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

8) After completing installation, fill reservoir with brake fluid and bleed air from brake system referring to “Air Bleeding of Brake System: in Section 4A”.
9) Check each installed part for fluid leakage.
10) Perform brake test and check fluid leakage.

Front Disc Brake Caliper Disassembly and Assembly

S4RS0A4206006

Disassembly

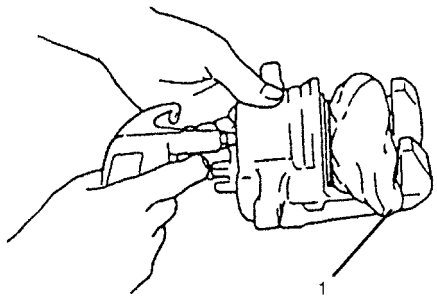
CAUTION:

Clean around caliper with brake fluid before disassembly.

1) Remove piston with air blown into flexible hose bolt installation hole.

WARNING:

Do not apply too highly compressed air which will cause piston to jump out of cylinder. Place a cloth (1) to prevent piston from damage. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.



I2RH01420011-

2) Remove cylinder boot (2).

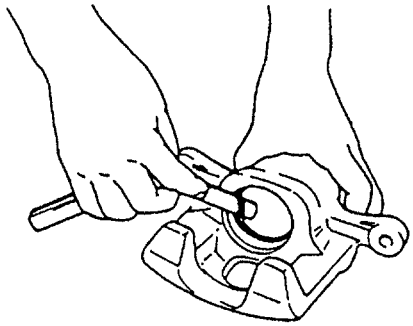
CAUTION:

Be careful not to damage inside (bore side) of cylinder.

3) Remove piston seal using a thin blade like a thickness gauge, etc.

CAUTION:

Be careful not to damage inside (bore side) of cylinder.



I2RH01420013-

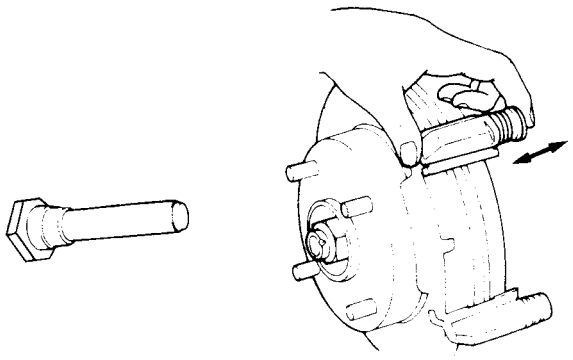
4) Remove bleeder plug and cap from caliper.

Assembly

Assemble parts in reverse order of disassembly, observing the following instructions.

CAUTION:

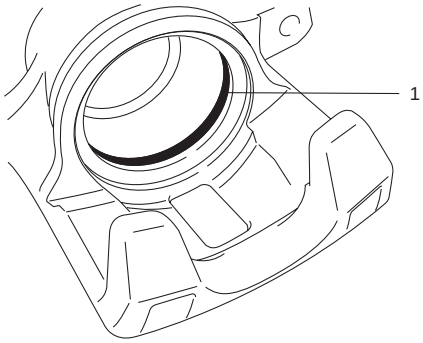
- **Wash each part cleanly before installation in the same fluid as the one used in master cylinder reservoir.**
- **Never use other fluid or thinner.**
- **Before installing piston seal or cylinder boot to cylinder, apply brake fluid to them.**
- **Install a new piston seal into groove in cylinder securely making sure that it is not twisted.**
- **Before installing caliper to carrier, install slide pin with grease applied into caliper carrier hole and check for its smooth movement in thrust direction.**
- **After reassembling brake lines, bleed air from them.**



I2RH01420016-

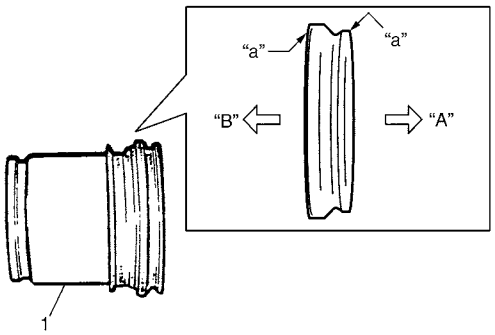
- Install piston seal, boot and piston to caliper referring to the following instructions.

1) Replace with a new piston seal (1) at every overhaul. After applying rubber grease (included in repair kit), fit piston seal (1) into groove in cylinder taking care not to twist it.



I2RH01420017-

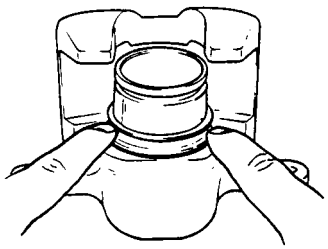
2) Before inserting piston (1) into cylinder, apply rubber grease (included in repair kit) to new boot “a” and install it onto piston as shown.



I4RS0A420006-

“A”:	1 grooved side directed cylinder side
“B”:	2 grooved side directed pad side

3) Fit boot as it is in figure into boot groove in cylinder with fingers.

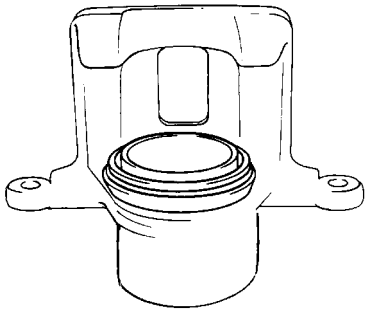


I2RH01420019-

4) Insert piston into cylinder by hand and fit boot in boot groove in piston.

NOTE:

Check that boot is fitted in boot groove securely all around piston and cylinder.



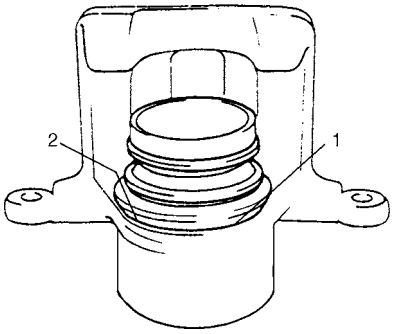
I2RH01420020-

5) To confirm that boot is fitted in its groove in cylinder properly, pull piston out of cylinder a little but do not take it all out.

NOTE:

Boot's face (1) should be at the same level from cylinder's face (2) all around.

6) Insert piston into cylinder by hand.



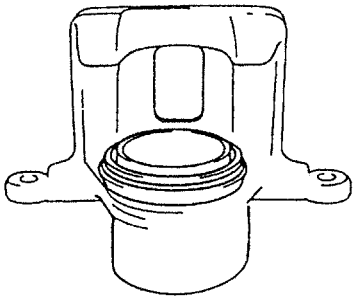
I4RS0A420004-

Front Disc Brake Caliper Inspection

S4RS0A4206007

Pin Boot and Cylinder Boot

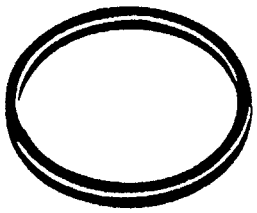
Check boots for breakage, crack and damage.
If defective, replace.



I2RH01420014-

Piston Seal

Excessive or uneven wear of pad lining may indicate unsmooth return of piston.
In such case, replace rubber seal.



I2RH01420015-

Front Brake Disc Removal and Installation

S4RS0A4206008

Removal

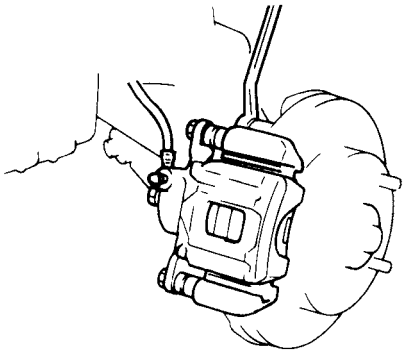
1) Hoist vehicle and remove wheel.
2) Remove caliper assembly by removing caliper carrier bolts (2 pcs)

CAUTION:

During removal, be careful not to damage brake flexible hose and not to depress brake pedal.

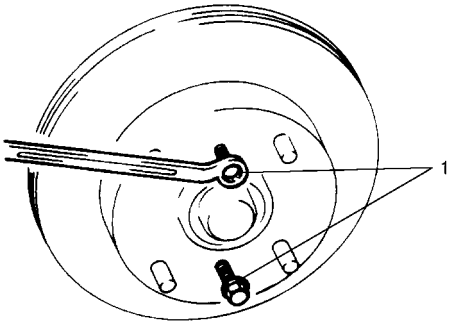
NOTE:

Hang removed caliper with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with brake pads removed.



I2RH01420024-

3) Pull brake disc off by using 8 mm bolts (1) (2 pcs).



I2RH01420025-

Installation

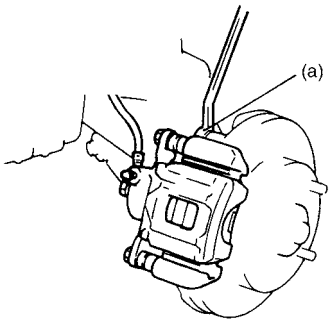
1) Install disc to wheel hub.
2) Install caliper assembly to steering knuckle.

CAUTION:

Make sure that flexible hose is not twisted when installing caliper assembly. If it is twisted, reinstall it using care not to twist it.

3) Torque caliper carrier bolts to specification.

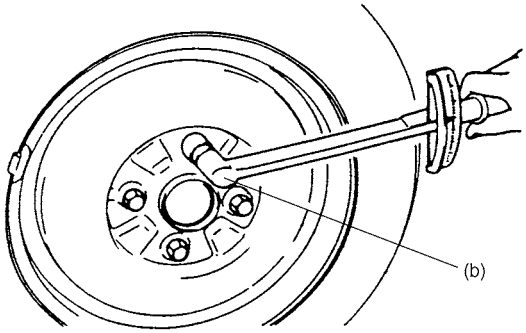
Tightening torque
Caliper carrier bolt (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01420028-

4) Torque front wheel nuts to specification.

Tightening torque
Wheel nut (b): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01420029-

5) Upon completion of installation, perform brake test.

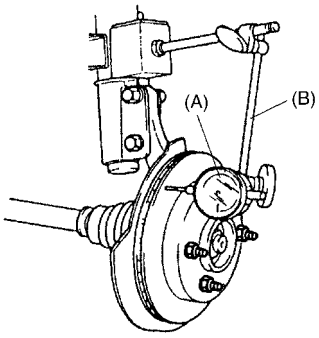
Front Brake Disc Inspection

S4RS0A4206009

- Install wheel nuts to hub bolts and fasten to fix the brake disc.
  Using magnetic stand and with dial gauge positioned at about 10 mm (0.39 in.) inward from periphery of disc, measure deflection of disc.
  If limit value is exceeded, replace correct or replace.

Disc deflection
Limit: 0.10 mm (0.004 in.) max.

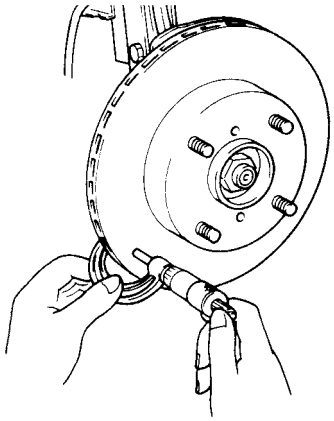
Special tool
(A): 09900–20607
(B): 09900-20701



I2RH01420026-

- Using micrometer, measure thickness of brake disc.
  If it is less than limit, replace brake disc.

Brake disc thickness
Standard: 20.0 mm (0.79 in.)
Limit: 18.0 mm (0.71 in.)



I2RH01420027-

Specifications

Tightening Torque Specifications

S4RS0A4207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Caliper pin bolt	26	2.6	19.0	☞ / ☞
Wheel nut	85	8.5	61.5	☞ / ☞ / ☞
Flexible hose joint bolt	23	2.3	17.0	☞
Bleeder plug	8.0	0.8	6.0	☞
Caliper carrier bolt	85	8.5	61.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Disc Brake Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

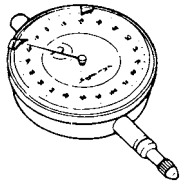
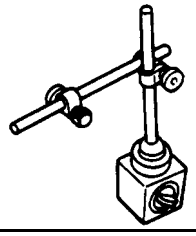
S4RS0A4208001

NOTE:

Required service material is also described in the following.
“Front Disc Brake Components: ”

Special Tool

S4RS0A4208002

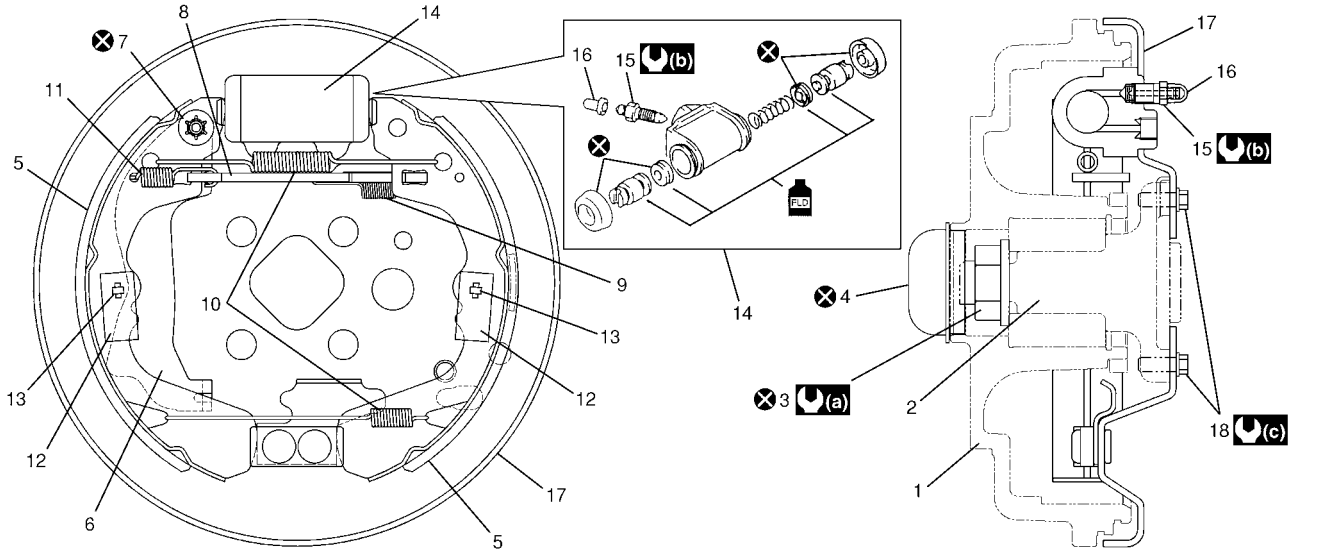
09900–20607 Dial gauge ☞		09900–20701 Magnetic stand ☞	

Rear Brakes

Repair Instructions

Rear Drum Brake Components

S4RS0A4306001



I4RS0A430001-

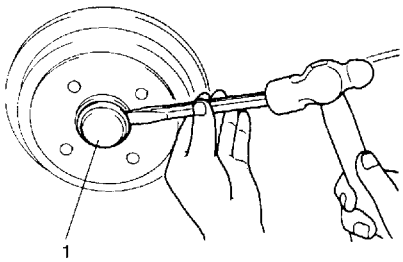
1. Rear brake drum	9. Quadrant spring	17. Brake back plate
2. Spindle	10. Shoe return spring	18. Spindle bolt
3. Spindle nut	11. Antirattle spring	(a) : 175 N·m (17.5 kg-m, 126.5 lb-ft)
4. Spindle cap	12. Shoe hold down spring	(b) : 7.5 N·m (0.75 kg-m, 6.0 lb-ft)
5. Brake shoe	13. Shoe hold down pin	(c) : 73 N·m (7.3 kg-m, 53.0 lb-ft)
6. Parking brake shoe lever	14. Wheel cylinder : Apply brake fluid to piston cup.	: Do not reuse.
7. Push nut	15. Rear bleeder plug	
8. Brake strut	16. Bleeder plug cap	

Rear Brake Drum Removal and Installation

S4RS0A4306002

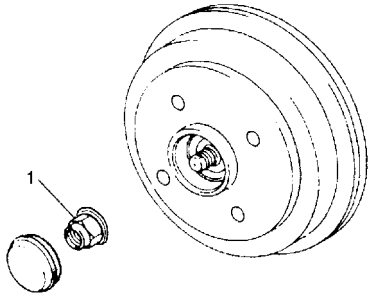
Removal

1) Hoist vehicle and remove wheel.
2) Remove spindle cap (1) as shown (by hammering lightly at 3 locations around it so as not to deform or cause damage to seating part of brake drum).



I4RS0A430002-

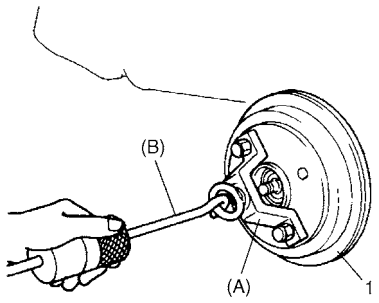
3) Uncaulk spindle nut and remove spindle nut (1).



I4RS0A430003-

4) Release parking brake lever.
5) Pull rear brake drum (1) off by using special tools.

Special tool
(A): 09943–17912
(B): 09942–15511

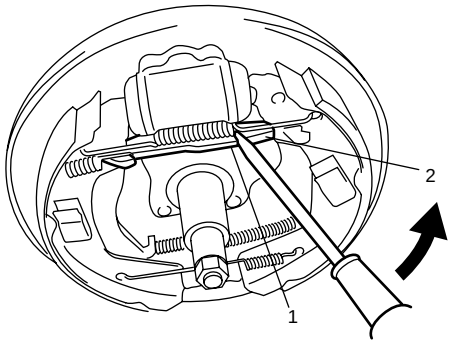


I4RS0A430004-

6) Remove wheel bearing from brake drum referring to "Wheel Bearing and Wheel Stud Bolt Removal and Installation: in Section 2C" if necessary.

Installation

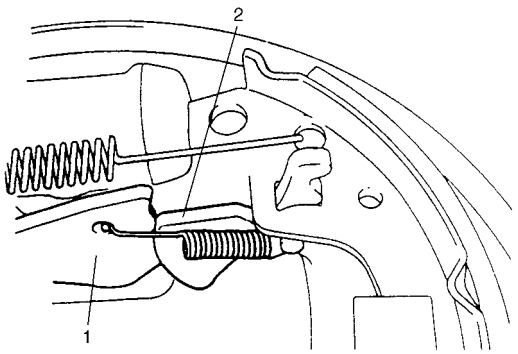
1) Install wheel bearing to brake drum referring to "Wheel Bearing and Wheel Stud Bolt Removal and Installation: in Section 2C", if removal.
2) Before installing brake drum, to maximize brake shoe-to-drum clearance, put screwdriver between rod (1) and ratchet (2) and push down ratchet as shown in figure.



I4RS0A430006-

NOTE:

The figure show ratchet position where brake shoe-to-drum clearance is maximum.

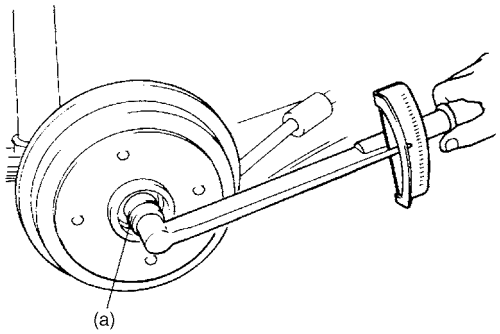


I2RH01430009-

1.	Rod
2.	Ratchet

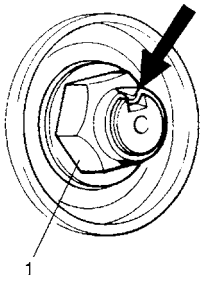
3) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.
4) Install new spindle nut (a).
5) Tighten spindle nut (a) to specified torque.

Tightening torque
Spindle nut (a): 175 N·m (17.5 kg-m, 126.5 lb-ft)



I4RS0A430005-

6) Calk spindle nut (1).



I4RS0A430007-

7) Install new spindle cap.

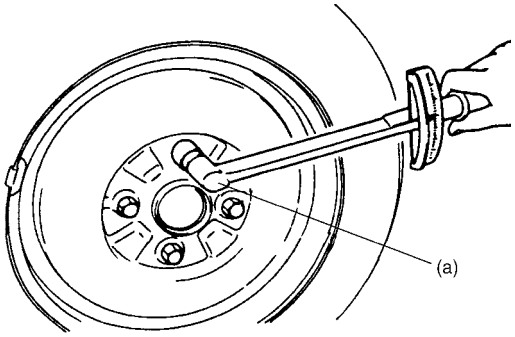
NOTE:

- **When installing spindle cap, hammer lightly several locations on the collar of cap until collar comes closely into contact with brake drum.**
- **If fitting part of cap is deformed or damaged or if it is fitted loosely, replace with new one.**

8) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable.

9) Install wheel and tighten wheel nuts to specified torque.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I2RH01430011-

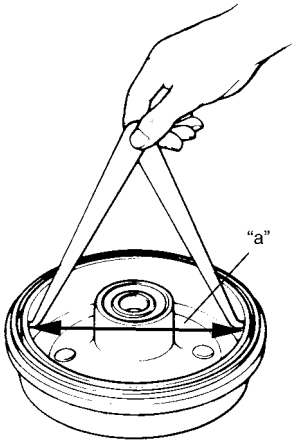
10) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).

Rear Brake Drum and Shoe Inspection

S4RS0A4306003

Brake Drum
Inspect brake drum for wear.
If limit value of drum inner diameter is exceeded or uneven or stepped wear is excessive, replace drum.

Drum inner diameter "a"
Standard: 200 mm (7.87 in.)
Limit: 202 mm (7.95 in.)



I4RS0A430008-

Cracked, Scored or Grooved Drum
A cracked drum is unsafe for further service and must be replaced. Do not attempt to weld a cracked drum.
Smooth up any slight scores. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to resurface drum braking surface.
If brake linings are slightly worn and drum is grooved, drum should be polished with fine emery cloth but should not be turned.

NOTE:

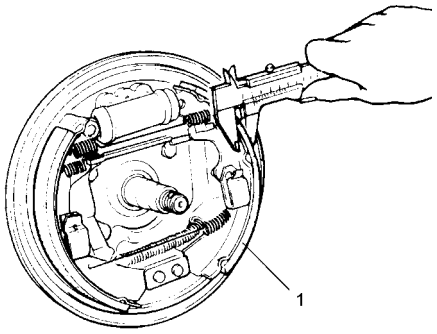
When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.

Brake Shoe
Measure thickness of brake shoe (1). Also, check surface of lining for hardening, excessive wear and oil.

Brake shoe thickness (lining + shoe rim)
Standard: 5.6 mm (0.22 in.)
Limit: 2.6 mm (0.10 in.)

CAUTION:

Never polish lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage drum. When it is required to correct lining, replace it with a new one.



I2RH01430007-

ABS Sensor Ring Removal and Installation (If Equipped)

S4RS0A4306009

CAUTION:

Do not reuse (reinstall) removed ABS sensor ring.

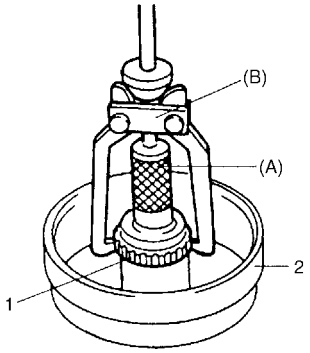
Removal

1) Remove brake drum referring to "Rear Brake Drum Removal and Installation: ".
2) Remove sensor ring (1) from brake drum (2) using special tools.

CAUTION:

Pull out sensor ring from brake drum gradually and evenly. Attempt to pull it out partially may cause it to be deformed.

Special tool
(A): 09913–75520
(B): 09913–65135



I4RS0A430009-

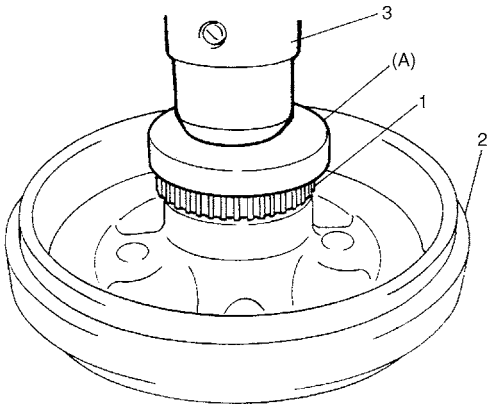
Installation

1) Install new sensor ring (1) to brake drum (2) by using special tool and hydraulic press (3).

CAUTION:

Used sensor ring can not be press-fitted securely.

Special tool
(A): 09926–68310



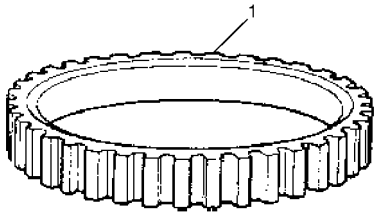
I4RS0A430010-

2) Install brake drum referring to “Rear Brake Drum Removal and Installation: ”.

ABS Sensor Ring Inspection

S4RS0A4306010

- Check ring serration (teeth) for being missing, damaged or deformed.
- Check sensor ring (1) for being deformed (warped).
- Check that no foreign material is attached
  If any malfunction is found, repair or replace.



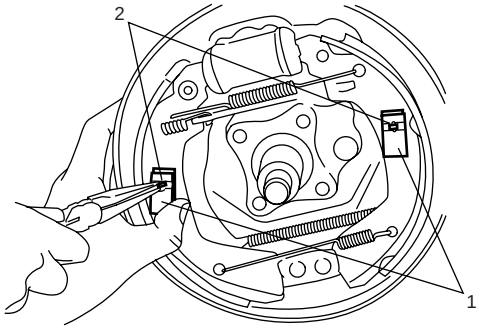
I4RS0A430011-

Rear Brake Shoe Removal and Installation

S4RS0A4306004

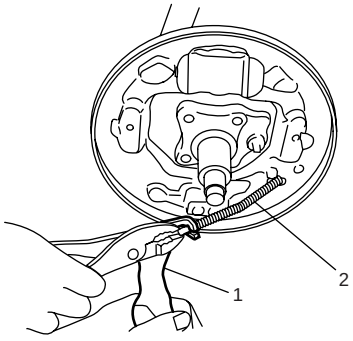
Removal

1) Remove brake drum referring to “Rear Brake Drum Removal and Installation: ”.
2) Remove shoe hold down springs (1) by turning shoe hold down pins (2).



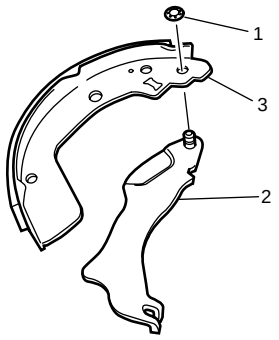
I4RS0A430012-

3) Remove return springs, brake shoes and strut.
4) Disconnect parking brake shoe lever (1) from parking brake cable (2).



I4RS0A430013-

5) Remove push nut (1).
6) Remove parking brake shoe lever (2) from shoe rim (3).

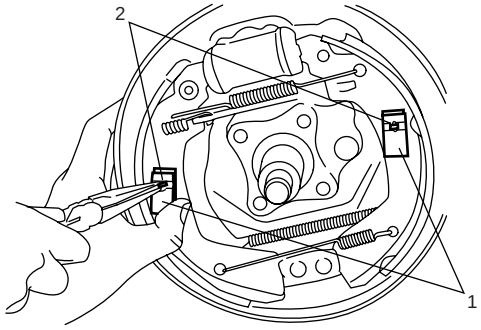


I4RS0A430014-

Installation

Install parts in reverse order of removal, noting the following.

- Install shoe hold down springs (1) by pushing them down in place and turning hold down pins (2).
- Install brake drum referring to step 2) to 10) of “Rear Brake Drum Removal and Installation: ”.



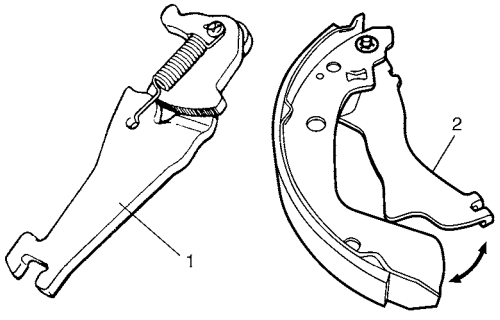
I4RS0A430012-

Rear Brake Shoe Inspection

S4RS0A4306005

- Check ratchet of brake strut (1) assembly for wear or damage.
- Check shoe return spring, antirattle spring and shoe hold down spring for damage, corrosion and weakening.
- Check for smooth movement of brake shoe lever (2) along shoe rim.

If any defective or malfunction is found, repair or replace.



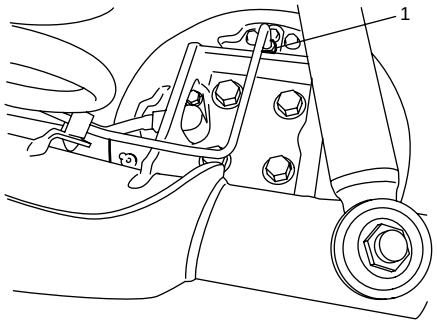
I4RS0A430016-

Wheel Cylinder Removal and Installation

S4RS0A4306006

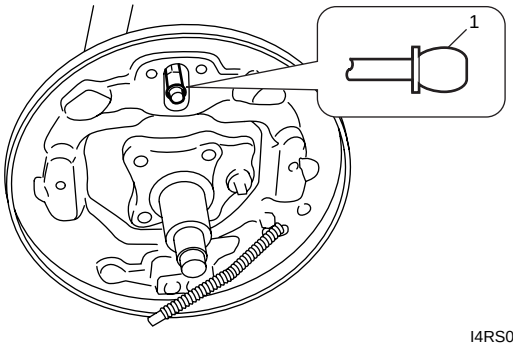
Removal

1) Remove brake drum referring to “Rear Brake Drum Removal and Installation: ”.
2) Remove brake shoe referring to “Rear Brake Shoe Removal and Installation: ”.
3) Loosen brake pipe flare nut (1) but only within the extent that fluid does not leak.



I4RS0A430015-

4) Remove wheel cylinder mounting bolts. Disconnect brake pipe from wheel cylinder and put bleeder plug cap (1) onto pipe to prevent fluid from spilling.



I4RS0A430017-

Installation

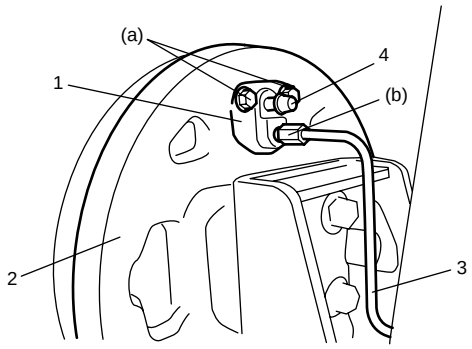
1) Take off bleeder plug cap from brake pipe and connect pipe to wheel cylinder (1) just enough to prevent fluid from leaking.
2) Install wheel cylinder (1) to brake back plate (2), and tighten wheel cylinder mounting bolts to specified torque.

   Tightening torque
   Wheel cylinder mounting bolt (a): 12 N·m (1.2 kg-m, 9.0 lb-ft)

3) Tighten flare nut of brake pipe (3) to specified torque.

   Tightening torque
   Rear brake pipe flare nut (b): 16 N·m (1.6 kg-m, 11.5 lb-ft)

4) Install bleeder plug cap (4) taken off from pipe back to bleeder plug.



I4RS0A430018-

5) Install brake shoes. Refer to “Rear Brake Shoe Removal and Installation: ”.
6) Install brake drum. Refer to “Rear Brake Drum Removal and Installation: ”.
7) Fill reservoir with brake fluid and bleed brake system. For bleeding operation refer to “Air Bleeding of Brake System: in Section 4A”.
8) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load 3 to 5 times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable.
9) Install wheel and tighten wheel nuts to specified torque.

Tightening torque
Wheel nut: 85 N·m (8.5 kg-m, 61.5 lb-ft)

10) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).
11) Check each installed part for fluid leakage.

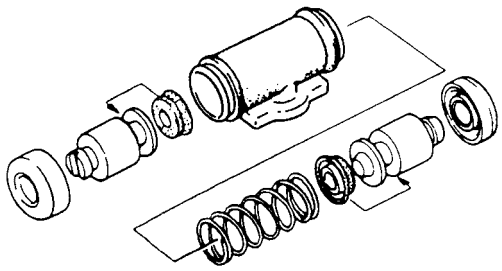
Wheel Cylinder Inspection

S4RS0A4306007

Inspect wheel cylinder disassembled parts for wear, cracks, corrosion or damage.

NOTE:

Clean wheel cylinder components with brake fluid.



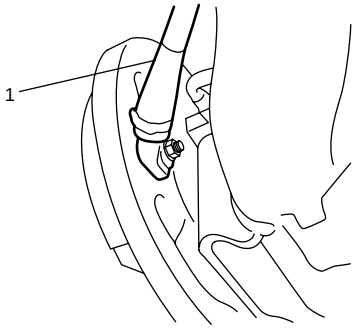
I4RS0A430019-

Brake Back Plate Removal and Installation

S4RS0A4306008

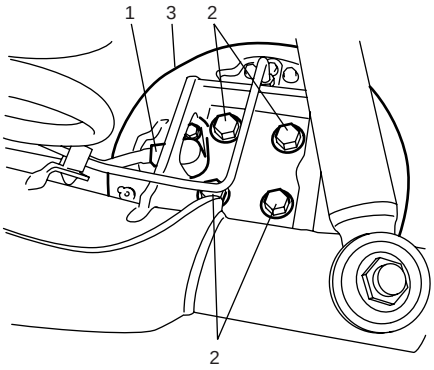
Removal

1) Remove brake drum referring to “Rear Brake Drum Removal and Installation: ”.
2) Remove brake shoe referring to “Rear Brake Shoe Removal and Installation: ”.
3) Remove wheel cylinder referring to “Wheel Cylinder Removal and Installation: ”.
4) Remove parking brake cable (1) from brake back plate.



I4RS0A430020-

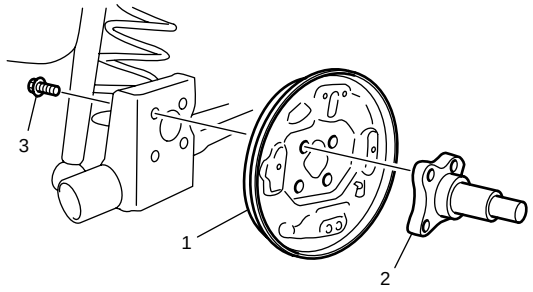
5) Remove rear wheel speed sensor (1) from brake back plate.
6) Remove spindle bolt (2), and remove brake back plate (3) and spindle.



I4RS0A430021-

Installation

1) Install brake back plate (1) and spindle (2), and tighten spindle bolts (3) by hand.



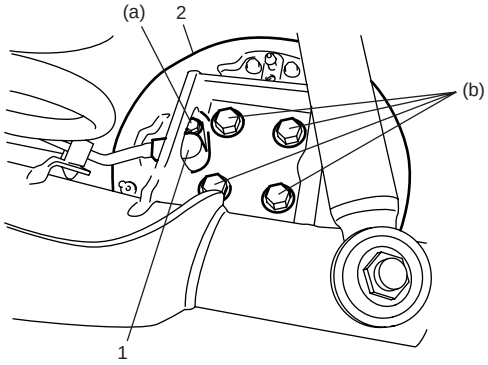
I4RS0A430022-

2) Install rear wheel speed sensor (1) to brake back plate (2).

Tightening torque
Rear wheel speed sensor bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

3) Tighten spindle bolts (b) to specified torque.

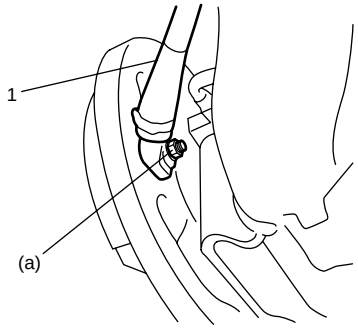
Tightening torque
Spindle bolt (b): 73 N·m (7.3 kg-m, 53.0 lb-ft)



I4RS0A430023-

4) Install parking brake cable (1) to brake back plate

Tightening torque
Parking cable cap nut (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A430024-

5) Install wheel cylinder and connect brake pipe flare nut, and then tighten wheel cylinder bolts and flare nut to specified torque referring to “Wheel Cylinder Removal and Installation: ”.
6) Install brake shoe referring to “Rear Brake Shoe Removal and Installation: ”.
7) Install brake drum referring to step 2) to 7) of “Rear Brake Drum Removal and Installation: ”.
8) Fill reservoir with brake fluid and bleed brake system. For bleeding operation refer to “Air Bleeding of Brake System: in Section 4A”.
9) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load 3 to 5 times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable.

Tightening torque
Wheel nut (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

10) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).
11) Check each installed part for fluid leakage.

Specifications

Tightening Torque Specifications

S4RS0A4307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Spindle nut	175	17.5	126.5	☞
Wheel nut	85	8.5	61.5	☞ / ☞ / ☞
Wheel cylinder mounting bolt	12	1.2	9.0	☞
Rear brake pipe flare nut	16	1.6	11.5	☞
Rear wheel speed sensor bolt	11	1.1	8.0	☞
Spindle bolt	73	7.3	53.0	☞
Parking cable cap nut	10	1.0	7.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Rear Drum Brake Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

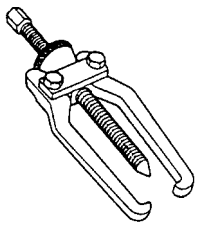
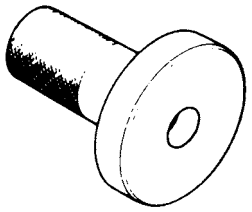
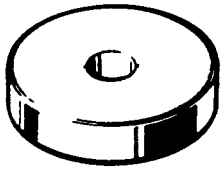
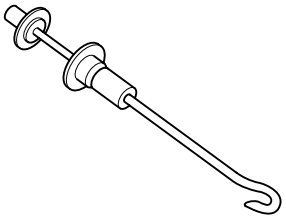
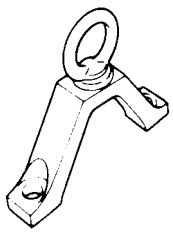
S4RS0A4308001

NOTE:

Required service material is also described in the following.
“Rear Drum Brake Components: ”

Special Tool

S4RS0A4308002

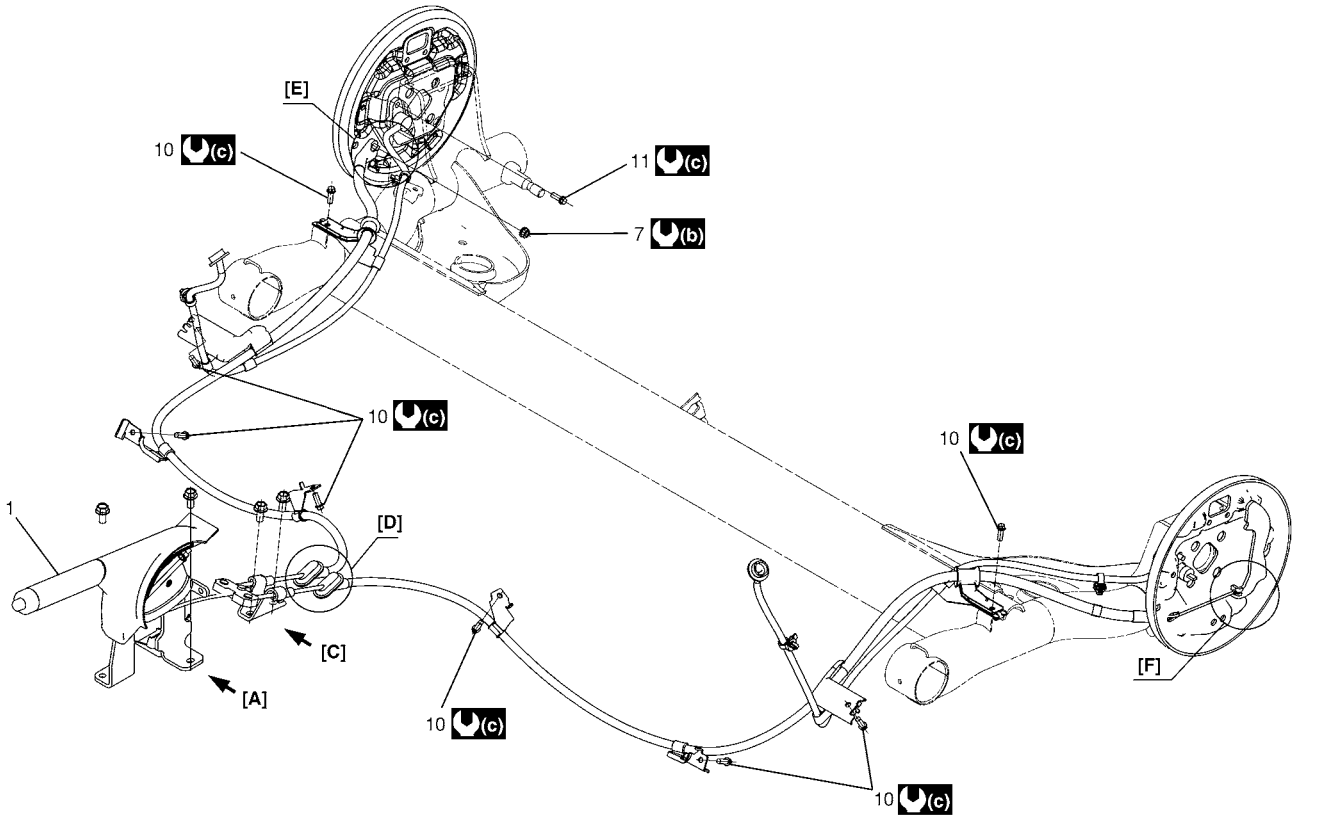
09913–65135 Bearing puller ☞		09913–75520 Bearing installer ☞	
09926–68310 Differential bevel pinion bearing installer ☞		09942–15511 Sliding hammer ☞	
09943–17912 Wheel hub remover ☞			

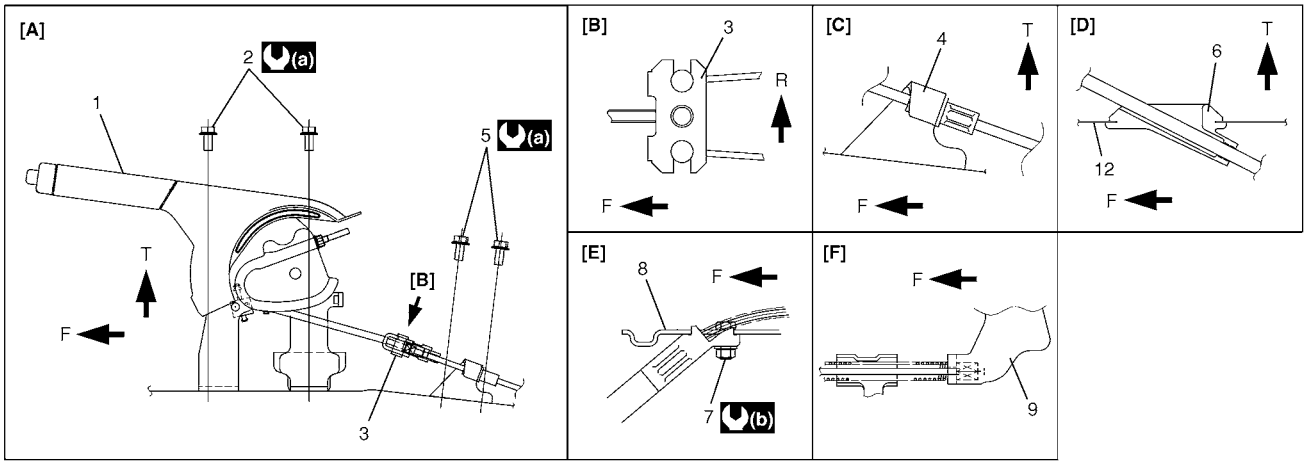
Parking Brake

General Description

Parking Brake Cable Construction

S4RS0A4401001





I4RS0A440001-

T: Top side	4. Parking cable bracket	10. Parking cable clamp bolt	[D]: View [D]
F: Front side	5. Parking cable bracket bolt	11. Rear wheel speed sensor bolt	[E]: View [E]
R: Right side	6. Grommet	12. Vehicle body	[F]: View [F]
1. Parking brake lever assembly	7. Parking cable cap nut	[A]: View [A]	(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
2. Parking brake lever bolt	8. Brake back plate	[B]: View [B]	(b): 10 N·m (1.0 kg-m, 7.5 lb-ft)
3. Equalizer	9. Parking brake shoe lever	[C]: View [C]	(c): 11 N·m (1.1 kg-m, 8.0 lb-ft)

Repair Instructions

Parking Brake Inspection and Adjustment

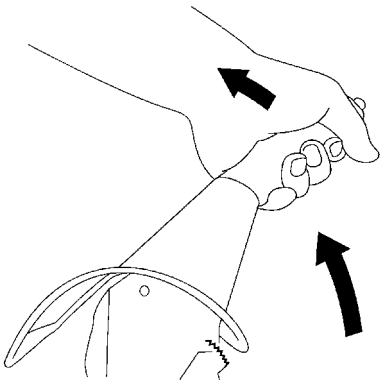
S4RS0A4406001

Inspection

Hold center of parking brake lever grip and pull it up with 200 N (20 kg, 44 lbs) force.
With parking brake lever pulled up as shown, count ratchet notches. There should be 4 to 9 notches.
Also, check if both right and left rear wheels are locked firmly.
To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake lever without pressing its button.
One click sound corresponds to one notch.
If number of notches is out of specification, adjust cable referring to adjustment procedure so as to obtain specified parking brake stroke.

NOTE:

Check tooth tip of each notch for damage or wear.
If any damage or wear is found, replace parking brake lever.



I4RS0A440002-

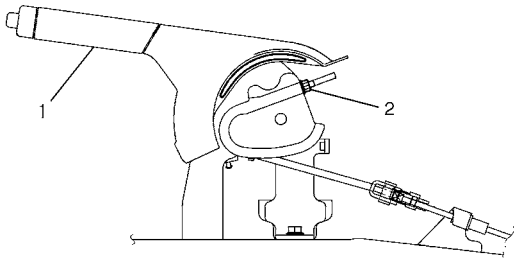
Adjustment

NOTE:

Make sure for the following conditions before cable adjustment.

- **No air is trapped in brake system.**
- **Brake pedal travel is proper.**
- **Brake pedal has been depressed a few times with about 300 N (30 kg, 66 lbs) load.**
- **Parking brake lever (1) has been pulled up a few times with about 200 N (20 kg, 44 lbs) load.**
  If parking brake cable is replaced with new one, pull up parking brake lever a few times with about 500 N·m (50 kg, 110 lbs) force.
- **Rear brake shoes are not worn beyond limit, and self adjusting mechanism operates properly.**

After confirming that the conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening adjust nut (2).



I4RS0A440003-

NOTE:

Check brake drum for dragging after adjustment.

Parking brake stroke (When lever is pulled up at 200 N (20 kg, 44 lbs)
4 to 9 notches

Parking Brake Cable Removal and Installation

S4RS0A4406002

Removal

NOTE:

When it is necessary to remove both right and left parking brake cables, repeat below steps 2) and 6) on right and left wheels.

1) Raise, suitably support vehicle.
2) Remove wheel.
3) Disconnect parking brake cable from equalizer (parking brake lever) and clamps.
4) Remove brake drum. Refer to “Rear Brake Drum Removal and Installation: in Section 4C”.
5) Disconnect parking brake cable from brake shoe lever referring to “Rear Brake Shoe Removal and Installation: in Section 4C”.
6) Remove parking brake cable and parking cable bracket.

Installation

Install it by reversing removal procedure, noting the following points.

- Install clamps properly referring to “Parking Brake Cable Construction: ”.
- Tighten bolts and nuts to specified torque referring to “Parking Brake Cable Construction: ”.

  Tightening torque
  Parking brake lever bolt: 25 N·m (2.5 kg-m, 18.0 lb-ft)
  Parking cable clamp bolt: 11 N·m (1.1 kg-m, 8.0 lb-ft)
  Parking cable bracket bolt: 25 N·m (2.5 kg-m, 18.0 lb-ft)

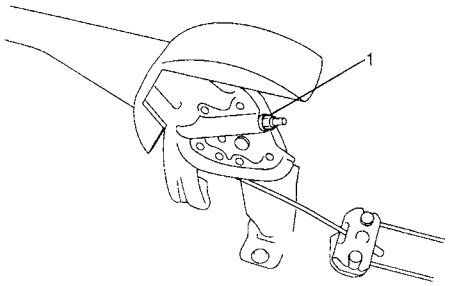
- Adjust parking brake cable. Refer to “Parking Brake Inspection and Adjustment: ”.
- Check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

Parking Brake Lever Removal and Installation

S4RS0A4406003

Removal

1) Disconnect negative (–) cable at battery.
2) Remove console box.
3) Block vehicle wheels and release parking brake lever.
4) Disconnect lead wire of parking brake switch at coupler.
5) Loosen parking brake cable adjusting nut (1).

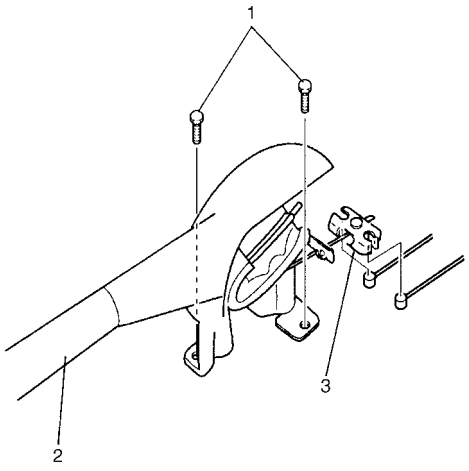


I4RS0A440004-

6) Remove parking brake lever bolts (1) and then remove parking brake lever assembly (2) with equalizer (3).

NOTE:

Don’t disassemble parking brake lever switch. It must be removed and installed as a complete switch assembly.

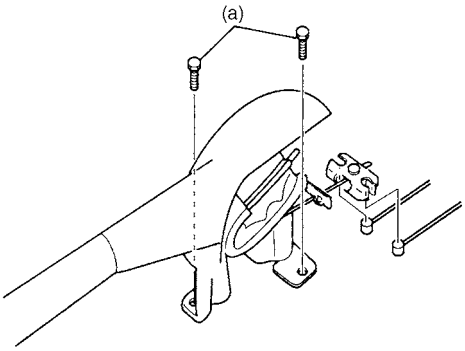


I4RS0A440005-

Installation

1) Install in reverse order of removal procedure. Check equalizer inclined angle.

   Tightening torque
   Parking brake lever bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I4RS0A440006-

2) After all parts are installed, parking brake lever needs to be adjusted. Refer to “Parking Brake Inspection and Adjustment: ”.
3) Check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

Specifications

Tightening Torque Specifications

S4RS0A4407001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Parking brake lever bolt	25	2.5	18.0	☞ / ☞
Parking cable clamp bolt	11	1.1	8.0	☞
Parking cable bracket bolt	25	2.5	18.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Parking Brake Cable Construction: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

ABS

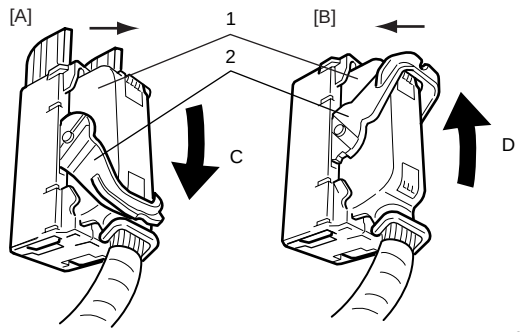
Precautions

Precautions in Diagnosing Troubles

S4RS0A4500001

To ensure that the trouble diagnosis is done accurately and smoothly, observe the following and follow “ABS Check: ”.

- If the vehicles was operated in any of the following ways, ABS warning lamp may light momentarily but this does not indicate anything abnormal in ABS.
  - The vehicle was driven with parking brake pulled.
  - The vehicle was driven with brake dragging.
  - The vehicle was stuck in mud, sand, etc.
  - Wheel spin occurred while driving.
  - Wheel(s) was rotated while the vehicle was jacked up.
- Be sure to read “Precautions for Electrical Circuit Service: in Section 00” before inspection and observe what is written there.
- Be sure to use the trouble diagnosis procedure as described in “ABS Check: ”. Failure to follow it may result in incorrect diagnosis. (Some other diagnosis trouble code may be stored by mistake in the memory of ABS control module during inspection.)
- When disconnecting ABS hydraulic unit / control module connector (1), pull down lock lever (2) of connector.
  When connecting, set the connector on ABS hydraulic unit / control module assembly and pull up the lock lever (2) until it locks.



I4RH01450001-

[A]: Disconnect	C: Pull down to disconnect
[B]: Connect	D: Pull up to connect

Precautions in On-Vehicle Service

S4RS0A4500002

When connector is connected to ABS hydraulic unit / control module assembly, do not disconnect connectors of sensors with ignition switch ON. Otherwise, DTC will be set in ABS control module.

General Description

ABS Description

S4RS0A4501001

The ABS (Antilock Brake System) controls the fluid pressure applied to the wheel cylinder of each brake from the master cylinder so that each wheel is not locked even when hard braking is applied.
This ABS has also the following function.
While braking is applied, but before ABS control becomes effective, braking force is distributed between the front and rear so as to prevent the rear wheels from being locked too early for better stability of the vehicle.
The main component parts of this ABS include the following parts in addition to those of the conventional brake system.

- Wheel speed sensor which senses revolution speed of each wheel and outputs its signal.
- ABS warning lamp which lights to inform abnormality when system fails to operate properly.
- ABS hydraulic unit / control module assembly is incorporated ABS control module, ABS hydraulic unit (actuator assembly), solenoid valve power supply driver (transistor), solenoid valve driver (transistor), pump motor driver (transistor).
  - ABS control module which sends operation signal to ABS hydraulic unit to control fluid pressure applied to each wheel cylinder based on signal from each wheel speed sensor so as to prevent wheel from locking.
  - ABS hydraulic unit which operates according to signal from ABS control module to control fluid pressure applied to wheel cylinder of each 4 wheels.
  - Solenoid valve power supply driver (transistor) which supplies power to solenoid valve in ABS hydraulic unit.
  - Solenoid valve driver (transistor) which controls each solenoid valves in ABS hydraulic unit.
  - Pump motor driver (transistor) which supplies power to pump motor in ABS hydraulic unit.

This ABS is equipped with Electronic Brake force Distribution (EBD) system that controls a fluid pressure of rear wheels to best condition, which is the same function as that of proportioning valve, by the signal from wheel sensor independently of change of load due to load capacity and so on. And if the EBD system fails to operate properly, the brake warning lamp lights to inform abnormality.

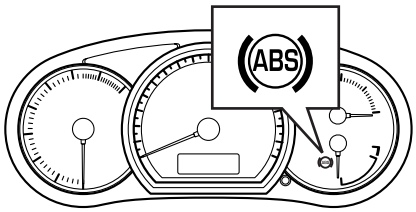
ABS Hydraulic Unit / Control Module Assembly Description

S4RS0A4501002

ABS control module is a component of ABS hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ABS control module diagnoses conditions of the system component parts (whether or not there is any abnormality) all the time and indicates the results (warning of abnormality occurrence and DTC) through the ABS warning lamp as described.



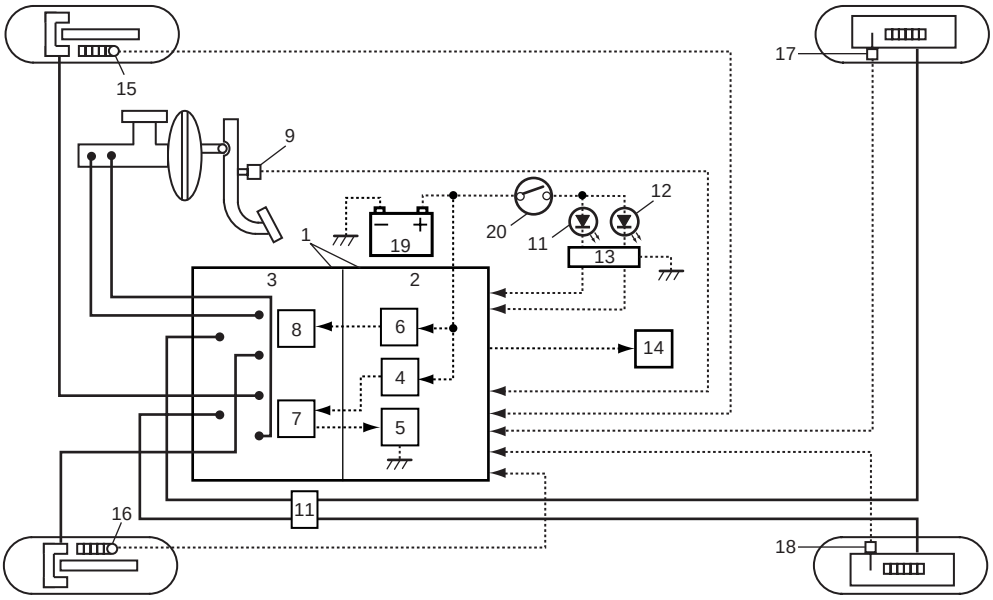
I4RS0A450001-

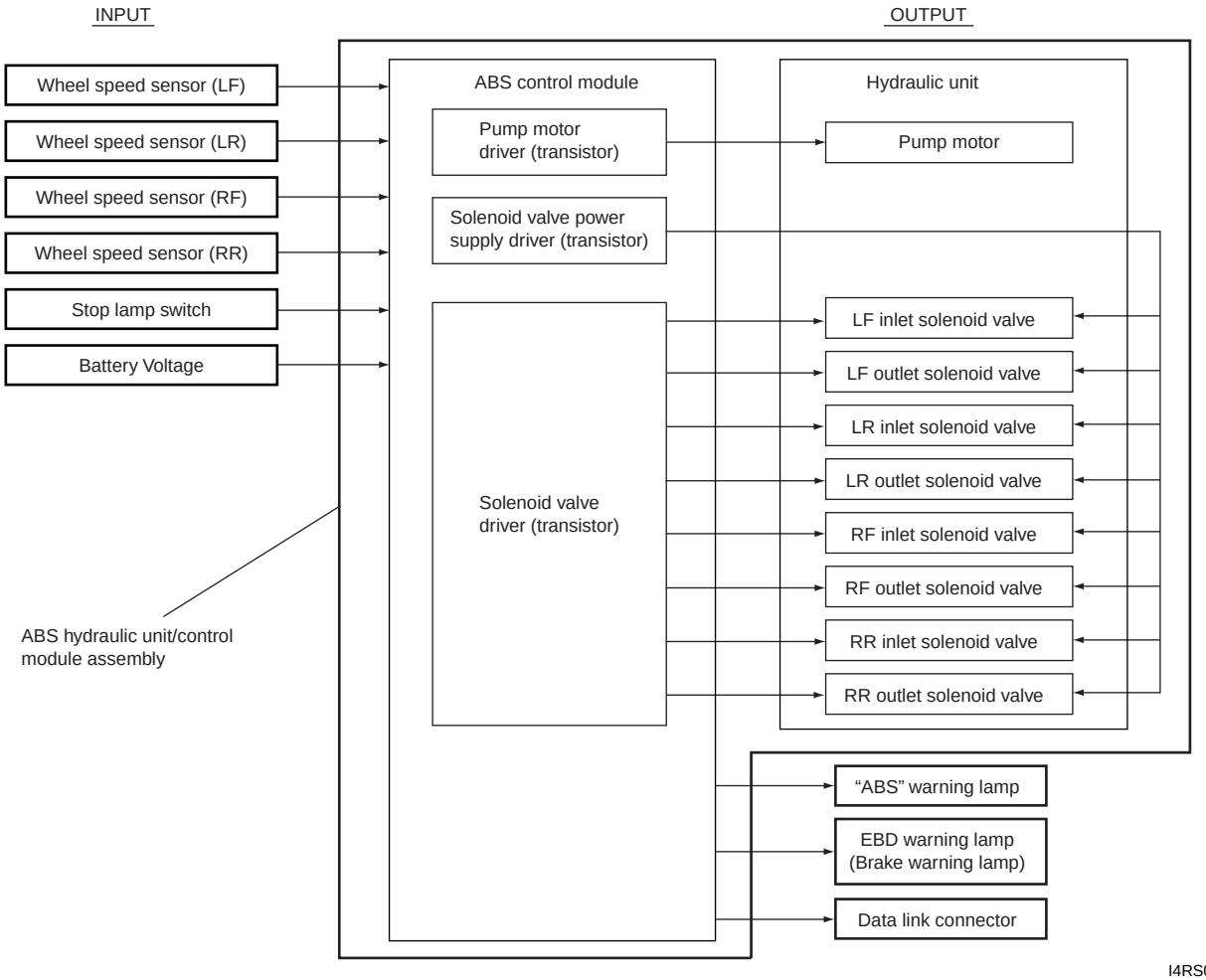
- When ignition switch is turned ON, ABS warning lamp lights for 2 seconds to check its circuit.
- When no abnormality has been detected (the system is in good condition), ABS warning lamp turns OFF after 2 seconds.
- When an abnormality in the system is detected, ABS warning lamp lights and the area where that abnormality lies is stored in the memory of EEPROM in ABS control module.

Schematic and Routing Diagram

ABS Schematic

S4RS0A4502001



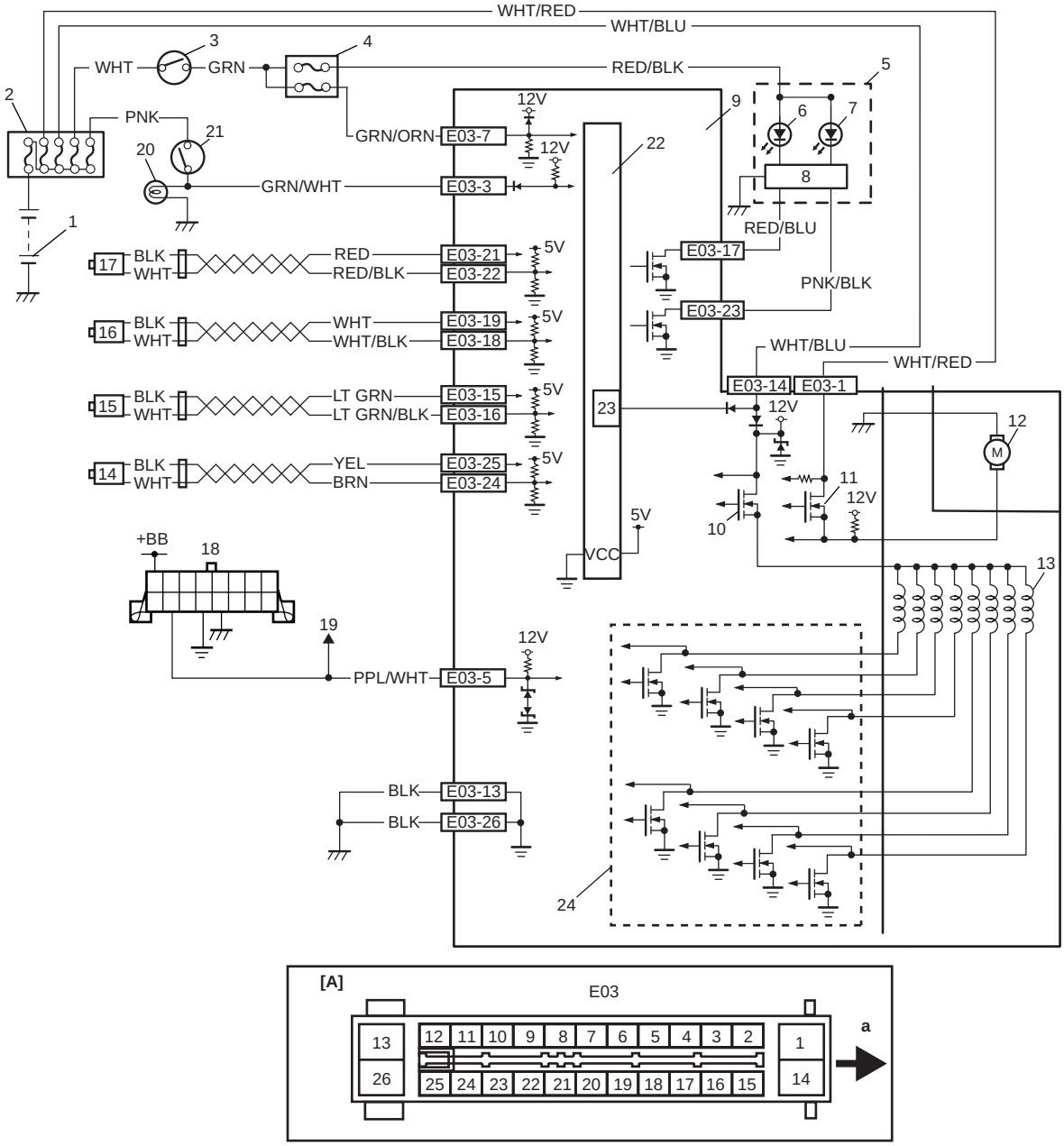


I4RS0A450002-

1. ABS hydraulic unit / control module assembly	8. Pump motor	15. Wheel speed sensor (Right-front)
2. ABS control module	9. Stop lamp switch	16. Wheel speed sensor (Left-front)
3. ABS hydraulic unit	10. ABS warning lamp	17. Wheel speed sensor (Right-rear)
4. Solenoid valve power supply driver (transistor)	11. EBD warning lamp (Brake warning lamp)	18. Wheel speed sensor (Left-rear)
5. Solenoid valve driver (transistor)	12. Lamp driver module	19. Battery
6. Pump motor driver (transistor)	13. 4 way joint	20. Ignition switch
7. Solenoid valve	14. Data link connector	

ABS Wiring Circuit Diagram

S4RS0A4502002



I4RS0A450003-

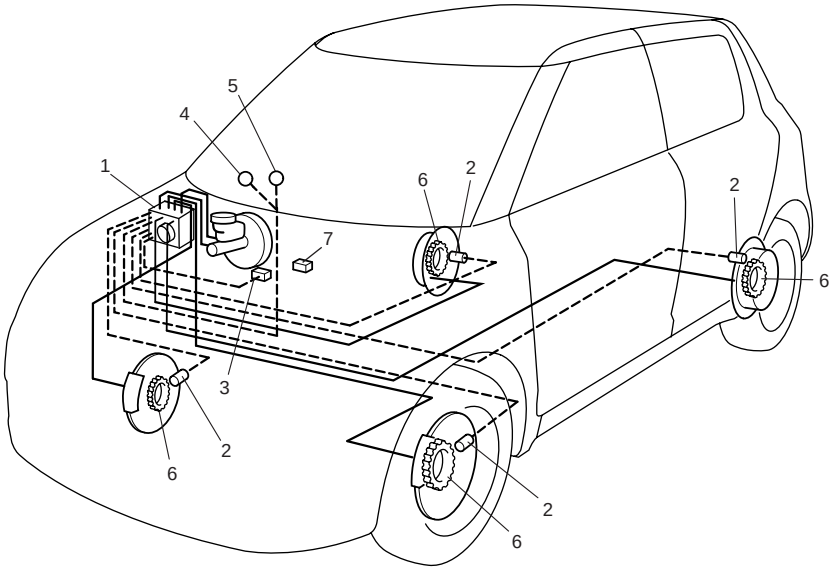
[A]: Terminal arrangement of ABS hydraulic unit / control module assembly	8. Lamp driver module	17. Left-front wheel speed sensor
a: Upside	9. ABS hydraulic unit / control module assembly	18. Data link connector
1. Battery	10. Solenoid valve power supply driver (transistor)	19. To ECM, TCM, SDM and BCM
2. Main fuse box	11. ABS pump motor driver (transistor)	20. Stop lamp
3. Ignition switch	12. Pump motor	21. Brake light switch
4. Circuit fuse box	13. Solenoid valves	22. Power control unit
5. Combination meter	14. Right-rear wheel speed sensor	23. Internal memory
6. ABS warning lamp	15. Left-rear wheel speed sensor	24. Solenoid valve driver (transistor)
7. EBD warning lamp (Brake warning lamp)	16. Right-front wheel speed sensor	

Terminal		Wire color	Circuit
E03	1	WHT/RED	ABS pump motor driver (Transistor)
	2	—	—
	3	GRN/WHT	Brake light switch
	4	—	—
	5	BLU	Dark link connector
	6	—	—
	7	GRN/ORN	Ignition switch
	8	—	—
	9	—	—
	10	—	—
	11	—	—
	12	—	—
	13	BLK	Ground
	14	WHT/BLU	Solenoid valve power supply driver (Transistor)
	15	LT GRN	Left–rear wheel speed sensor (+)
	16	LT GRN/BLK	Left–rear wheel speed sensor (–)
	17	RED/BLU	ABS warning lamp
	18	WHT/BLK	Right–front wheel speed sensor (–)
	19	WHT	Right–front wheel speed sensor (+)
	20	—	—
	21	RED	Left–front wheel speed sensor (+)
	22	RED/BLK	Left–front wheel speed sensor (–)
	23	PNK/BLK	EBD warning lamp (Brake warning lamp)
	24	BRN	Right–rear wheel speed sensor (–)
	25	YEL	Right–rear wheel speed sensor (+)
	26	BLK	Ground

Component Location

ABS Components Location

S4RS0A4503001

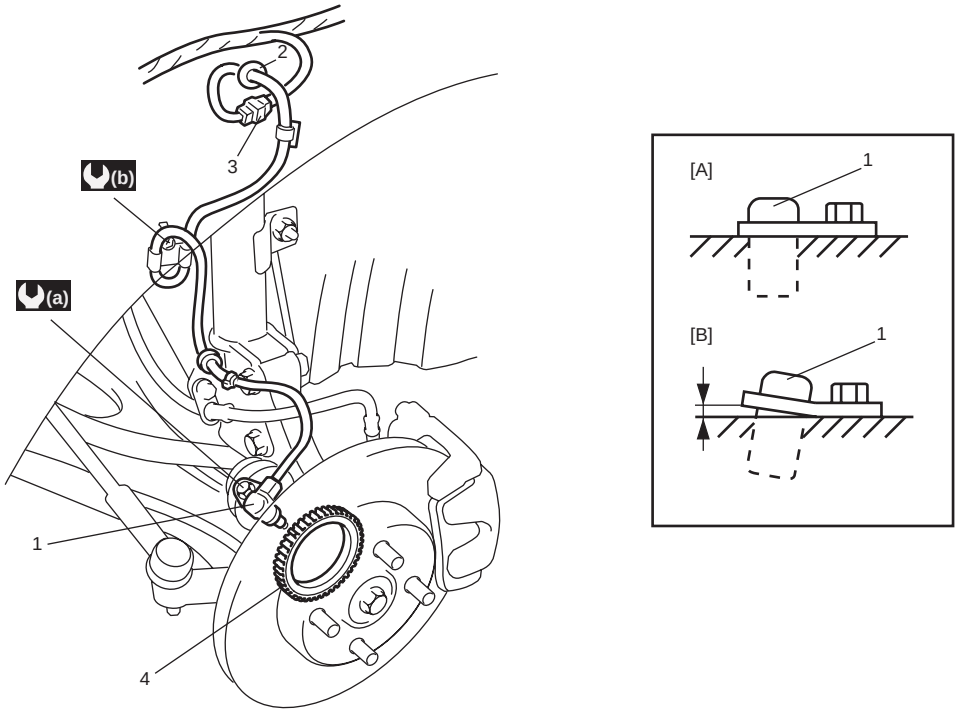


I4RS0A450004-

1. ABS hydraulic unit / control module assembly	5. EBD warning lamp (Brake warning lamp)
2. Wheel speed sensors	6. Wheel speed sensor rings
3. Stop lamp switch	7. Data link connector
4. ABS warning lamp	

Front Wheel Speed Sensor Components Location

S4RS0A4503002

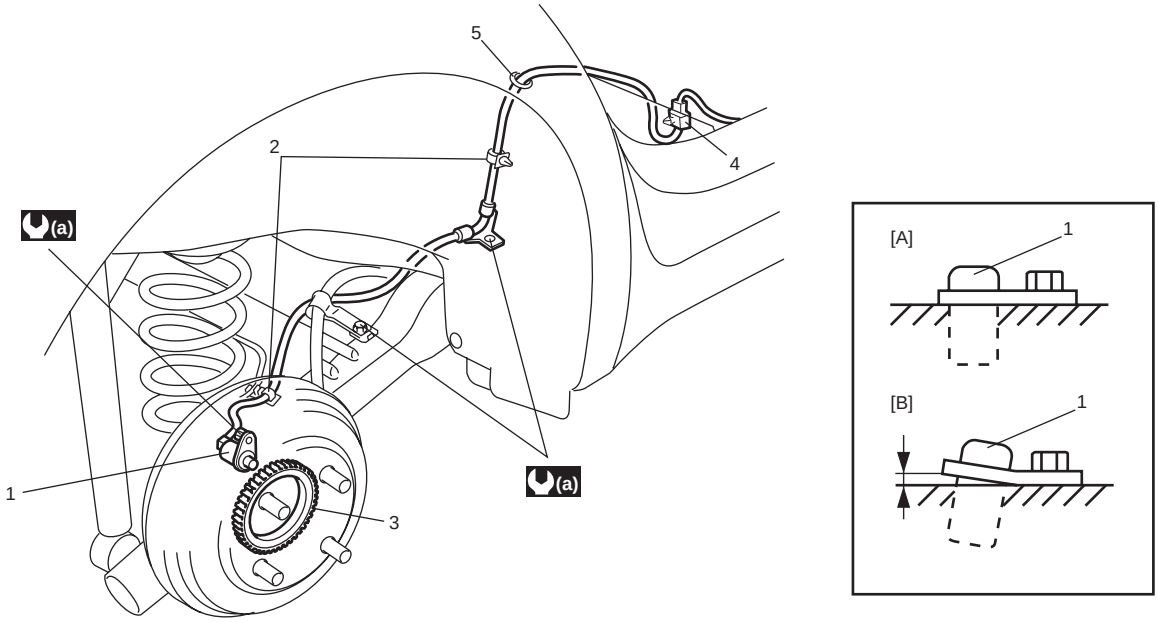


I4RS0A450005-

[A]: OK	1. Front wheel speed sensor	3. Connector	(a) 25 N·m (2.5 kg-m, 18.0 lb-ft)
[B]: NG	2. Grommet	4. Sensor ring	(b) 11 N·m (1.1 kg-m, 8.0 lb-ft)

Rear Wheel Speed Sensor Components Location

S4RS0A4503003



I4RS0A450006-

[A]: OK	1. Rear wheel speed sensor	3. Sensor ring	5. Grommet
[B]: NG	2. Clip	4. Connector	(a) 11 N·m (1.1 kg-m, 8.0 lb-ft)

Diagnostic Information and Procedures

ABS Check

S4RS0A4504001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ **Malfunction analysis** 1) Perform “Customer complaint analysis: ”. 2) Perform “Problem symptom confirmation: ”. 3) Perform “DTC check, record and clearance: ” and recheck DTC. *Is there any malfunction DTC?*	Go to Step 4.	Go to Step 2.
2	☞ **Driving test** 1) Perform “Step 2: Driving Test: ”. *Is trouble symptom identified?*	Go to Step 3.	Go to Step 6.
3	☞ **DTC check** 1) Perform “DTC Check: ”. *Is it malfunction code?*	Go to Step 4.	Go to Step 5.
4	☞ **ABS check** 1) Inspect and repair referring to applicable DTC flow. *Does trouble recur?*	Go to Step 5.	Go to Step 7.
5	☞ **Brakes diagnosis** 1) Inspect and repair referring to “Brakes Symptom Diagnosis: in Section 4A”. *Does trouble recur?*	Go to Step 3.	Go to Step 7.
6	☞ **Check for intermittent problem** 1) Check intermittent troubles referring to “Intermittent and Poor Connection Inspection: in Section 00” and related circuit of trouble code recorded in Step 1. *Does trouble recur?*	Go to Step 4.	Go to Step 7.
7	☞ **Final confirmation test** 1) Perform “Step 7: Final Confirmation Test: ”. *Does trouble recur?*	Go to Step 3.	End.

Step 1: Malfunction Analysis

Customer complaint analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer.
For this purpose, use of such a questionnaire form as shown in the following will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date of Reg:	Date of problem:	Mileage:

Problem Symptoms	● ABS warning lamp abnormal: fails to turn on/fails to go off/flashes ● Abnormal noise while vehicle is running: from motor, from valve, other_____ ● Wheel is locked at braking: ● Pump motor does not stop (running): ● Braking does not work: ● Other:
Frequency of occurrence	● Continuous/Intermittent (times a day, a month)/ other_____
Conditions for Occurrence of Problem	● Vehicle at stop & ignition switch ON: ● When starting: at initial start only/at every start/Other_____ ● Vehicle speed: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other_____ ● Road surface condition: Paved road/rough road/snow-covered road/ other_____ ● Chain equipment:
Environmental Condition	● Weather: fair/cloudy/rain/snow/other_____ ● Temperature: °F (°C)
Diagnostic Trouble Code	● First check: Normal code/malfunction code ( ) ● Second check after test drive: Normal code/malfunction code ( )

I2RH01450014-

Problem symptom confirmation

Check if what the customer claimed in "Customer Questionnaire" is actually found in the vehicle and if that symptom is found, whether it is identified as a failure. (This step should be shared with the customer if possible.) Check warning lamps related to brake system referring to "EBD Warning Lamp (Brake Warning Lamp) Check: " and "ABS Warning Lamp Check: ".

DTC check, record and clearance

Perform "DTC Check: " procedure, record it and then clear it referring to "DTC Clearance: ".
Recheck DTC referring to "DTC Check: ".
When DTC which is recorded at DTC check procedure is detected again after performing DTC clearance, go to "Step 4: ABS Check: " to proceed the diagnosis.
When DTC which is recorded at DTC check procedure is not indicated anymore after performing DTC clearance, ABS control module does not perform the system diagnosis, or temporary abnormality may occur, therefore go to "Step 2: Driving Test: " to proceed the diagnosis.

Step 2: Driving Test

Test drive the vehicle at 40 km/h for more than a minute and check if any trouble symptom (such as abnormal lighting of ABS warning light) exists.
If the malfunction DTC is confirmed again at ignition switch ON, driving test as described is not necessary. Proceed to Step 3.

Step 3: DTC Check
Recheck DTC referring to “DTC Check: ”.

Step 4: ABS Check
According to ABS Check for the DTC confirmation in Step 3, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator assembly or other part and repair or replace faulty parts.

Step 5: Brakes Diagnosis
Check the parts or system suspected as a possible cause referring to “Brakes Symptom Diagnosis: in Section 4A” and based on symptoms appearing on the vehicle (symptom obtained through Steps 1 and 2 and repair or replace faulty parts, if any).

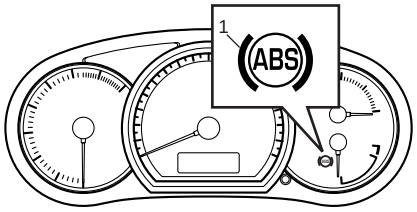
Step 6: Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection: in Section 00” and related circuit of trouble code recorded in Step 1 to 3.

Step 7: Final Confirmation Test
Confirm that the problem symptom has gone and the ABS is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once referring to “DTC Clearance: ” and perform test driving and confirm that no DTC is indicated.

ABS Warning Lamp Check

S4RS0A4504002

1) Turn ignition switch ON.
2) Check that ABS warning lamp (1) comes ON for about 2 seconds and then goes off.
   If any faulty condition is found, advance to “ABS Warning Lamp Does Not Come ON at Ignition Switch ON: ”, “ABS Warning Lamp Comes ON Steady: ” or “ABS Warning Lamp Flashes Continuously while Ignition Switch Is ON: ”.



I4RS0A450007-

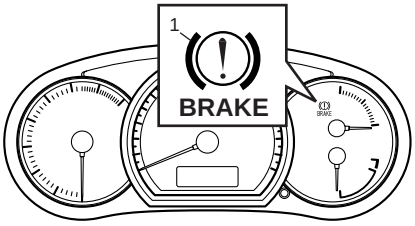
EBD Warning Lamp (Brake Warning Lamp) Check

S4RS0A4504003

NOTE:

Perform this check on a level place.

1) Turn ignition switch ON with parking brake applied.
2) Check that EBD warning lamp (brake warning lamp) (1) is turned ON.
3) Release parking brake with ignition switch ON and check that EBD warning lamp (brake warning lamp) goes off.
   If it doesn’t go off, go to “EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady: ”.



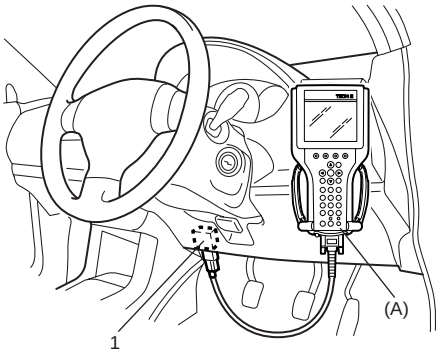
I4RS0A450008-

DTC Check

S4RS0A4504004

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (1).

   Special tool
   (A): SUZUKI scan tool



I4RS0A450009-

3) Turn ignition switch to ON position.
4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to SUZUKI scan tool operator’s manual for further details.

NOTE:

If SUZUKI scan tool can not communicate ABS hydraulic unit / control module, perform "Serial Data Link Circuit Check: ".

5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from DLC.

DTC Table

S4RS0A4504005

CAUTION:

Be sure to perform "ABS Check: " before starting diagnosis.

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	
NO DTC	Normal	
☞C1021	RF	Wheel speed sensor circuit
☞C1025	LF	
☞C1031	RR	
☞C1035	LR	
☞C1022	RF	Wheel speed sensor circuit or sensor ring
☞C1026	LF	
☞C1032	RR	
☞C1036	LR	
☞C1041	RF	Inlet solenoid valve circuit
☞C1042		Outlet solenoid valve circuit
☞C1045	LF	Inlet solenoid valve circuit
☞C1046		Outlet solenoid valve circuit
☞C1051	RR	Inlet solenoid valve circuit
☞C1052		Outlet solenoid valve circuit
☞C1055	LR	Inlet solenoid valve circuit
☞C1056		Outlet solenoid valve circuit
☞C1057	Power source	
☞C1061	ABS pump motor and/or motor driver circuit	
☞C1063	Solenoid valve power supply driver circuit	
☞C1071	ABS control module	

DTC Clearance

S4RS0A4504006

WARNING:

When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure or using SUZUKI scan tool.

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch to ON position.
3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further derails.

NOTE:

For DTC C 1021, C1022, C1025, C1026, C1031, C1032, C1035, C1036 and C1061, confirm that ABS warning lamp turns off after performing Step 2 of "Test Driving" under "ABS Check: ", and then clear the DTCs.

4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.
5) Perform "Driving Test" (Step 2 of "ABS Check: ") and "DTC Check: " and confirm that NO DTC is displayed on scan tool.

Scan Tool Data

S4RS0A4504007

The parameter data below are values measured with the scan tool when the normally operating vehicle is under the following conditions. When taking measurements for comparison by using the scan tool, be sure to check that the vehicle is under the following conditions.

- Apply parking brake and block wheels.
- Ignition switch ON.
- Turn OFF air conditioner (if equipped).
- Apply no load to power steering (if equipped). (Don't turn it)
- Turn OFF all electric loads (except ignition).
- No DTC.
- ABS is not operated. (Normal braking operation)

Scan Tool Data	Standards	Condition
Battery Voltage	10.0 – 16.0 V	—
Pump Motor Driver	0.0 V	—
RF Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
LF Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
RR Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
LR Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
Brake Switch	ON	Brake pedal depressed
	OFF	Brake pedal released

Scan Tool Data Definition

Battery Volt (V): Battery Voltage is an analog input signal read by the ABS control module. Certain ABS control module functions will be modified if the battery voltage falls below or rises above programmed thresholds.

Pump Motor Driver (V): This parameter indicates the operational condition of the pump motor driver (transistor).

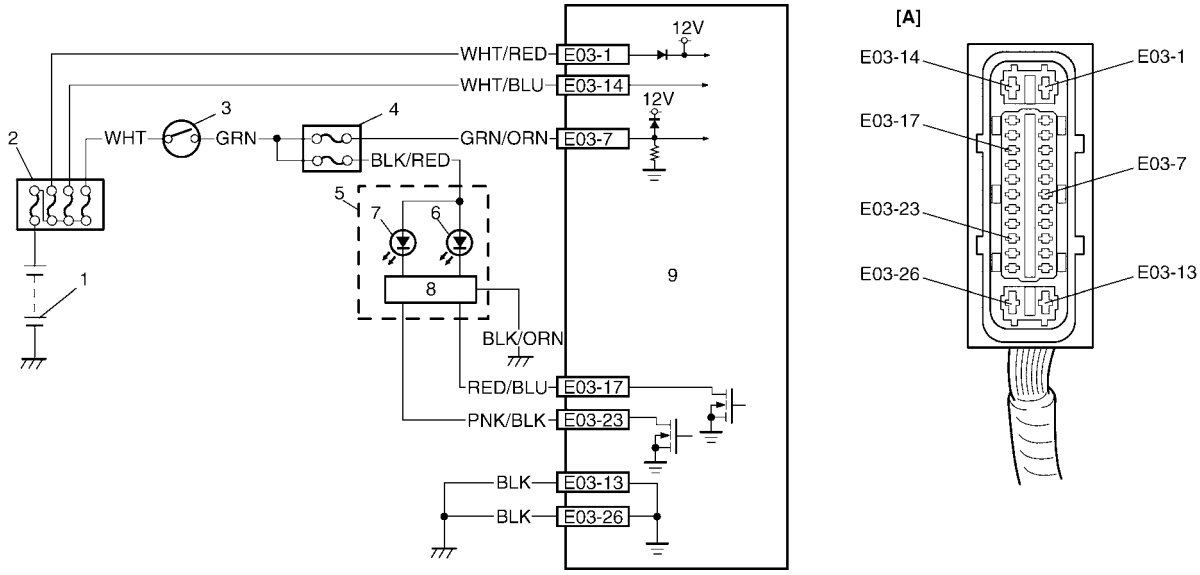
RF Wheel Speed, LF Wheel Speed, RR Wheel Speed and LF Wheel Speed (km/h, MPH): Wheel speed is an ABS control module internal parameter. It is computed by reference pulses from the wheel speed sensor.

Brake Switch (ON, OFF): This switch signal informs the ABS control module whether the brake is active or not.

ABS Warning Lamp Does Not Come ON at Ignition Switch ON

S4RS0A4504008

Wiring Diagram



I4RS0A450010-

[A]: ABS hydraulic unit / control module connector E03	4. Circuit fuse box	8. Lamp driver module
1. Battery	5. Combination meter	9. ABS hydraulic unit / control module assembly
2. Main fuse box	6. ABS warning lamp	
3. Ignition switch	7. EBD warning lamp (Brake warning lamp)	

Circuit Description

Operation (ON/OFF) of ABS warning lamp is controlled by ABS control module through lamp driver module in combination meter.

If the antilock brake system is in good condition, ABS control module turns ABS warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ABS warning lamp is turned ON continuously by ABS control module. Also, it is turned ON continuously by lamp driver module when the connector of ABS control module is disconnected.

Troubleshooting

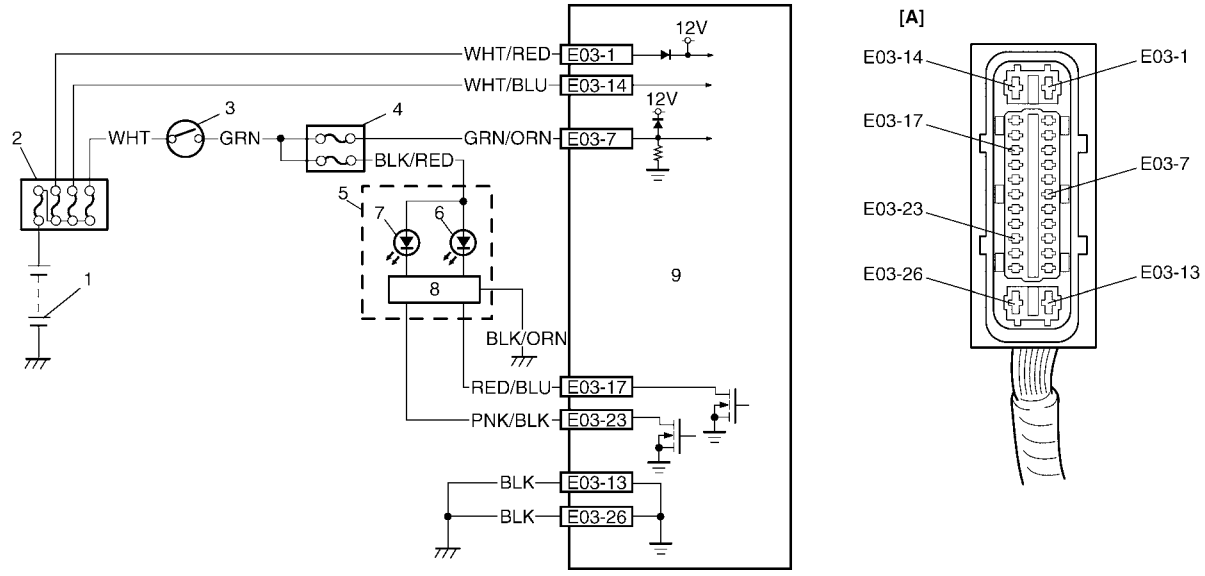
Step	Action	Yes	No
1	1) Turn ignition switch to ON position. *Do other warning lamps come ON?*	Go to Step 2.	Go to Step 4.
2	1) Turn OFF ignition switch. 2) Disconnect ABS hydraulic unit / control module connector. 3) Turn ON ignition switch. *Does ABS warning lamp light with ignition switch ON?*	Replace ABS hydraulic unit / control module assembly.	Go to Step 3.

Step	Action	Yes	No
3	1) Remove combination meter with ignition switch turned OFF. 2) Measure resistance between “RED/BLU” wire of combination meter connector and vehicle body ground. *Is it infinite (∞)?*	Go to Step 6.	“RED/BLU” circuit shorted to ground.
4	*Is Circuit fuse for combination meter in good condition?*	Go to Step 5.	Replace fuse and check for short circuit to ground.
5	1) Remove combination meter with ignition switch turned OFF. 2) Check for proper connection to “RED/BLK” wire of combination meter connector. 3) If OK, turn ON ignition switch and measure voltage at “RED/BLK” wire of combination meter connector. *Is it 10 – 14 V?*	Go to Step 6.	Repair power supply circuit for combination meter.
6	1) Measure resistance between “BLK/ORN” wire of combination meter connector and ground. *Is resistance below 5 Ω?*	Replace combination meter.	“BLK/ORN” circuit open or high resistance.

ABS Warning Lamp Comes ON Steady

S4RS0A4504009

Wiring Diagram



I4RS0A450010-

[A]: ABS hydraulic unit / control module connector E03	4. Circuit fuse box	8. Lamp driver module
1. Battery	5. Combination meter	9. ABS hydraulic unit / control module assembly
2. Main fuse box	6. ABS warning lamp	
3. Ignition switch	7. EBD warning lamp (Brake warning lamp)	

Circuit Description

Operation (ON/OFF) of ABS warning lamp is controlled by ABS control module through lamp driver module in combination meter.

If the Antilock brake system is in good condition, ABS control module turns ABS warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ABS warning lamp is turned ON continuously by ABS control module. Also, it is turned ON continuously by lamp driver module when the connector of ABS control module is disconnected.

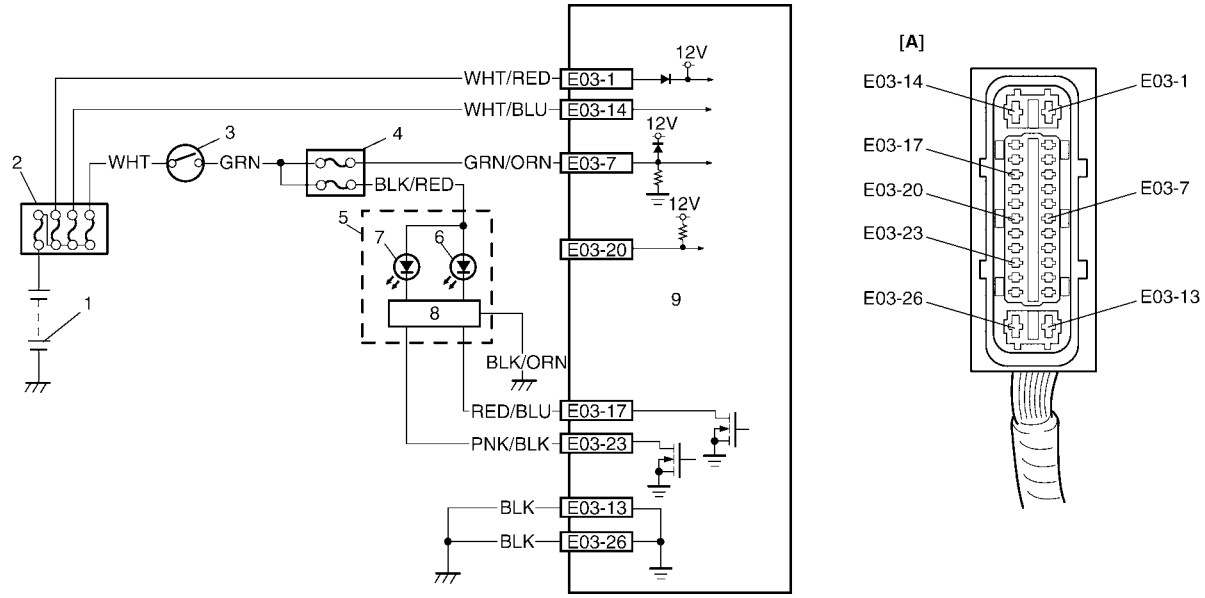
Troubleshooting

Step	Action	Yes	No
1	1) Perform diagnostic trouble code check. *Is there any DTC(s)?*	Go to Step 7 of "ABS Check: ".	Go to Step 2.
2	*Are main fuses for ABS pump motor and ABS solenoid in good condition?*	Go to Step 3.	Replace fuse and check circuit for short to ground.
3	1) Turn ignition switch to OFF. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-7", "E03-13" and "E03-17". 4) If OK then turn ignition switch to ON position and measure voltage between terminal "E03-7" and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	"GRN/ORN" circuit open.
4	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-1" and "E03-14". 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of "E03-1", "E03-14" and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	"WHT/RED" and/or "WHT/BLU" circuit open.
5	1) Turn ignition switch to ON and light the ABS warning lamp. 2) Connect terminal "E03-17" of disconnected ABS hydraulic unit / control module connector to vehicle body ground using service wire. *Does ABS warning lamp turn off?*	Go to Step 6.	"RED/BLU" circuit open. If wire and connection are OK, replace combination meter.
6	1) Turn ignition switch to OFF and measure resistance between each terminal of "E03-13", "E03-26" and vehicle body ground. *Is resistance less than 2 Ω?*	Substitute a known-good ABS hydraulic unite / control module assembly and recheck.	Ground circuit for ABS hydraulic unit / control module open or high resistance.

ABS Warning Lamp Flashes Continuously while Ignition Switch Is ON

S4RS0A4504010

Wiring Diagram



I4RS0A450011-

[A]: ABS hydraulic unit / control module connector E03	5. Combination meter
1. Battery	6. ABS warning lamp
2. Main fuse box	7. EBD warning lamp (brake warning lamp)
3. Ignition switch	8. Lamp driver module
4. Circuit fuse box	9. ABS hydraulic unit / control module assembly

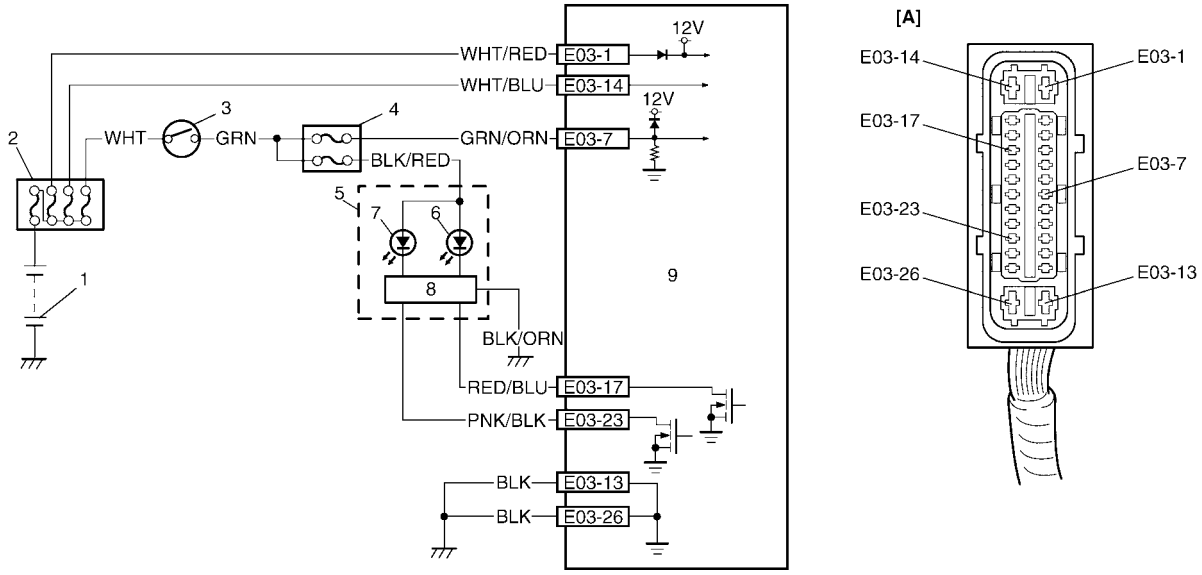
Troubleshooting

Step	Action	Yes	No
1	1) Check for proper connection to ABS control module at ABS hydraulic unit / control module connector. *Is it in good condition?*	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.	“E03-20” terminal shorted to ground.

EBD Warning Lamp (Brake Warning Lamp) Comes ON Steady

S4RS0A4504012

Wiring Diagram



I4RS0A450010-

[A]: ABS hydraulic unit / control module connector E03	4. Circuit fuse box	8. Lamp driver module
1. Battery	5. Combination meter	9. ABS hydraulic unit / control module assembly
2. Main fuse box	6. ABS warning lamp	
3. Ignition switch	7. EBD warning lamp (Brake warning lamp)	

Circuit Description

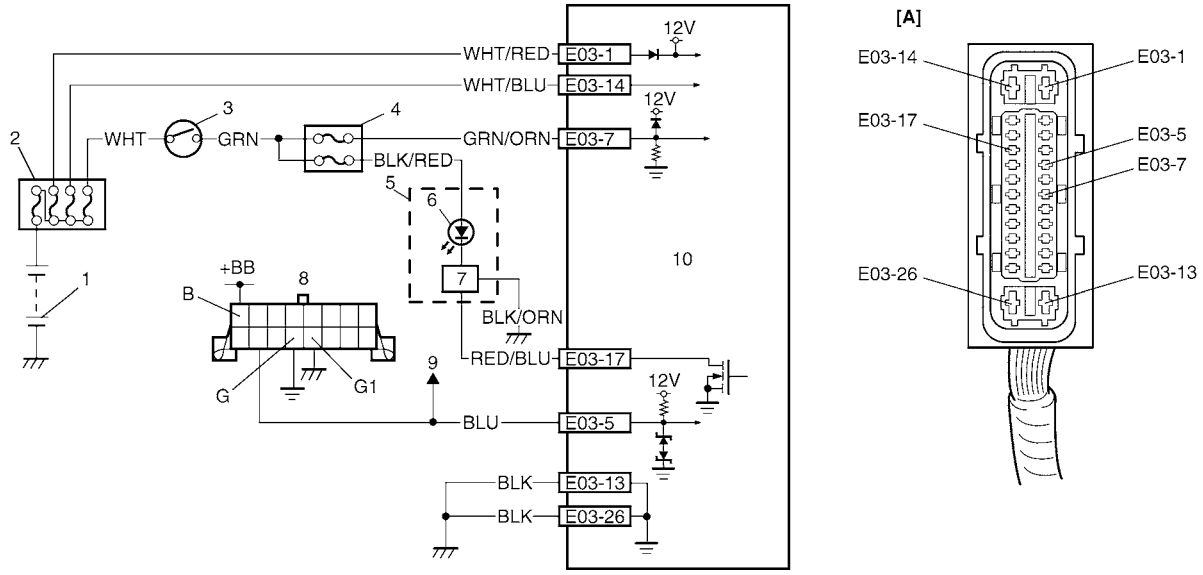
EBD warning lamp (brake warning lamp) is controlled by parking brake switch, brake fluid level switch and ABS hydraulic unit / control module assembly through lamp driver module in combination meter.

Troubleshooting

Step	Action	Yes	No
1	1) Make sure that: • Parking brake is completely released. • Brake fluid level is upper than the minimum level. *Are the check results OK?*	Go to Step 2.	Release parking brake completely and/or replenish brake fluid.
2	1) Turn ignition switch to ON position. *Does "ABS" warning lamp come on steady?*	Perform "ABS Warning Lamp Comes ON Steady: " previously outlined.	Go to Step 3.
3	1) Turn ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-23". 4) If OK, apply chocks to wheels and select gear in neutral position. 5) Keep brake pedal depressed and start engine. Release parking brake. 6) Connect terminal "E03-23" of disconnected ABS hydraulic unit / control module connector to ground using service wire. *Does brake warning lamp turn off?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	"PNK/BLK" circuit open. If wire and connection are OK, replace combination meter.

Serial Data Link Circuit Check

S4RS0A4504013

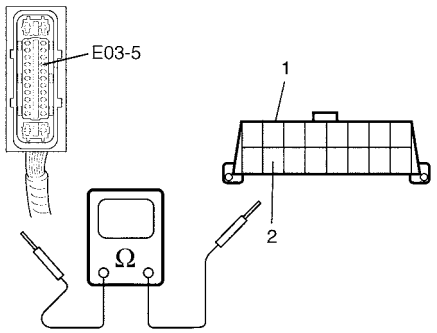


I4RS0A450012-

[A]: ABS hydraulic unit / control module connector E03			
1. Battery	4. Circuit fuse box	7. Lamp driver module	10. ABS hydraulic unit / control module assembly
2. Main fuse box	5. Combination meter	8. Data link connector (DLC)	
3. Ignition switch	6. ABS warning lamp	9. To ECM, TCM control module and SDM	

Inspection

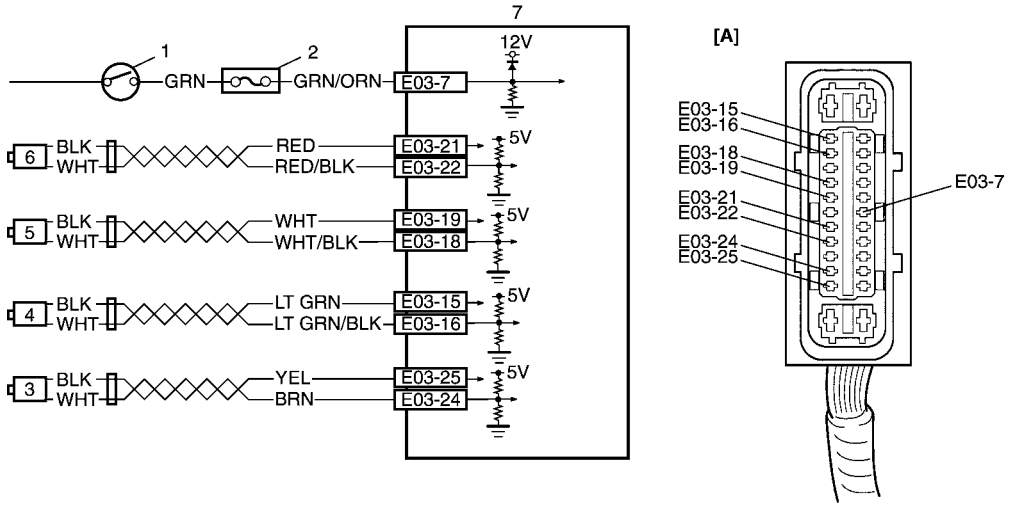
Step	Action	Yes	No
1	1) Turn ignition switch to ON position. *Does ABS warning lamp come ON?*	Go to Step 2.	Go to Step 6.
2	1) Turn ignition switch to OFF position. *Are main fuses for ABS pump motor and ABS solenoid in good condition?*	Go to Step 3.	Replace fuse and check for short.
3	1) Disconnect ABS hydraulic unit / control module connector. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminal “E03-7”. 3) If OK then turn ignition switch to ON position and measure voltage between terminal “E03-7” and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	“GRN/ORN” wire circuit open.
4	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-1” and “E03-14”. 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of “E03-1”, “E03-14” and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	“WHT/RED” and / or “WHT/BLU” wire circuit open.

Step	Action	Yes	No
5	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-13” and “E03-26”. 3) If OK, measure resistance between each terminal of “E03-13”, “E03-26” and vehicle body ground. *Are resistance less than 2 Ω?*	Go to Step 6.	Ground circuit for ABS hydraulic unit / control module open or high resistance.
6	1) Check if communication is possible by trying communication with other controller (ECM, TCM or SDM). *Is it possible to communicate with other controller?*	Go to Step 7.	Repair open in common section of serial data circuit (“PPL/WHT” wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit (“PPL/WHT” wire circuit).
7	1) Turn ignition switch to ON position. 2) Measure voltage between terminal B of data link connector and vehicle body ground. *Is voltage 10 – 12 V?*	Go to step 8.	Terminal B circuit open or shorted to ground.
8	1) Turn ignition switch to OFF position. 2) Measure resistance between the following terminals; • Terminal G of data link connector and vehicle body ground. • Terminal G1 of data link connector and vehicle body ground. *Is each resistance 1Ω or less?*	Go to step 9.	Terminal G and/or G1 circuit open or high resistance.
9	1) Turn ignition switch to OFF position. 2) Check proper connection at “E03-5” (“PPL/WHT” wire) terminal for serial data circuit. 3) If OK, then check resistance between “E03-5” (“PPL/WHT” wire) terminal and “PPL/WHT” wire terminal (2) for serial data circuit in DLC (1). *Is resistance 1 Ω or less?*  I4RS0A450013-	Substitute a known-good ABS hydraulic unit / control module and recheck.	Repair high resistance or open in “PPL/WHT” wire circuit for anti lock brake system.

DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Sensor Ring

S4RS0A4504015

Wiring Diagram



I4RS0A450014-

[A]: ABS hydraulic unit / control module connector E03	3. Right-rear wheel speed sensor	6. Left-front wheel speed sensor
1. Ignition switch	4. Left-rear wheel speed sensor	7. ABS hydraulic unit / control module assembly
2. Circuit fuse box	5. Right-front wheel speed sensor	

DTC Detecting Condition

The ABS control module monitors the voltage at the terminal of each sensor while the ignition switch is ON. When the voltage is not within the specified range, an applicable DTC will be set. Also, when no sensor signal is inputted at running, an applicable DTC will be set.

NOTE:

When the vehicle was operated in any of the following ways, one of these DTCs may be set even when the sensor is in good condition. If such possibility is suspected, clear DTC once referring to "DTC Clearance: " and then performing the driving test as described in Step 2 of "ABS Check: ", check whether or not any abnormality exists.

- **The vehicle was driven with parking brake pulled.**
- **Wheel spin occurred while driving.**
- **Wheel(s) was turned while the vehicle was jacked up.**
- **The vehicle was stuck.**

DTC Troubleshooting

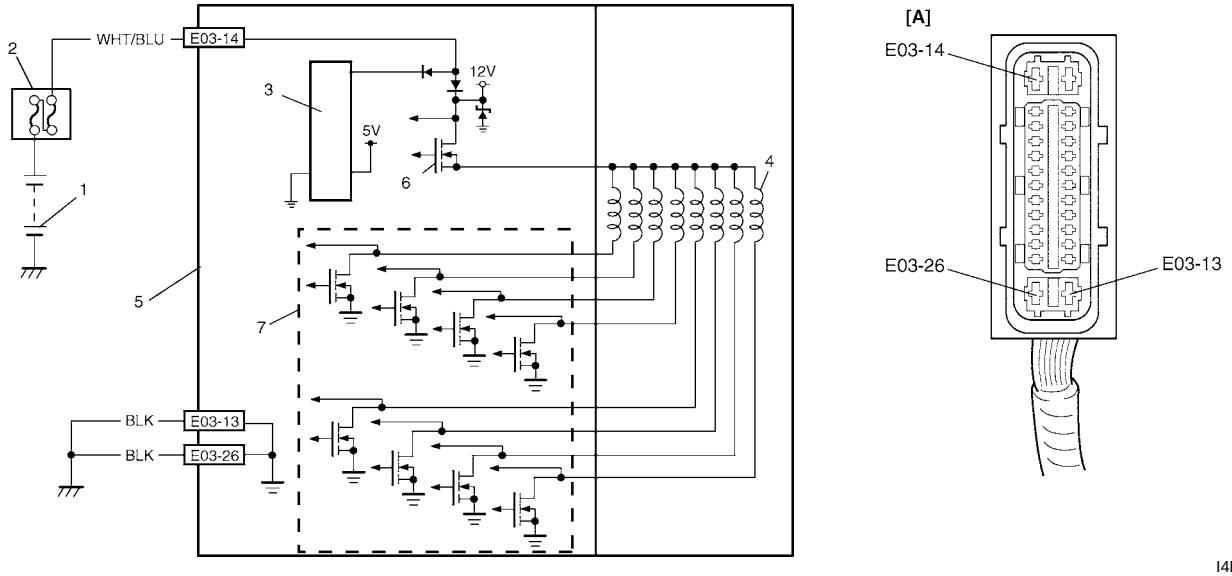
Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	1) Disconnect applicable ABS wheel speed sensor coupler with ignition switch OFF. 2) Measure resistance between terminals of ABS wheel speed sensor. Refer to "Front Wheel Speed Sensor Inspection: " and/or "Rear Wheel Speed Sensor Inspection: ". *Is measured resistance value as specified?*	Go to Step 3.	Replace ABS wheel speed sensor assembly.

Step	Action	Yes	No
3	1) Turn ignition switch OFF. 2) Connect applicable ABS wheel speed sensor coupler. 3) Disconnect ABS hydraulic unit / control module connector. 4) Check for proper connection to ABS control module at each sensor terminal. 5) If OK, then turn ignition switch ON and measure voltage between applicable sensor terminal of module connector and body ground. *Is it 0 V?*	Go to Step 4.	ABS wheel speed sensor circuit shorted to power.
4	1) Turn ignition switch OFF. 2) Measure resistance between the following points. • Both ABS hydraulic unit / control module connector terminals of the corresponding sensor. This check result should be the same as Step 2). • Either terminal of wheel speed sensor coupler and body ground. This check result should be no continuity. *Are both check results OK?*	Go to Step 5.	Circuit open or shorted to ground.
5	1) Remove applicable ABS wheel speed sensor. 2) Check sensor for damage or foreign material attached. *Is it in good condition?*	Go to Step 6.	Clean, repair or replace.
6	Check front and/or rear sensor ring for the following (remove rear drum as necessary): • Sensor ring serration (teeth) neither missing nor damaged • No foreign material being attached • Sensor ring not being eccentric • Wheel bearing free from excessive play *Are they in good condition?*	Go to Step 7.	Clean, repair or replace.
7	1) Install ABS wheel speed sensor to knuckle. 2) Tighten sensor bolt to specified torque and check that there is no clearance between sensor and knuckle. *Is it OK?*	Go to Step 8.	Replace ABS wheel speed sensor.
8	Refer to “Front Wheel Speed Sensor On-Vehicle Inspection: ” and/or “Rear Wheel Speed Sensor On-Vehicle Inspection: ”, check output voltage or waveform. *Is specified voltage and/or waveform obtained?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	Replace sensor and recheck.

DTC C1041 / C1045 / C1051 / C1055, DTC C1042 / C1046 / C1052 / C1056: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Circuit, Right-Front / Left-Front / Right-Rear / Left-Rear Outlet Solenoid Circuit

S4RS0A4504016

Wiring Diagram



I4RS0A450015-

[A]: ABS hydraulic unit / control module assembly connector E03	3. ABS power control module	6. Solenoid valve power supply driver (transistor)
1. Battery	4. Solenoid valve	7. Solenoid valve driver (transistor)
2. Main fuse box	5. ABS hydraulic unit / control module assembly	

DTC Detecting Condition

The ABS control module monitors the output from the valve.
When the output of each valve exceeds the specified value compared with the signal sent from ABS control module, this DTC is set.

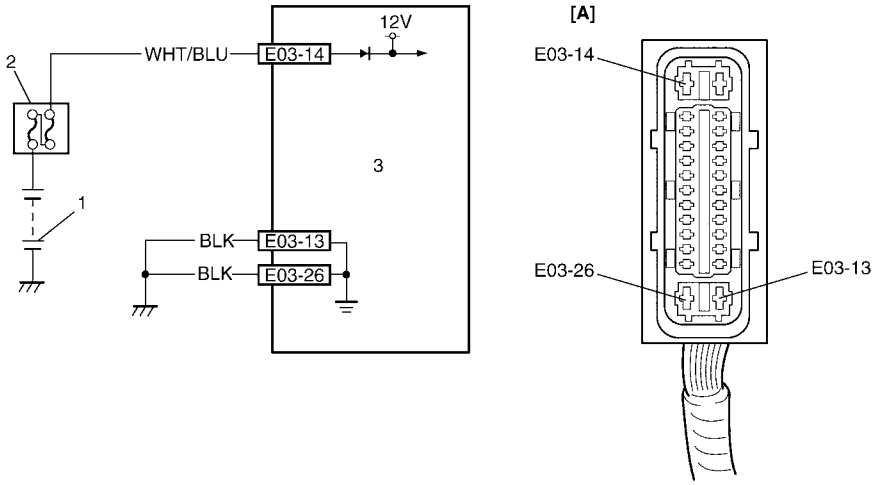
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	1) Turn ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminal "E03-14". 4) If OK, then measure voltage between terminal "E03-14" of module connector and "E03-26". *Is it 10 – 14 V?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	"WHT/BLU" or "BLK" circuit open.

DTC C1057: Power Source Circuit

S4RS0A4504017

Wiring Diagram



I4RS0A450016-

[A]: ABS hydraulic unit / control module connector E03	2. Main fuse box
1. Battery	3. ABS hydraulic unit / control module assembly

DTC Detecting Condition

The ABS control module monitors the power source voltage at terminal “E03-14”. When the power source voltage becomes extremely high or low while vehicle is running at more than 20 km/h (13 MPH), this DTC will be set. As soon as the power source voltage becomes normal, the ABS warning lamp will be turned off and the ABS control module will return to normal operation, but the set DTC will be remain.

DTC Troubleshooting

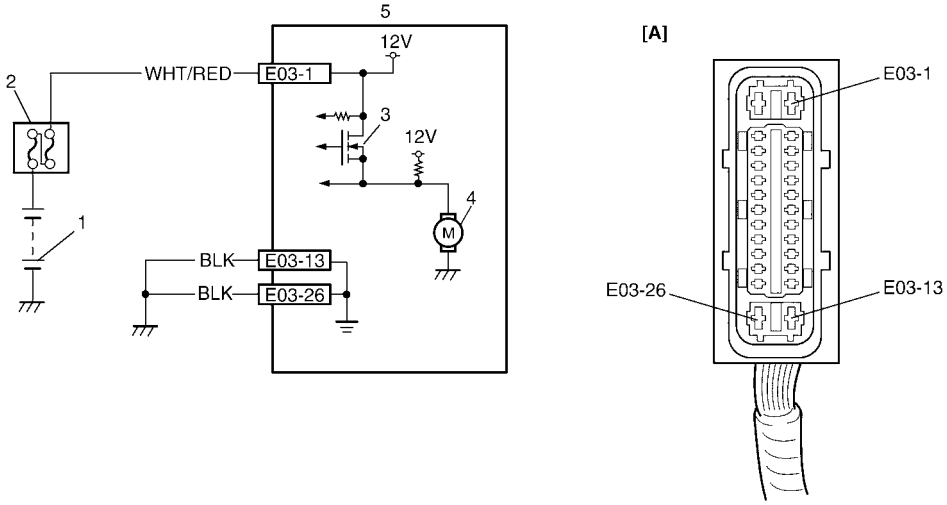
Step	Action	Yes	No
1	*Was “ABS Check” performed?*	Go to Step 2.	Go to “ABS Check: ”.
2	1) Disconnect ABS hydraulic unit / control module connector with ignition switch turned OFF. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-14” and “E03-13”. 3) If OK, then turn ignition switch to ON position and measure voltage between terminals “E03-14” and “E03-13”. *Is voltage 9.7 ± 0.3 V or more?*	Go to Step 5.	Go to Step 3.
3	1) Turn ignition switch to OFF. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-13” and “E03-26”. 3) If OK then turn ignition switch to ON and measure resistance between each terminal of “E03-13” and “E03-26” and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 4.	“BLK” wire circuit in open or high resistance.
4	1) Measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 9.7 ± 0.3 V or more?*	Imperfect short between “WHT/BLU” wire circuit and body ground.	Check charging system referring to “Generator Test (Undercharged Battery Check): in Section 1J”.

Step	Action	Yes	No
5	1) Measure voltage between terminals “E03-14” and “E03-13” with engine running. *Is voltage 18 ± 1.0 V or less?*	Poor connection of “E03-14” and/or “E03-13” terminals. If the terminals are in good condition, substitute a known-good ABS hydraulic unit / control module and recheck.	Check charging system referring to “Generator Test (Overcharged Battery Check): in Section 1J”.

DTC C1061: ABS Pump Motor and/or Motor Driver Circuit

S4RS0A4504018

Wiring Diagram



I4RS0A450017-

[A]: ABS hydraulic unit / control module connector E03	2. Main fuse box	4. ABS pump motor
1. Battery	3. Pump motor driver (transistor)	5. ABS hydraulic unit / control module assembly

DTC Detecting Condition

The ABS control module monitors the voltage at monitor terminal of pump motor circuit constantly with the ignition switch turned ON. It sets this DTC when the voltage at the monitor terminal does not become high / low according to ON/OFF commands to the motor driver (transistor) of the module (does not follow these commands).

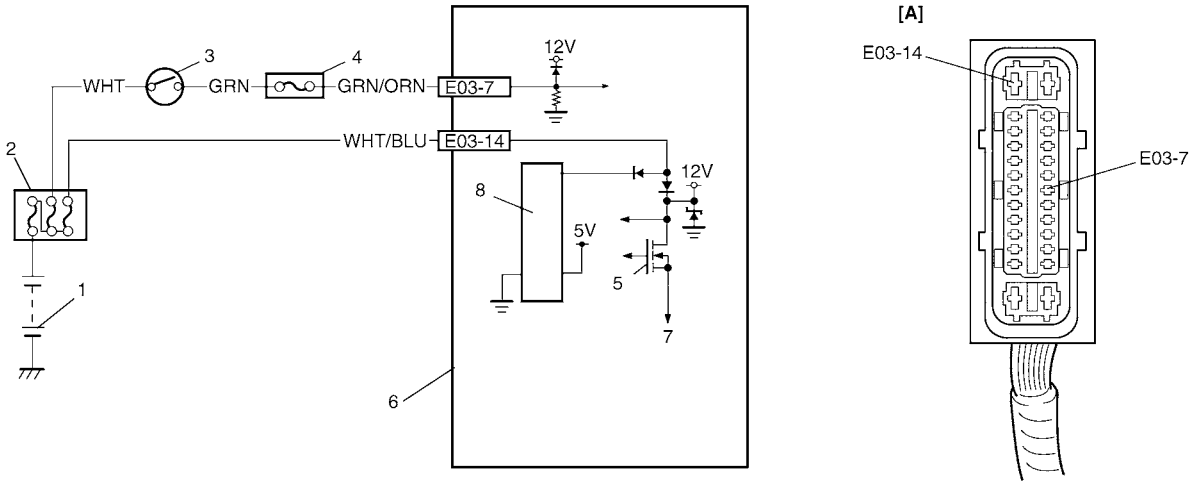
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “ABS Check” performed?*	Go to Step 2.	Go to “ABS Check: ”.
2	1) Turn Ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminal “E03-1”. 4) If OK, then measure voltage between terminal “E03-1” of module connector and body ground. *Is it 10 – 14 V?*	Go to Step 3.	“WHT/RED” circuit open.
3	Measure resistance between terminal “E03-13” and “E03-26” of ABS hydraulic unit / control module connector and body ground. *Is resistance less than 1 Ω?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	Ground circuit for ABS hydraulic unit / control module open or high resistance.

DTC C1063: Solenoid Valve Power Supply Driver Circuit

S4RS0A4504019

Wiring Diagram



I4RS0A450018-

[A]: ABS hydraulic unit / control module connector E03	5. Solenoid valve power supply driver (transistor)
1. Battery	6. ABS hydraulic unit / control module assembly
2. Main fuse box	7. To solenoid valve
3. Ignition switch	8. ABS power control module
4. Circuit fuse box	

DTC Detecting Condition

ABS control module monitors the voltage at the terminal of solenoid circuit constantly with ignition switch turned ON. Also, immediately after ignition switch is turned ON, perform initial check as follows.
Switch solenoid valve power supply driver (transistor) in the order of OFF → ON and check if voltage changes to Low → High. If anything faulty is found in the initial check and when the voltage is low with ignition switch turned ON, this DTC will be set.

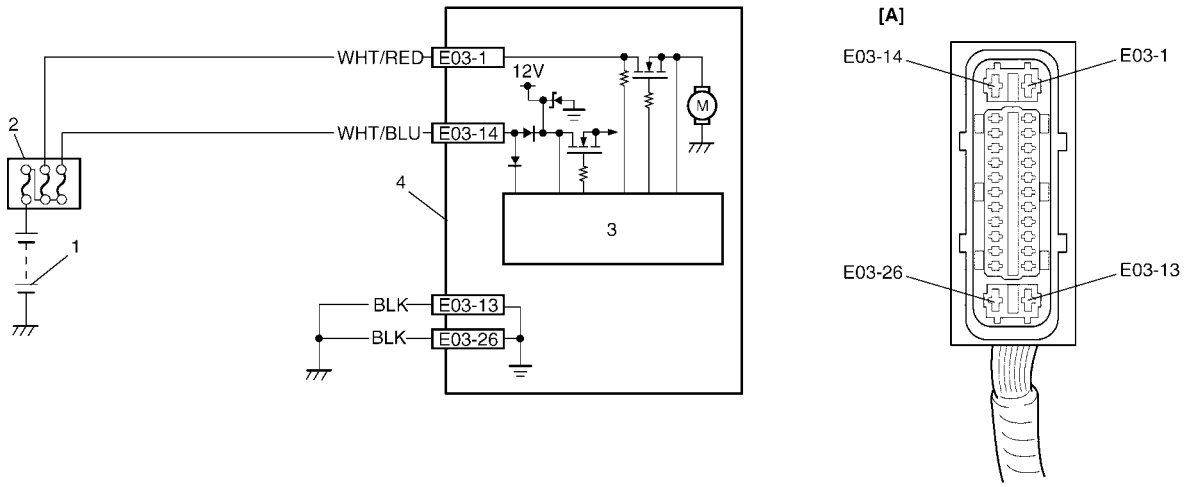
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	Check battery voltage. *Is it about 11 V or higher?*	Go to Step 3.	Check charging system referring to "Battery Inspection: in Section 1J" and "Generator Test (Undercharged Battery Check): in Section 1J".
3	Check main fuse for ABS solenoid and its terminal. *Is it in good condition?*	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	1) Turn ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module at terminal "E03-14". 4) If OK, then measure voltage between connector terminal "E03-14" and body ground. *Is it 10 – 14 V?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	"WHT/BLU" circuit imperfect short to ground.

DTC C1071: ABS Control Module

S4RS0A4504020

Wiring Diagram



I4RS0A450019-

[A]: ABS hydraulic unit / control module connector E03	2. Main fuse box	4. ABS hydraulic unit / control module assembly
1. Battery	3. ABS power control module	

DTC Detecting Condition

This DTC will be set when an internal malfunction is detected in the ABS control module.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check: ".
2	Clear all DTCs and check DTC. *Is it DTC C1071?*	Go to Step 3.	Could be a temporary malfunction of the ABS control module.
3	1) Check for proper connection of ABS hydraulic unit / control module connector. 2) If OK, disconnect ABS hydraulic unit / control module connector and check the following. • Voltage "E03-1" terminal: 10 – 14 V • Voltage "E03-14" terminal: 10 – 14 V • Resistance between "E03-13" and body ground: Continuity • Resistance between "E03-26" and body ground: Continuity *Are the check result as specified?*	Replace ABS hydraulic unit / control module assembly.	Repair "WHT/RED", "WHT/BLU" and/or "BLK" circuit and recheck.

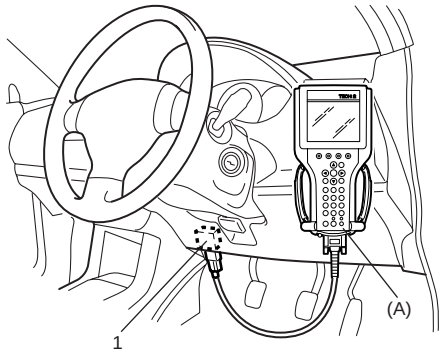
Repair Instructions

ABS Hydraulic Unit Operation Check

S4RS0A4506001

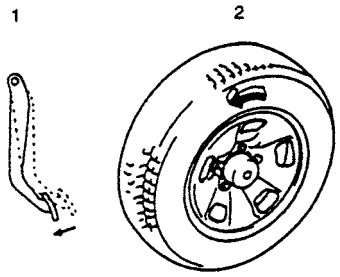
1) Check that basic brake system other than ABS is in good condition.
2) Check that battery voltage is 11 V or higher.
3) Lift up vehicle.
4) Set transmission to neutral and release parking brake.
5) Turn each wheel gradually by hand to check if brake dragging occurs. If it does, correct.
6) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

   Special tool
   (A): SUZUKI scan tool



I4RS0A450020-

7) Turn ignition switch to ON position and select menu to “HYDRAULIC CONTROL TEST” under “miscellaneous test” (“MISC. TEST”) mode of SUZUKI scan tool.
8) Perform the following checks with help of another person.
   Brake pedal (1) should be depressed and then select testing wheel by SUZUKI scan tool and the wheel (2) should be turned by another person’s hand. At this time, check that:
   - Operation sound of solenoid is heard and the wheel turns only about 0.5 sec. (Brake force is depressurized).
   - Operation sound of pump motor is heard and pulsation is felt at brake pedal.



I4RH01450021-

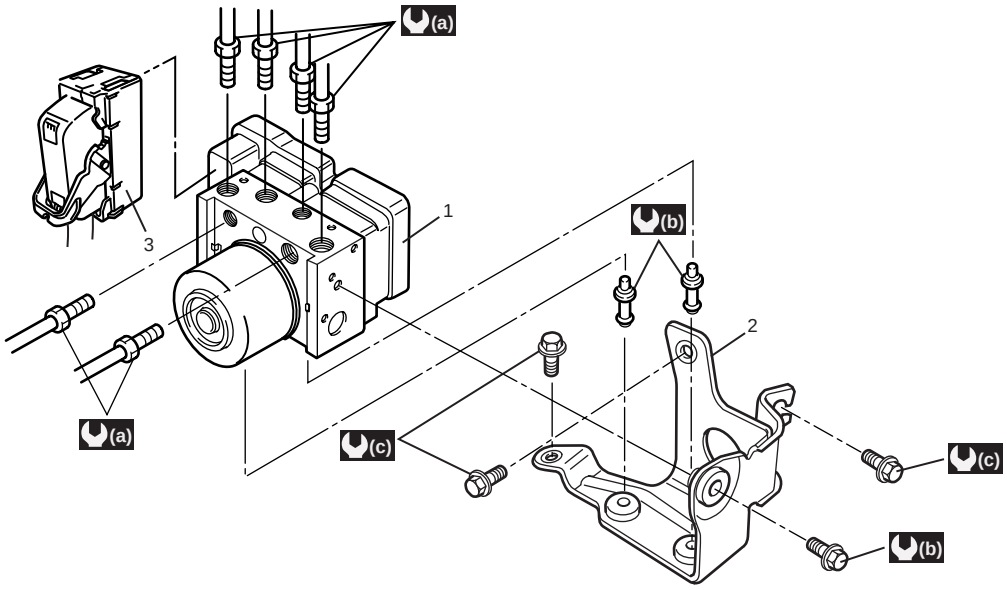
9) Check for all 4-wheels condition respectively. If a faulty condition is found, replace hydraulic unit / control module assembly.
10) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

ABS Hydraulic Unit / Control Module Assembly Components

S4RS0A4506002

CAUTION:

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit / control module assembly.



I4RS0A450021-

1. ABS hydraulic unit / control module assembly	3. Connector	(b) 9 N·m (0.9 kg-m, 6.5 lb-ft)
2. Bracket	(a) 16 N·m (1.6 kg-m, 11.5 lb-ft)	(c) 25 N·m (2.5 kg-m, 18.0 lb-ft)

ABS Hydraulic Unit / Control Module Assembly On-Vehicle Inspection

S4RS0A4506003

CAUTION:

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit / control module assembly.

Check hydraulic unit for fluid leakage.
If any, repair or replace.

ABS Hydraulic Unit / Control Module Assembly Removal and Installation

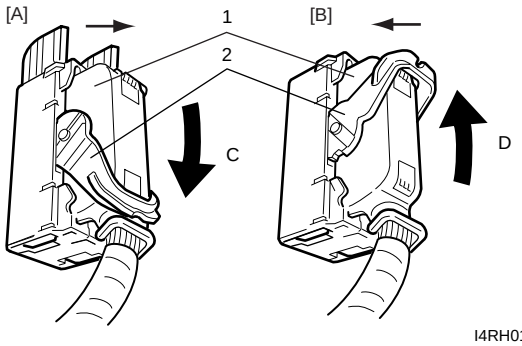
S4RS0A4506004

CAUTION:

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit / control module assembly.

Removal

1) Disconnect negative cable from battery.
2) Disconnect ABS hydraulic unit / control module assembly connector (1) by pull down the lock (2).



I4RH01450001-

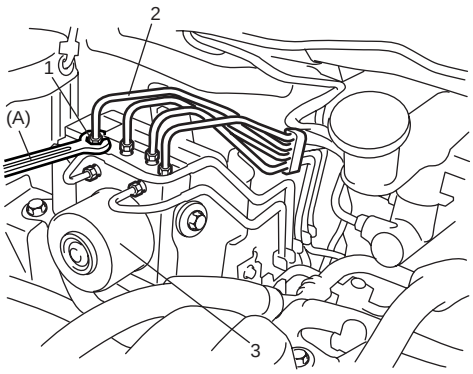
[A]: Disconnect	C: Pull down to disconnect
[B]: Connect	D: Pull up to connect

3) Using special tool, loosen flare nuts (1) and disconnect brake pipes (2) from ABS hydraulic unit / control module assembly (3).

Special tool
(A): 09950-78220

NOTE:

Put bleeder plug cap or the like onto pipe to prevent fluid from spilling. Do not allow brake fluid to get on painted surfaces.



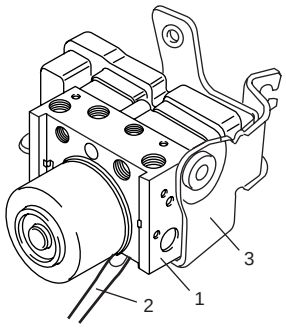
I4RS0A450022-

4) Remove ABS hydraulic unit / control module with bracket from vehicle by removing three bracket bolts.

5) Remove bolt and pull out ABS hydraulic unit / control module assembly (1) from bracket (3) using flat end rod or the like (2).

CAUTION:

- **Do not give an impact to hydraulic unit.**
- **Use care not to allow dust to enter hydraulic unit.**
- **Do not place hydraulic unit on its side or upside down. Handling it in inappropriate way will affect its original performance.**

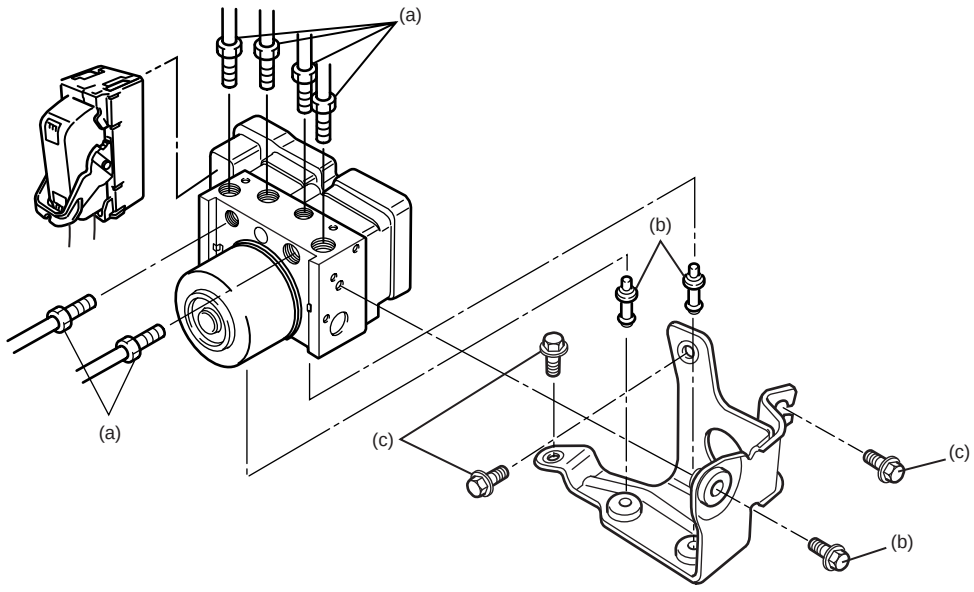


I4RS0A450023-

Installation

1) Install hydraulic unit / control module assembly by reversing removal procedure.

Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)
ABS hydraulic unit / control module assembly bolt (b): 9 N·m (0.9 kg-m, 6.5 lb-ft)
ABS hydraulic unit / control module assembly bracket bolt (c): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I4RS0A450024-

2) Bleed air from brake system referring to “Air Bleeding of Brake System: in Section 4A”.
3) Check each installed part for fluid leakage and perform “ABS Hydraulic Unit Operation Check: ”.

NOTE:

For new ABS hydraulic unit / control module assembly, if “ABS Hydraulic Unit Operation Check: ” has not been performed, ABS warning lamp may flash when ignition switch is turned ON position.
Accordingly preform “ABS Hydraulic Unit Operation Check: ” to stop flashing of ABS warning lamp.

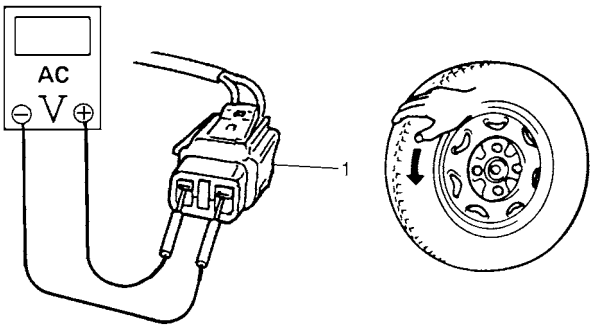
Front Wheel Speed Sensor On-Vehicle Inspection

S4RS0A4506005

Output Voltage Inspection

1) Disconnect negative cable from battery.
2) Hoist vehicle a little.
3) Disconnect wheel speed sensor connector.
4) Disconnect wheel speed grommet from vehicle body.
5) Connect voltmeter between connector (1) terminals.
6) While turning wheel by hand at a speed of approximately 3/4 rotation to 1 1/4 rotation per second, check AC voltage of sensor.

Output AC voltage at 3/4 to 1 1/4 rotation per second
53 mV or more

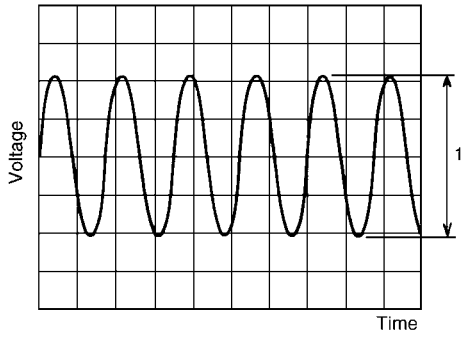


I2RH01450049-

7) If measured voltage is not as specified, check sensor, ring and their installation conditions.

Reference
When using oscilloscope for this check, check if peak-to-peak voltage (1) meets specification and waveform is complete.

Peak-to-peak voltage at 1/2 to 1 rotation per second
140 mV or more at 15 Hz



I2RH01450050-

Front Wheel Speed Sensor Removal and Installation

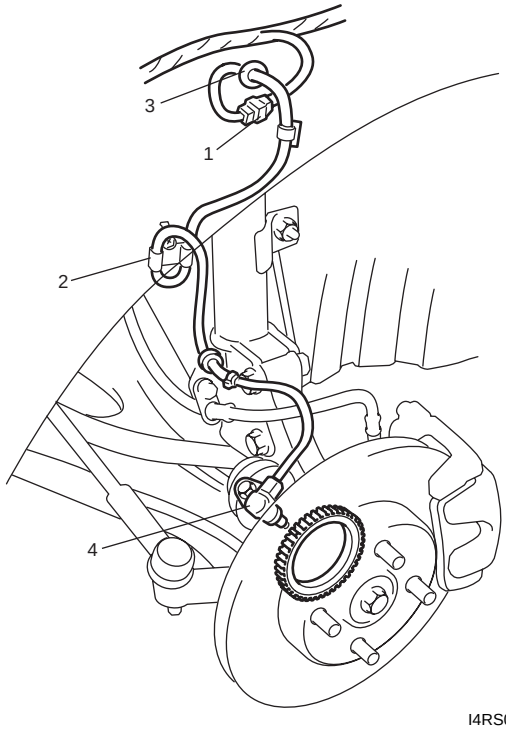
S4RS0A4506006

Removal

1) Disconnect negative cable from battery.
2) Disconnect front wheel speed sensor coupler (1).
3) Hoist vehicle and remove wheel.
4) Remove harness clamp, clamp bolt (2) and grommet (3).
5) Remove front wheel speed sensor (4) from knuckle.

CAUTION:

- **Do not pull wire harness when removing front wheel speed sensor.**
- **Do not cause damage to surface of front wheel speed sensor and do not allow dust, etc. to enter its installation hole.**



I4RS0A450025-

Installation

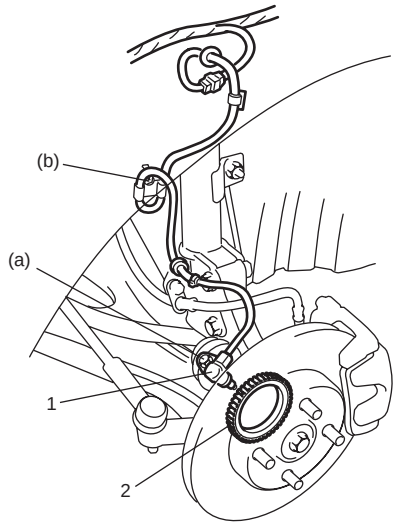
1) Check that no foreign material is attached to sensor (1) and sensor ring (2).
2) Install it by reversing removal procedure.

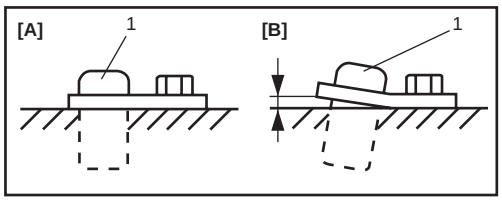
Tightening torque
Front wheel speed sensor bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
Front wheel speed sensor harness clamp bolt (b): 11 N·m (1.1 kg-m, 8.0 lb-ft)

CAUTION:

Do not pull or twist wire harness more than necessary when installing front wheel speed sensor.

3) Check that there is no clearance between sensor and knuckle.





I4RS0A450026-

[A]: OK
[B]: NG

Front Wheel Speed Sensor Inspection

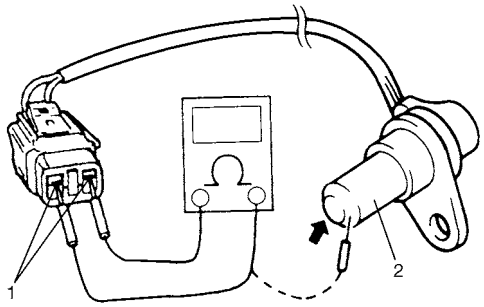
S4RS0A4506007

- Check sensor for damage.
- Measure resistance of sensor.

Between both terminals (1) of sensor
1.2 – 1.6 kΩ at 20 °C (68 °F)

Between sensor terminal (1) and sensor body (2)
Infinity (∞)

If the check result is not as specified and any malcondition is found, replace.



I2RH01450052-

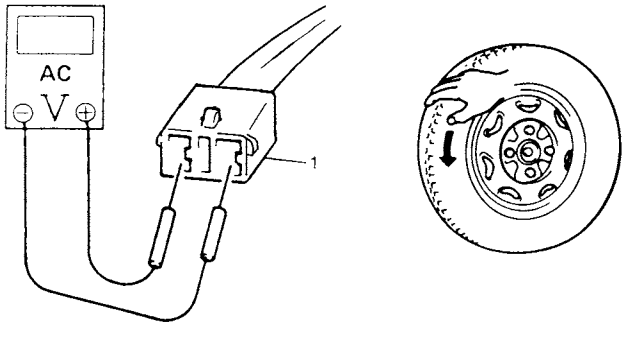
Rear Wheel Speed Sensor On-Vehicle Inspection

S4RS0A4506008

Output Voltage Inspection

1) Disconnect connector from rear wheel speed sensor referring to Step 1) to 4) of “Rear Wheel Speed Sensor Removal and Installation: ”.
2) Hoist vehicle.
3) Connect voltmeter between connector (1) terminals.
4) While turning wheel at a speed of approximately 3/4 to 1 1/4 rotation per second, check AC voltage of sensor.

Output AC voltage at 3/4 to 1 1/4 rotation per second
53 mV or more

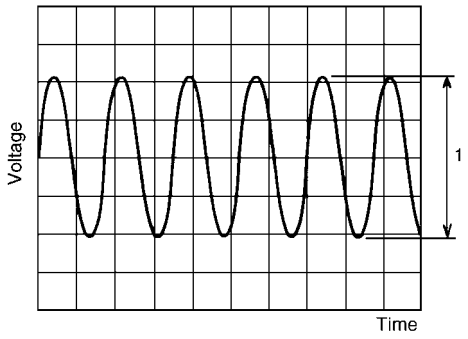


I3RH01450049-

5) If measured voltage is not as specified, check sensor, ring and their installation conditions.

Reference
When using oscilloscope for this check, check if peak-to-peak voltage (1) meets specification and waveform is complete.

Peak-to-peak voltage at 1/2 to 1 rotation per second
140 mV or more at 15 Hz



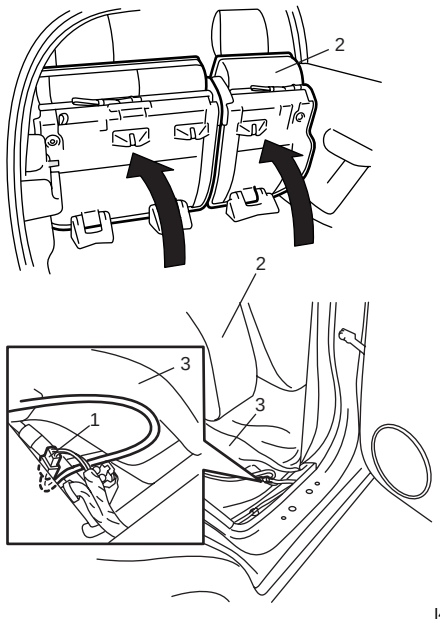
I2RH01450050-

Rear Wheel Speed Sensor Removal and Installation

S4RS0A4506009

Removal

1) Disconnect negative cable from battery.
2) Remove rear side sill scuff.
3) Fold rear seat (2) up as shown, and then turn over floor carpet (3).
4) Disconnect rear wheel speed sensor coupler (1).
5) Hoist vehicle.



I4RS0A450028-

6) Detach ABS wheel sensor wire harness (1).

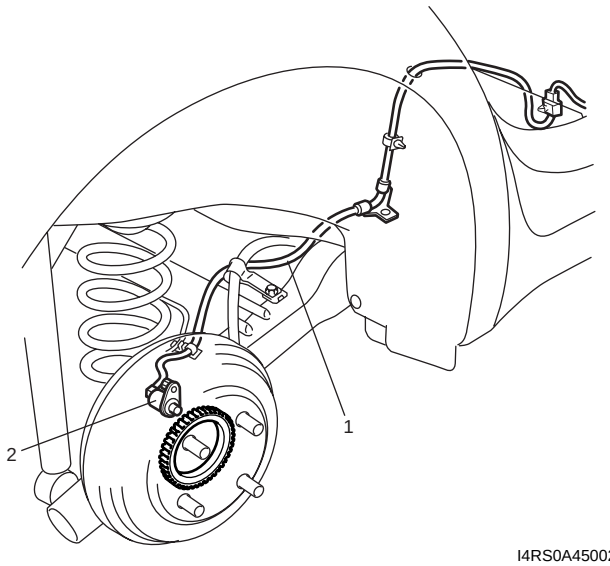
NOTE:

Do not detach clip of rear wheel speed sensor connector from vehicle body unless replacement is necessary.

7) Remove rear wheel speed sensor (2) from knuckle.

CAUTION:

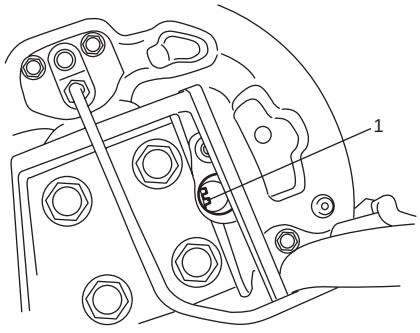
- **Do not pull wire harness when removing rear wheel speed sensor.**
- **Do not cause damage to surface of rear wheel speed sensor and do not allow dust, etc. to enter its installation hole.**



I4RS0A450029-

Installation
Reverse removal procedure for installation noting the following.

- Check that no foreign material is attached to sensor and ring (1).



I4RS0A450030-

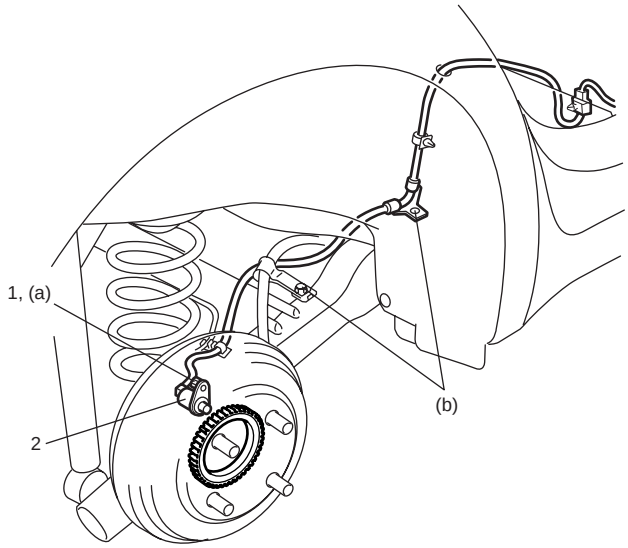
- Be sure to install wheel speed sensor (2) and its bolt at the correct (upper) position as shown in figure. Tighten sensor bolt (1) and harness clamp bolts to specified torque.

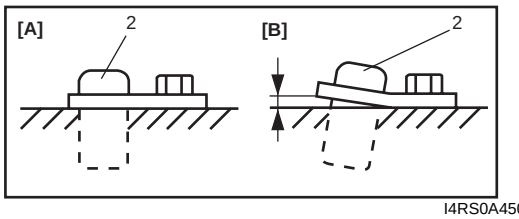
  Tightening torque
  Rear wheel speed sensor bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)
  Rear wheel speed sensor harness clamp bolt (b): 11 N·m (1.1 kg-m, 8.0 lb-ft)

  CAUTION:

  Do not pull or twist wire harness more than necessary when installing rear wheel speed sensor.

- Check that there is no clearance between sensor and knuckle.





I4RS0A450031-

[A]: OK	[B]: NG

Rear Wheel Speed Sensor Inspection

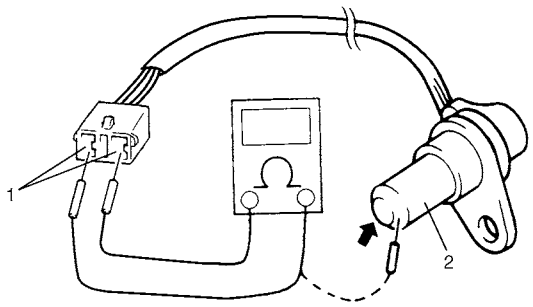
S4RS0A4506010

- Check sensor for damage.
- Measure resistance of sensor.

  Between both terminals (1) of sensor
  1.2 – 1.6 kΩ at 20 °C (68 °F)

  Between sensor terminal (1) and sensor body (2)
  Infinity (∞)

  If the check result is not as specified and any malcondition is found, replace.



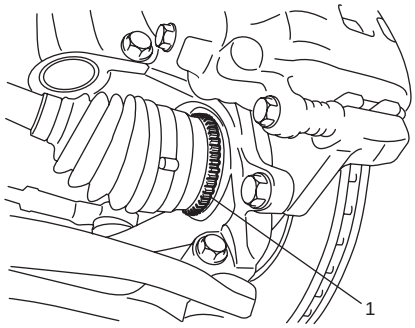
I3RH01450052-

Front Wheel Speed Sensor Ring On-Vehicle Inspection

S4RS0A4506011

- Check ring (1) for being missing, damaged or deformed.
- Turn drive shaft and check if ring rotation is free from eccentricity and looseness.
- Check that no foreign material is attached.

If any faulty is found, repair or replace. Refer to “Front Drive Shaft Disassembly and Assembly: in Section 3A”.



I4RS0A450032-

Front Wheel Speed Sensor Ring Removal and Installation

S4RS0A4506012

NOTE:

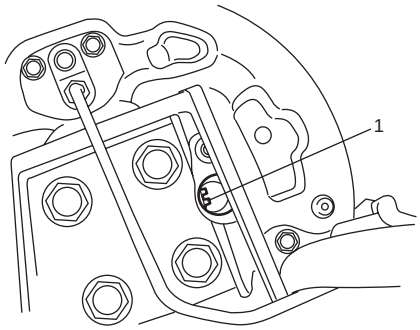
The front wheel sensor ring can not be removed or replaced alone. If front wheel sensor ring needs to be replaced, replace it as a wheel side joint assembly of drive shaft.

For removal and installation of wheel side joint assembly of drive shaft, referring to “Front Drive Shaft Disassembly and Assembly: in Section 3A”.

Rear Wheel Speed Sensor Ring On-Vehicle Inspection

S4RS0A4506013

- Check ring serration (teeth) (1) for being missing, damaged or deformed.
- Turn wheel and check if ring rotation is free from eccentricity and looseness.
- Check that no foreign material is attached. If any faulty is found, repair or replace.



I4RS0A450033-

Rear Wheel Speed Sensor Ring Removal and Installation

S4RS0A4506014

For removal and installation of rear wheel speed sensor ring, refer to “ABS Sensor Ring Removal and Installation (If Equipped): in Section 4C”.

Specifications

Tightening Torque Specifications

S4RS0A4507001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Brake pipe flare nut	16	1.6	11.5	☞
ABS hydraulic unit / control module assembly bolt	9	0.9	6.5	☞
ABS hydraulic unit / control module assembly bracket bolt	25	2.5	18.0	☞
Front wheel speed sensor bolt	25	2.5	18.0	☞
Front wheel speed sensor harness clamp bolt	11	1.1	8.0	☞
Rear wheel speed sensor bolt	11	1.1	8.0	☞
Rear wheel speed sensor harness clamp bolt	11	1.1	8.0	☞

NOTE:

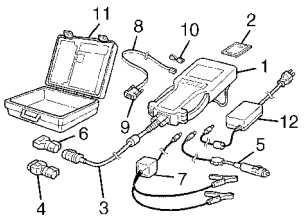
The specified tightening torque is also described in the following.
“Front Wheel Speed Sensor Components Location: ”
“Rear Wheel Speed Sensor Components Location: ”
“ABS Hydraulic Unit / Control Module Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A4508001

09950–78220 Flare nut wrench (10 mm) ☞ 	SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞ 

Section 5

Transmission / Transaxle

CONTENTS

Precautions 5-1
Precautions 5-1
Precautions on Transmission / Transaxle 5-1

Automatic Transmission 5A-1
Precautions 5A-1
Precautions in Diagnosing Trouble 5A-1
Precautions for Disassembly and Reassembly 5A-1
General Description 5A-3
A/T Description 5A-3
Clutch / Brake / Planetary Gear Function of Automatic Transaxle 5A-6
Table of Component Operation 5A-6
A/T Diagnosis General Description 5A-7
On-Board Diagnostic System Description 5A-7
CAN Communication System Description 5A-8
Schematic and Routing Diagram 5A-9
Transmission Control Module (TCM) Wiring Diagram 5A-9
Automatic Gear Shift Table 5A-11
Component Location 5A-12
Electronic Shift Control System Components Location 5A-12
Diagnostic Information and Procedures 5A-14
A/T System Check 5A-14
Visual Inspection 5A-17
Malfunction Indicator Lamp (MIL) Check 5A-17
DTC Table 5A-17
DTC Check 5A-19
DTC Clearance 5A-19
Fail-Safe Table 5A-20
Scan Tool Data 5A-22
A/T Basic Check 5A-25
Road Test 5A-26
Manual Road Test 5A-28
Engine Brake Test 5A-29
Stall Test 5A-29
Time Lag Test 5A-31
Line Pressure Test 5A-32
“P” Range Test 5A-33
A/T Symptom Diagnosis 5A-33
No Gear Shift to 4th gear 5A-41
No Lock-Up Occurs 5A-42
DTC P0705: Transmission Range Sensor Circuit Malfunction 5A-43
DTC P0707: Transmission Range Sensor Circuit Low 5A-45
DTC P0712: Transmission Fluid Temperature Sensor Circuit Low 5A-47
DTC P0713: Transmission Fluid Temperature Sensor Circuit High 5A-48
DTC P0717: Input / Turbine Speed Sensor Circuit Malfunction 5A-49
DTC P0722: Output Speed Sensor (VSS) Circuit No Signal 5A-51
DTC P0741 / P0742: TCC Circuit Performance or Stuck OFF / TCC Circuit Stuck ON 5A-53
DTC P0751 / P0752 / P0756 / P0757: Shift Solenoid Malfunction 5A-54
DTC P0787: Shift / Timing Solenoid Control Circuit Low 5A-55
DTC P0788: Shift / Timing Solenoid Control Circuit High 5A-57
DTC P0962: Pressure Control Solenoid Control Circuit Low 5A-59
DTC P0963: Pressure Control Solenoid Control Circuit High 5A-61
DTC P0973 / P0976: Shift Solenoid-A (No.1) Control Circuit Low / Shift Solenoid-B (No.2) Control Circuit Low 5A-63
DTC P0974 / P0977: Shift Solenoid-A (No.1) / Shift Solenoid-B (No.2) Control Circuit High 5A-65
DTC P1702: Internal Control Module Memory Check Sum Error 5A-67
DTC P1703: Can Invalid Data - TCM 5A-67
DTC P1723: Range Select Switch Malfunction 5A-68
DTC P1774: Control Module Communication Bus Off 5A-69
DTC P1775: High Speed CAN Communication Bus Off (Transmission Error) 5A-72
DTC P1777: TCM Lost Communication with ECM (Reception Error) 5A-75
DTC P1778: TCM Lost Communication with BCM (Reception Error) 5A-78
DTC P1878: Torque Converter Clutch Shudder 5A-81
DTC P2763: Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit High 5A-82
DTC P2764: Torque Converter Clutch (TCC) Circuit Pressure Control Solenoid Control Circuit Low 5A-84

Inspection of TCM and Its Circuits 5A-86
TCM Power and Ground Circuit Check 5A-90
Brake Interlock System Inspection 5A-91
Repair Instructions 5A-92
Learning Control Initialization 5A-92
A/T Fluid Level Check 5A-92
A/T Fluid Change 5A-93
Selector Lever Components 5A-93
Select Lever Assembly Installation 5A-94
Select Lever Knob Installation 5A-94
Selector Lever Inspection 5A-94
Select Cable Components 5A-94
Select Cable Removal and Installation 5A-95
Select Cable Adjustment 5A-95
Transmission Range Sensor (Shift Switch) Inspection and Adjustment 5A-96
Output Shaft Speed Sensor (VSS) Removal and Installation 5A-96
Output Shaft Speed Sensor (VSS) Inspection 5A-97
Input Shaft Speed Sensor Removal and Installation 5A-97
Input Shaft Speed Sensor Inspection 5A-97
Transmission Fluid Temperature Sensor Removal and Installation 5A-98
Transmission Fluid Temperature Sensor Inspection 5A-98
“3” Position Switch Inspection 5A-99
Solenoid Valves (Shift Solenoid Valves and Timing Solenoid Valve) Removal and Installation 5A-99
Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection 5A-100
Pressure Control Solenoid Valves (Pressure Control Solenoid and TCC Pressure Control Solenoid) Removal and Installation 5A-102
Pressure Control Solenoid Valve Inspection 5A-102
Transmission Control Module (TCM) Removal and Installation 5A-103
A/T Relay Inspection 5A-104
Differential Side Oil Seal Replacement 5A-104
Shift Lock Solenoid Inspection 5A-105
Shift Lock Solenoid Replacement 5A-105
Key Interlock Cable Removal and Installation 5A-106
A/T Fluid Cooler Hoses Replacement 5A-107
Automatic Transaxle Unit Components 5A-107
Automatic Transaxle Unit Dismounting and Remounting 5A-108
Automatic Transaxle Assembly Components 5A-110
Automatic Transaxle Unit Disassembly 5A-112
Oil Pump Assembly Components 5A-123
Oil Pump Assembly Disassembly and Reassembly 5A-124
Oil Pump Assembly Inspection 5A-124
Direct Clutch Assembly Components 5A-126
Direct Clutch Assembly Preliminary Check 5A-126
Direct Clutch Assembly Disassembly and Reassembly 5A-127
Direct Clutch Assembly Inspection 5A-129
Forward and Reverse Clutch Assembly Components 5A-130
Forward and Reverse Clutch Assembly Preliminary Check 5A-130
Forward and Reverse Clutch Assembly Disassembly and Reassembly 5A-131
Forward and Reverse Clutch Assembly Inspection 5A-134
2nd Brake Piston Assembly Components 5A-135
2nd Brake Piston Assembly Disassembly and Reassembly 5A-135
Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components 5A-136
Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Disassembly and Reassembly 5A-137
Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Inspection 5A-138
Countershaft Assembly Components 5A-139
Countershaft Assembly Disassembly and Reassembly 5A-139
Valve Body Assembly Components 5A-140
Valve Body Assembly Disassembly and Reassembly 5A-141
Differential Assembly Components 5A-142
Differential Assembly Disassembly and Reassembly 5A-143
Differential Assembly Inspection 5A-144
Torque Converter Housing Disassembly and Reassembly 5A-145
Transaxle Case Disassembly and Reassembly 5A-147
Automatic Transaxle Unit Inspection and Adjustment 5A-148
Automatic Transaxle Unit Assembly 5A-150
Specifications 5A-166
Tightening Torque Specifications 5A-166
Special Tools and Equipment 5A-167
Recommended Service Material 5A-167
Special Tool 5A-167

Manual Transmission 5B-1
General Description 5B-1
Manual Transaxle Construction and Servicing 5B-1
Diagnostic Information and Procedures 5B-3
Manual Transaxle Symptom Diagnosis 5B-3
Repair Instructions 5B-3
Manual Transaxle Oil Change 5B-3
Differential Side Oil Seal Replacement 5B-4
Gear Shift Control Lever and Cable Components 5B-5
Gear Shift Control Lever and Cable Removal and Installation 5B-6
Gear Select Control Cable Adjustment 5B-6

Vehicle Speed Sensor (VSS) Removal and Installation....5B-7
Back Up Lamp Switch Removal and Installation....5B-7
Back Up Lamp Switch Inspection....5B-8
Manual Transaxle Unit Components....5B-8
Manual Transaxle Unit Dismounting and Remounting....5B-9
Gear Shift and Select Shaft Assembly Components....5B-11
Gear Shift and Select Shaft Assembly Removal and Installation....5B-11
Gear Shift and Select Shaft Disassembly and Assembly....5B-12
Manual Transaxle Assembly Components....5B-13
Fifth Gear Disassembly and Assembly....5B-14
Manual Transaxle Assembly Disassembly and Reassembly....5B-17
Transaxle Right Case Disassembly and Assembly....5B-22
Transaxle Left Case Disassembly and Assembly....5B-23
Input Shaft and Countershaft Components....5B-24
Input Shaft Assembly Disassembly and Reassembly....5B-25
Countershaft Assembly Disassembly and Reassembly....5B-27
Synchronizer Parts Inspection....5B-30
Gear Shift Shaft Components....5B-30
5th and Reverse Gear Shift Shafts Disassembly and Assembly....5B-31
Gear Shift Shaft and Fork Inspection....5B-31
Differential Components....5B-32
Differential Disassembly and Assembly....5B-32
Specifications....5B-34
Tightening Torque Specifications....5B-34
Special Tools and Equipment....5B-35
Recommended Service Material....5B-35
Special Tool....5B-35

Clutch....5C-1
General Description....5C-1
Clutch Construction....5C-1
Diagnostic Information and Procedures....5C-2
Clutch System Symptom Diagnosis....5C-2
Repair Instructions....5C-3
Clutch Pedal Inspection....5C-3
Clutch Fluid Level Inspection....5C-4
Air Bleeding of Clutch System....5C-4
Clutch Fluid Pipe and Hose Components....5C-5
Clutch Fluid Pipe Removal and Installation....5C-5
Clutch Fluid Pipe Inspection....5C-6
Clutch Master Cylinder Removal and Installation....5C-6
Clutch Operating Cylinder Removal and Installation....5C-6
Clutch Pedal and Clutch Pedal Bracket Components....5C-7
Clutch Cover, Clutch Disc and Flywheel Components....5C-8
Clutch Cover, Clutch Disc and Flywheel Removal and Installation....5C-8
Clutch Cover, Clutch Disc and Flywheel Inspection....5C-10
Clutch Release System Removal and Installation....5C-10
Clutch Release System Inspection....5C-12
Specifications....5C-12
Tightening Torque Specifications....5C-12
Special Tools and Equipment....5C-13
Recommended Service Material....5C-13
Special Tool....5C-13

Precautions

Precautions

Precautions on Transmission / Transaxle

S4RS0A5000001

Air Bag Warning

Refer to “Air Bag System Service Warning: in Section 00”.

Automatic Transmission

Precautions

Precautions in Diagnosing Trouble

S4RS0A5100001

- Do not disconnect couplers from TCM, battery cable from battery, TCM ground wire harness from engine or main fuse before checking the diagnostic information (DTC, freeze frame data, etc.) stored in TCM memory. Such disconnection will clear memorized information in TCM memory.
- Diagnostic information stored in TCM memory can be cleared as well as checked by using SUZUKI scan tool or generic scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
  It is indistinguishable which module turns on MIL because not only ECM but also TCM turns on MIL. Therefore, check both ECM and TCM for DTC when MIL lights on.
  When checking TCM for DTC, keep in mind that DTC is displayed on the scan tool as follows depending on the scan tool used.
  - SUZUKI scan tool displays DTC detected by TCM.
  - Generic scan tool displays DTC detected by each of ECM and TCM simultaneously.
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00" before inspection and observe what is written there.
- TCM and/or ECM replacement
  - When substituting a known-good TCM and/or ECM, check that all relays and actuators have resistance of specified value.
    Neglecting this check may result in damage to good TCM and/or ECM.
- Communication of ECUs, ECM, TCM and BCM is established by CAN (Controller Area Network). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System: in Section 00".

Precautions for Disassembly and Reassembly

S4RS0A5100002

When repairing automatic transaxle, it is necessary to conduct the on-vehicle test to investigate where the cause of the trouble lies first.
Then whether overhaul should be done or not is determined. If the transaxle is disassembled without such preliminary procedure, not only the cause of the trouble would be unknown, but also a secondary trouble may occur and often time would be wasted.
As the automatic transaxle consists of high precision component, the following cautions should be strictly observed when handling its parts in disassembly and reassembly.

- Disassembling valve body assembly is prohibited essentially. However, a few parts can be disassembled. When disassembling valve body component parts, confirm whether their parts are allowed to disassemble or not referring to "Valve Body Assembly Disassembly and Reassembly: ".
- When component part of forward clutch, direct clutch, 2nd brake and/or O/D and 2nd coast brake, namely clutch disc, brake disc, retaining plate and/or separator plate, have been replaced, all learned contents, which have been stored in TCM memory by executing learning control, should be initialized referring to "Learning Control Initialization: ".
- Make sure to wash dirt off from the transaxle so that no such dirt will enter the transaxle during dismounting and remounting.
- Select a clean place free from dust and dirt for overhauling.
- Place a rubber mat on the work bench to protect parts from damage.
- Work gloves or shop cloth should not be used. (Use a nylon cloth or a paper towel.)
- When separating the case joint, do not pry with a screwdriver or such but tap with a plastic hammer lightly.
- Make sure to wash dirt off from the transaxle so that no such dirt will enter the transaxle during disassembly and reassembly.
- Wash the disassembled parts in ATF (Automatic Transaxle Fluid) or kerosene (using care not to allow ATF or kerosene to get on your face, etc.) and confirm that each fluid passage is not clogged by blowing air into it. But use kerosene to wash the discs, resin washers and rubber parts.
- Replace each gasket, oil seal and O-ring with a new one.
- Apply ATF to sliding or rotating parts before reassembly.

CAUTION:

- **Keep component parts in group for each subassembly and avoid mixing them up.**
- **Clean all parts with cleaning solvent thoroughly and air dry them.**
- **Use kerosene or automatic transaxle fluid as cleaning solvent.**
- **Do not use wiping cloths or rags to clean or dry parts.**
- **All oil passages should be blown out and checked to make sure that they are not obstructed.**
- **Keep face and eyes away from solvent spray while air blowing parts.**
- **Check mating surface for irregularities and remove them, if any, and clean it again.**
- **Soak new clutch discs and brake discs in transaxle fluid for at least 2 hours before assembly.**
- **Replace all gaskets and O-ring with new ones.**
- **Apply automatic transaxle fluid to all O-rings.**
- **When installing seal ring, be careful so that it is not expanded excessively, extruded or caught.**
- **Replace oil seals that are removed and apply grease to their lips.**
- **Before installing, be sure to apply automatic transaxle fluid to sliding, rolling and thrusting surface of all component part. Also after installation, make sure to check each part for proper operation.**
- **Always use torque wrench when tightening bolts.**

- A new discs should be soaked in ATF at least 2 hours before use.

Part Inspection and Correction Table

Part	Inspect for	Correction
Casted part, machined part	Small flaw, burr	Remove with oil stone.
	Deep or grooved flaw	Replace part.
	Clogged fluid passage	Clean with air or wire.
	Flaw on installing surface, residual gasket	Remove with oil stone or replace part.
	Crack	Replace part.
Bearing	Unsmooth rotation	Replace.
	Streak, pitting, flaw, crack	Replace.
Bushing, thrust washer	Flaw, burr, wear, burning	Replace.
Oil seal, gasket	Flawed or hardened seal ring	Replace.
	Worn seal ring on its periphery or side	Replace.
	Piston seal ring, oil seal, gasket, etc.	Replace.
Gear	Flaw, burr	Replace.
	Worn gear tooth	Replace.
Splined part	Burr, flaw, torsion	Correct with oil stone or replace.
Snap ring	Wear, flaw, distortion	Replace.
	No interference	Replace.
Thread	Burr	Replace.
	Damage	Replace.
Spring	Settling, sign of burning	Replace.
Friction plate	Wear, burning, distortion, damaged claw	Replace.
Separator plate, retaining plate	Wear, burning, distortion, damaged claw	Replace.
Sealing surface (where lip contacts)	Flaw, rough surface, stepped wear, foreign material	Replace.

General Description

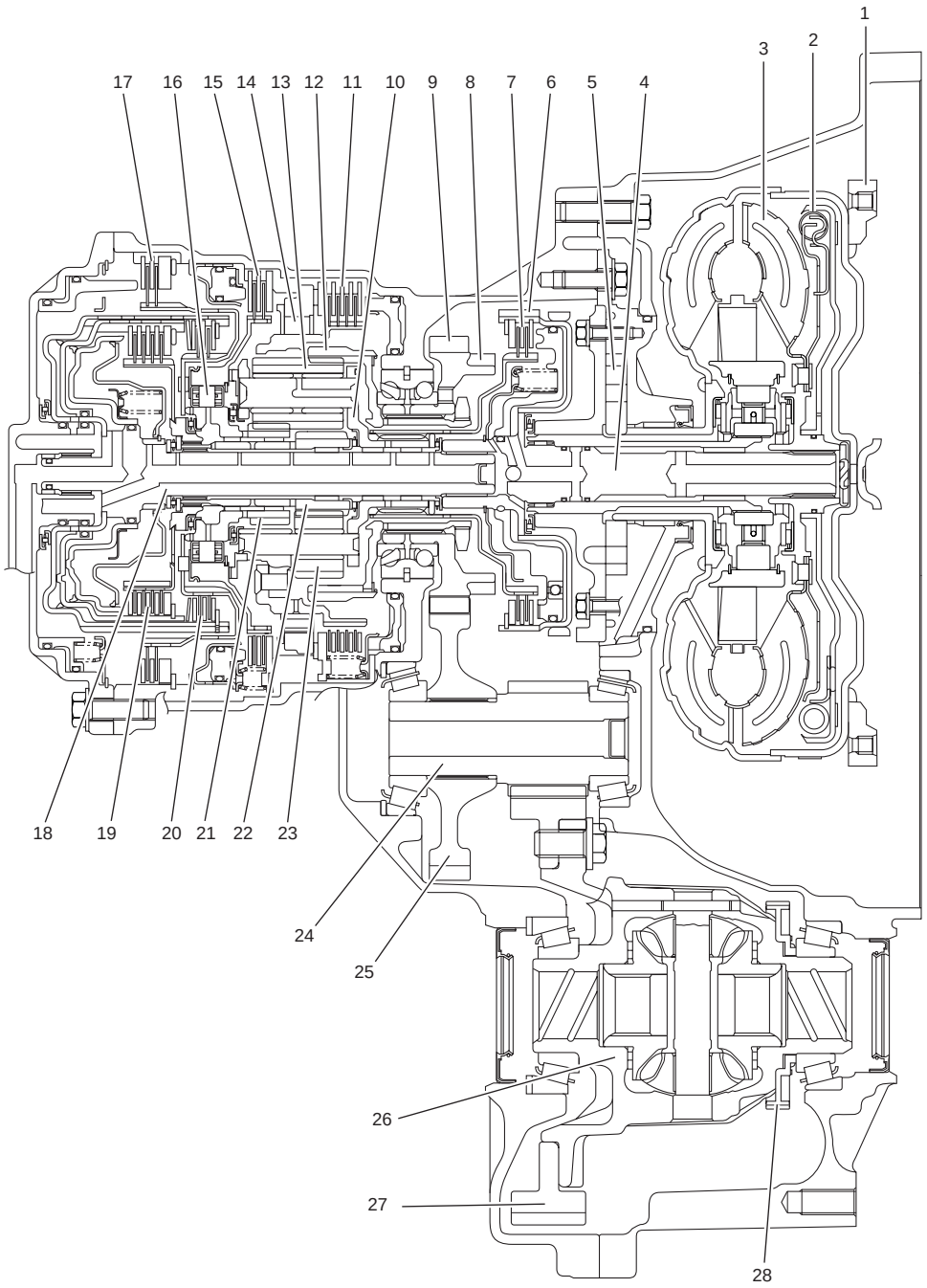
A/T Description

S4RS0A5101001

This automatic transaxle is electronic control full automatic transaxle with forward 3-speed plus overdrive (O/D) and reverse 1-speed.
The torque converter is a 3-element, 1-step and 2-phase type and is equipped with an automatically controlled lock-up mechanism.
The gear change device consists of a ravigneau type planetary gear unit, 3 multiple disc type clutches, 3 multiple disc type brakes and 2 one-way clutches.
The hydraulic pressure control device consists of a valve body assembly, pressure control solenoid valve (linear solenoid), 2 shift solenoid valves, TCC pressure control solenoid valve (linear solenoid) and a timing solenoid valve.
Optimum line pressure complying with engine torque is produced by the pressure control solenoid valve in dependence upon control signal from transmission control module (TCM). This makes it possible to control the line pressure with high accuracy in accordance with the engine power and running conditions to achieve smooth shifting characteristics and high efficiency.
A clutch-to-clutch control system is provided for shifting between 3rd gear and 4th gear. This clutch-to-clutch control system is made to function optimally, so that hydraulic pressure controls such as shown below are conducted.

- When upshifting from 3rd gear to 4th gear, to adjust the drain hydraulic pressure at releasing the forward clutch, a timing solenoid valve is used to switch a hydraulic passage with an orifice to another during shifting.
- When downshifting from 4th gear to 3rd gear, to adjust the line pressure applied to the forward clutch at engaging the forward clutch, a timing solenoid valve is used to switch a hydraulic passage with an orifice to another during shifting.
- When upshifting from 3rd gear to 4th gear with engine throttle opened, to optimize the line pressure applied to the forward clutch at releasing the forward clutch, the learning control is processed to compensate the switching timing of the timing solenoid at every shifting.
- When downshifting from 4th gear to 3rd gear with engine throttle opened, to optimize the line pressure applied to the forward clutch at engaging the forward clutch, the learning control is processed to compensate the line pressure at every shifting.

Employing the ravigneau type planetary gear unit and this clutch-to-clutch control system greatly simplifies the construction to make possible a lightweight and compact transaxle.
A line pressure learning control is conducted to provide optimum shifting time at every upshifting with engine throttle opened. If long upshifting time is detected, the subsequent line pressure applied during upshifting is intensified. On the contrary, if short upshifting time is detected, the subsequent line pressure applied during upshifting is weakened.
Slip controlled lock-up function
Even at a lower speed than when the TCC gets engaged completely, control over the TCC pressure control solenoid works to cause the TCC to slip (be engaged slightly), thereby improving the transmission efficiency. While such slip control is being executed, the oil pressure applied to the TCC is controlled by the TCC pressure control solenoid so that the difference between the engine speed and the input shaft speed becomes close to the specified value.
Also, during deceleration, the TCC is made to slip (be engaged slightly) to raise the engine speed and enlarge the fuel cut operation range so that better fuel consumption is achieved.
Due to this reason, it is absolutely necessary for the automatic transmission to use ATF suitable for slip control. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.



I3RM0B510001-

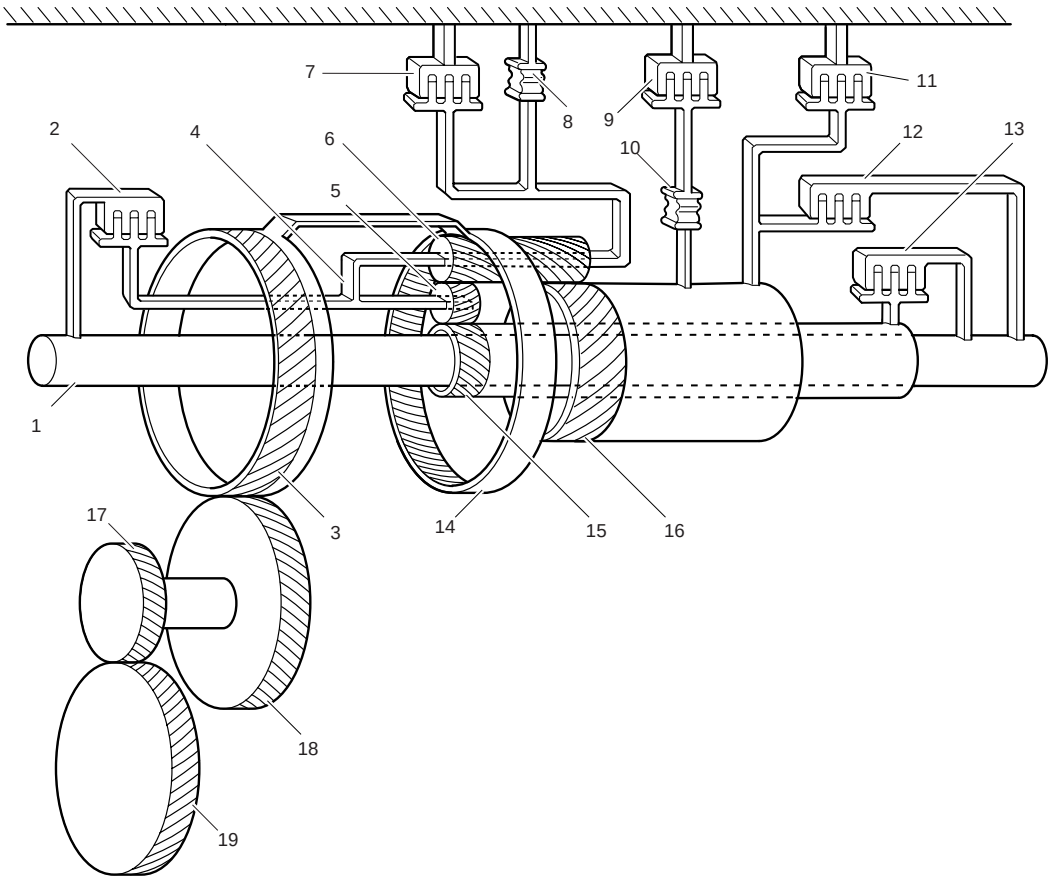
1. Drive plate	11. 1st and reverse brake	21. Rear sun gear
2. Torque converter clutch (TCC)	12. Ring gear	22. Front sun gear
3. Torque converter	13. Long planet pinion	23. Short planet pinion
4. Input shaft	14. One-way No.2 clutch	24. Countershaft
5. Oil pump	15. 2nd brake	25. Reduction driven gear
6. Direct clutch drum (double as sensor rotor for input shaft speed sensor)	16. One-way No.1 clutch	26. Differential case assembly
7. Direct clutch	17. O/D and 2nd coast brake	27. Final gear
8. Parking lock gear	18. Intermediate shaft	28. Output shaft speed sensor (VSS) drive gear
9. Reduction drive gear	19. Forward clutch	
10. Planet carrier	20. Reverse clutch	

Specifications

Item			Specifications	
Torque converter	Type Stall torque ratio		3-element, 1-step, 2-phase type (with TCC (lock-up) mechanism) 1.9 – 2.1	
Oil pump	Type Drive system		Internal involute gear type oil pump (non crescent type) Engine driven	
Gear change device	Type		Forward 4-step, reverse 1-step planetary gear type	
	Shift position		“P” range	Gear in neutral, output shaft fixed, engine start
			“R” range	Reverse
			“N” range	Gear in neutral, engine start
			“D” range	Forward 1st ↔ 2nd ↔ 3rd ↔ 4th automatic gear change
			“3” range	Forward 1st ↔ 2nd ↔ 3rd ← 4th automatic gear change
			“2” range	Forward 1st ↔ 2nd ← 3rd automatic gear change
			“L” range	Forward 1st ← 2nd ← 3rd reduction, and fixed at 1st gear
	Gear ratio	1st	2.875	Number of teeth Front sun gear: 24 Rear sun gear: 30 Long planet pinion: 20 Short planet pinion: 19 Ring gear: 69
		2nd	1.568	
		3rd	1.000	
		4th (overdrive gear)	0.697	
		Reverse (reverse gear)	2.300	
	Control elements		Wet type multiple-disc clutch... 3 sets Wet type multiple-disc brake... 3 sets One-way clutch... 2 sets	
	Reduction gear ratio		1.023	
	Final gear reduction ratio		4.052	
Lubrication	Lubrication system		Force feed system by oil pump	
Cooling	Cooling system		Radiator assisted cooling (water-cooled)	
Fluid used			SUZUKI ATF 3317 or Mobil ATF 3309	

Clutch / Brake / Planetary Gear Function of Automatic Transaxle

S4RS0A5101002



I4RS0A510001-

1. Input shaft and intermediate shaft	8: One-way No.2 clutch	15. Front sun gear
2: Direct clutch	9: 2nd brake	16. Rear sun gear
3. Reduction drive gear	10: One-way No.1 clutch	17. Final drive gear
4. Planet carrier	11: O/D and 2nd coast brake	18. Reduction driven gear
5. Short planet pinion	12: Reverse clutch	19. Final driven gear
6. Long planet pinion	13: Forward clutch	
7: 1st and reverse brake	14. Ring gear	

Functions

Part name	Function
Forward clutch	Meshes intermediate shaft and front sun gear
Direct clutch	Meshes input shaft and planet carrier
Reverse clutch	Meshes intermediate shaft and rear sun gear
O/D and 2nd coast brake	Fixes rear sun gear
2nd brake	Fixes rear sun gear
1st and reverse brake	Fixes planet carrier
One-way No.1 clutch	Prevents rear sun gear from turning counterclockwise
One-way No.2 clutch	Prevents planet carrier from turning counterclockwise

Table of Component Operation

S4RS0A5101003

Selector position	Gear position	Part					
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No.2)	TCC solenoid valve	Forward clutch	Direct clutch	Reverse clutch
P	Parking	○	○	×	×	×	×
R	Reverse	○	○	×	×	×	○
N	Neutral	○	○	×	×	×	×

Selector position	Gear position	Part					
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No.2)	TCC solenoid valve	Forward clutch	Direct clutch	Reverse clutch
D	1st	○	○	×	○	×	×
	2nd	○	×	×	○	×	×
	3rd	×	×	△	○	○	×
	4th	×	○	△	×	○	×
2	1st	○	○	×	○	×	×
	2nd	○	×	×	○	×	×
L	1st	○	○	×	○	×	×

Selector position	Gear position	Part				
		O/D and 2nd coast brake	2nd brake	1st and reverse brake	One-way No.1 clutch	One-way No.2 clutch
P	Parking	×	×	×	×	×
R	Reverse	×	×	○	×	×
N	Neutral	×	×	×	×	×
D	1st	×	×	×	×	○
	2nd	×	○	×	○	×
	3rd	×	○	×	×	×
	4th	○	○	×	×	×
2	1st	×	×	×	×	○
	2nd	○	○	×	○	×
L	1st	×	×	○	×	○

○: ON
×: OFF
△: ON only when TCC is operating

A/T Diagnosis General Description

S4RS0A5101005

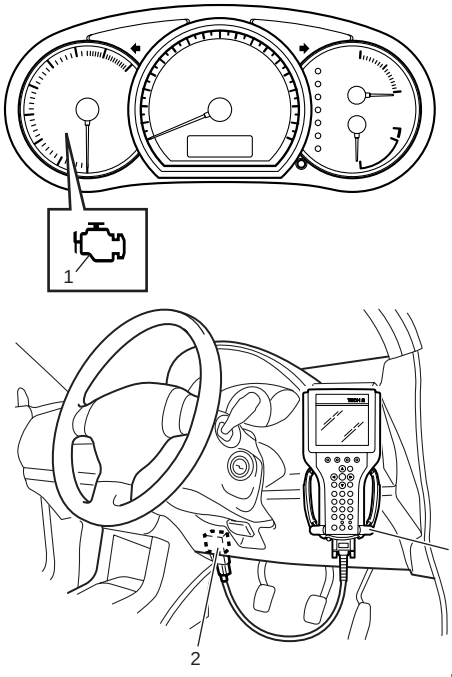
This vehicle is equipped with an electronic transaxle control system, which controls the automatic shift up and shift down timing, TCC operation, etc. suitably to vehicle driving conditions.
TCM has an On-Board Diagnosis System which detects a malfunction in this system.
When diagnosing a trouble in transaxle including this system, be sure to have full understanding of the outline of “On-Board Diagnostic System Description: ” and each item in “Precautions in Diagnosing Trouble: ” and execute diagnosis according to “A/T System Check: ” to obtain correct result smoothly.

On-Board Diagnostic System Description

S4RS0A5101006

For automatic transaxle control system, TCM has the following functions.

- When TCM detects a malfunction in A/T control system, TCM desire turning on malfunction indicator lamp (MIL) (1) and stores malfunction DTC in TCM memory.
- It is possible to communicate with TCM through data link connector (DLC) (2) by using scan tool (3). (Diagnostic information can be checked and erased by using scan tool.)



I4RS0A510002-

Warm-Up Cycle

A warm-up cycle means sufficient vehicle operation such that the coolant temperature has risen by at least 22 °C (40 °F) from engine starting and reaches a minimum temperature of 70 °C (160 °F).

Driving Cycle
A “Driving Cycle” consists of engine startup, driving mode where a malfunction would be detected if present, and engine shutoff.

2 Driving Cycles Detection Logic
The malfunction detected in the first driving cycle is stored in TCM memory (in the form of pending DTC and freeze frame data) but the malfunction indicator lamp (MIL) does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

Pending DTC
Pending DTC means a DTC detected and stored temporarily at 1 driving cycle of the DTC which is detected in the 2 driving cycle detection logic.

CAN Communication System Description

S4RS0A5101007

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a functionality to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. Communication of ECM, TCM, BCM and combination meter, is established by CAN. But, in communication between TCM and combination meter, data is transmitted only from TCM to combination meter. (Combination meter does not transmit data to TCM.) TCM transmission data is as follows.

TCM Transmission Data

				ECM	BCM	Combination Meter
TCM	Transmit	DATA	Torque down igintion delay request	○		
			Coast slip control signal	○		
			Vehicle speed pulse	○		
			TCM data validity	○		
			Transmission emissions related malfunction active			○
			Transmission gear selector position	○	○	○
			Transmission actual gear	○		

I4RS0A510003-

TCM Reception Data

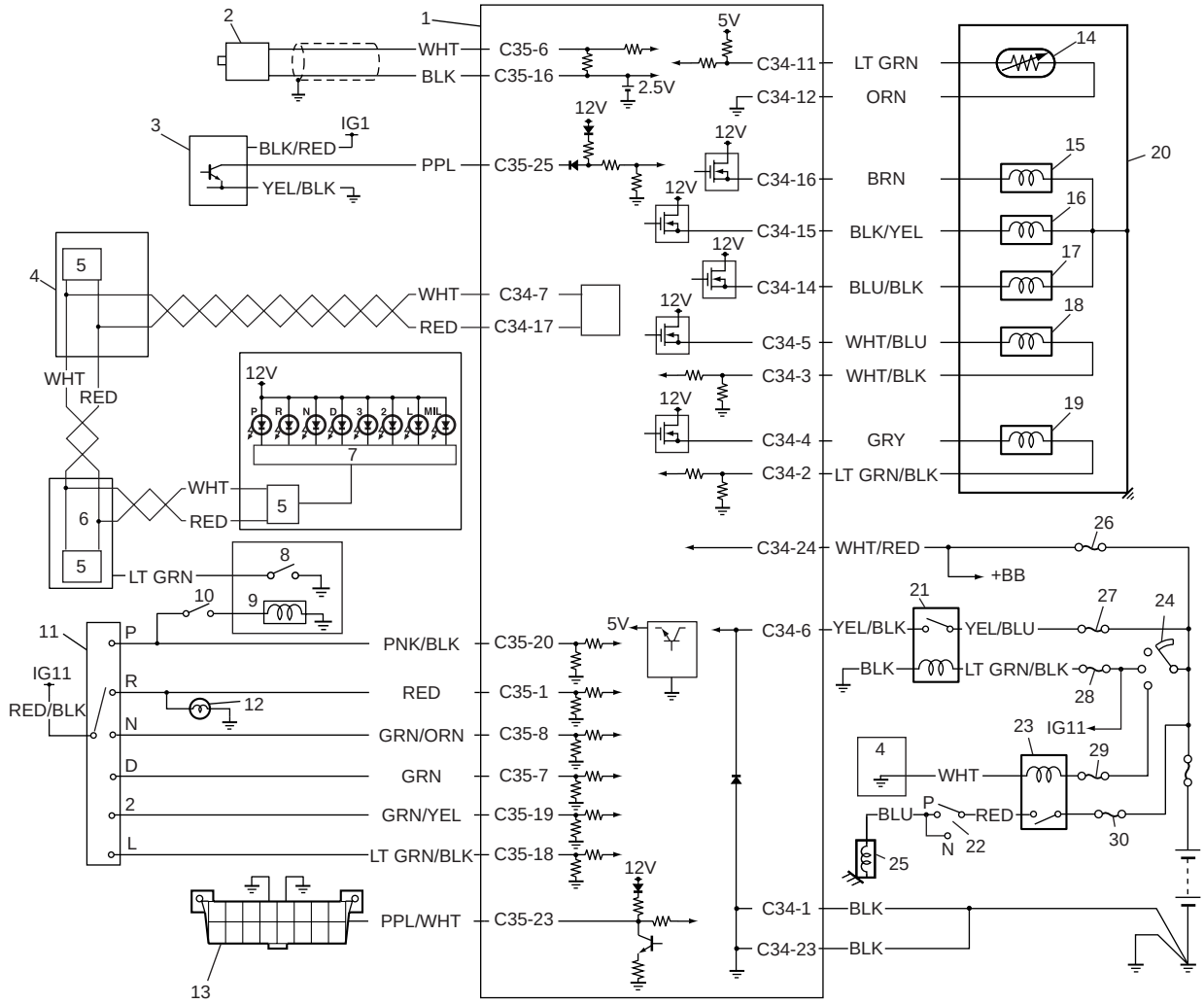
				ECM	BCM
TCM	Receive	DATA	Engine torque driver request	○	
			Engine speed	○	
			4th gear inhibit	○	
			Torque converter clutch control inhibit	○	
			Lock up/ slip control inhibit signal	○	
			Throttle position	○	
			Engine coolant temperature	○	
			Brake pedal switch active	○	
			"3" position switch active		○
			Stand by to engage air conditioning compressor clutch	○	

I4RS0A510004-

Schematic and Routing Diagram

Transmission Control Module (TCM) Wiring Diagram

S4RS0A5102001



I4RS0A510005-

1. TCM	12. Backup lamp	23. Starter motor relay
2. Input shaft speed sensor	13. Data link connector DLC	24. Ignition switch
3. Output shaft speed sensor / VSS	14. Transmission fluid temperature sensor	25. Starter motor
4. ECM	15. Shift solenoid valve-A (No.1)	26. “DOME” fuse
5. CAN driver	16. Shift solenoid valve-B (No.2)	27. “AT ETM” fuse
6. BCM	17. Timing solenoid valve	28. “IG SIG” fuse
7. Meter driver	18. TCC lock-up pressure control solenoid valve	29. “ST SIG” fuse
8. “3” position switch	19. Pressure control solenoid valve	30. “ST MOT” fuse
9. Shift lock solenoid	20. A/T	[A]: Terminal arrangement of TCM connector (viewed from harness side)
10. Brake light switch	21. AT relay	
11. Transmission range sensor	22. Inhibitor switch (including transmission range sensor)	

Operation of Shift Solenoid Valves, Timing Solenoid Valve and TCC Solenoid Valve

Selector position	Gear position	Solenoid				Condition
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No. 2)	Timing solenoid valve	TCC solenoid valve	
P	Parking	○	○	×	×	
R	Reverse	○	○	×	×	When vehicle is traveling forwards in less than 9 km/h, 6 mile/h vehicle speed
		○	○	○	×	When vehicle is traveling forwards in 9 km/h, 6 mile/h or more vehicle speed
	(Reverse)	×	×	×	×	When fail-safe function is operating
N	Neutral	○	○	×	×	
D	Neutral → 1st	—	—	○	—	Timing solenoid is turned ON for about 0.5 sec. while on gear shifting
	1st	○	○	×	×	
	2nd	○	×	×	×	
	3rd	×	×	×	△	
	3rd ↔ 4th	—	—	○	—	Timing solenoid is turned ON for about 0.5 sec. while on gear shifting
	4th	×	○	×	△	
	(3rd)	×	×	×	×	When fail-safe function is operating
2	1st	○	○	×	×	
	2nd	○	×	×	×	
	(3rd)	×	×	×	×	When fail-safe function is operating
L	1st	○	○	×	×	
	(3rd)	×	×	×	×	When fail-safe function is operating

○: ON (Turn power ON)
×: OFF (Turn power OFF)
△: ON only when TCC is operating

	Valve status	
	Turn power ON	Turn power OFF
Shift solenoid valve-A (No.1)	Close	Open
Shift solenoid valve-B (No.2)	Close	Open
Timing solenoid	Open	Close
TCC (lock-up) pressure control solenoid	Close	Open

Automatic Gear Shift Table

S4RS0A5102002

Automatic gear shift schedule is shown in the following table. Test-drive the vehicle on a flat road in the D position.

1.Shift Point in D, 3 and/or 2 position

	Throttle opening (%)	Shift	Vehicle speed km/h (mph)	Remark
UP shift	Over 85%	1st → 2nd	47 – 52 (29 – 32)	
		2nd → 3rd	95 – 100 (59 – 62)	
		3rd → 4th	152 – 157 (94 – 98)	
	50%	1st → 2nd	15 – 20 (9 – 12)	
		2nd → 3rd	46 – 51 (29 – 32)	
		3rd → 4th	80 – 85 (50 – 53)	
	10%	1st → 2nd	10 – 15 (6 – 9)	
		2nd → 3rd	29 – 34 (18 – 21)	
		3rd → 4th	43 – 48 (27 – 30)	
DOWN shift	Over 90%	4th → 3rd	137 – 142 (85 – 88)	
		3rd → 2nd	76 – 81 (47 – 50)	
		2nd → 1st	33 – 38 (21 – 24)	
	50%	4th → 3rd	64 – 69 (40 – 43)	
		3rd → 2nd	31 – 36 (19 – 22)	
		2nd → 1st	8 – 13 (5 – 8)	
	0%	4th → 3rd	28 – 33 (17 – 21)	
		3rd → 2nd	17 – 22 (11 – 14)	
		2nd → 1st	8 – 13 (5 – 8)	

2. Lock-up point in D and/or 3 position

	Lock-up clutch status	Throttle opening (%)	Vehicle speed km/h (mph)	Remark
3rd gear lock-up	ON	Over 80%	152 – 157 (94 – 98)	
		50%	80 – 85 (50 – 53)	
	OFF	Over 90%	108 – 113 (67 – 70)	
		50%	55 – 60 (34 – 37)	
4th gear lock-up	ON	Over 80%	255 (158)	Except throttle opening shift from low to high at vehicle speed 148 km/h (92 mph) or more with Lock-up ON condition.
		55%	152 – 157 (94 – 98)	
	OFF	Over 80%	146 – 151 (91 – 94)	
		55%	96 – 101 (60 – 63)	

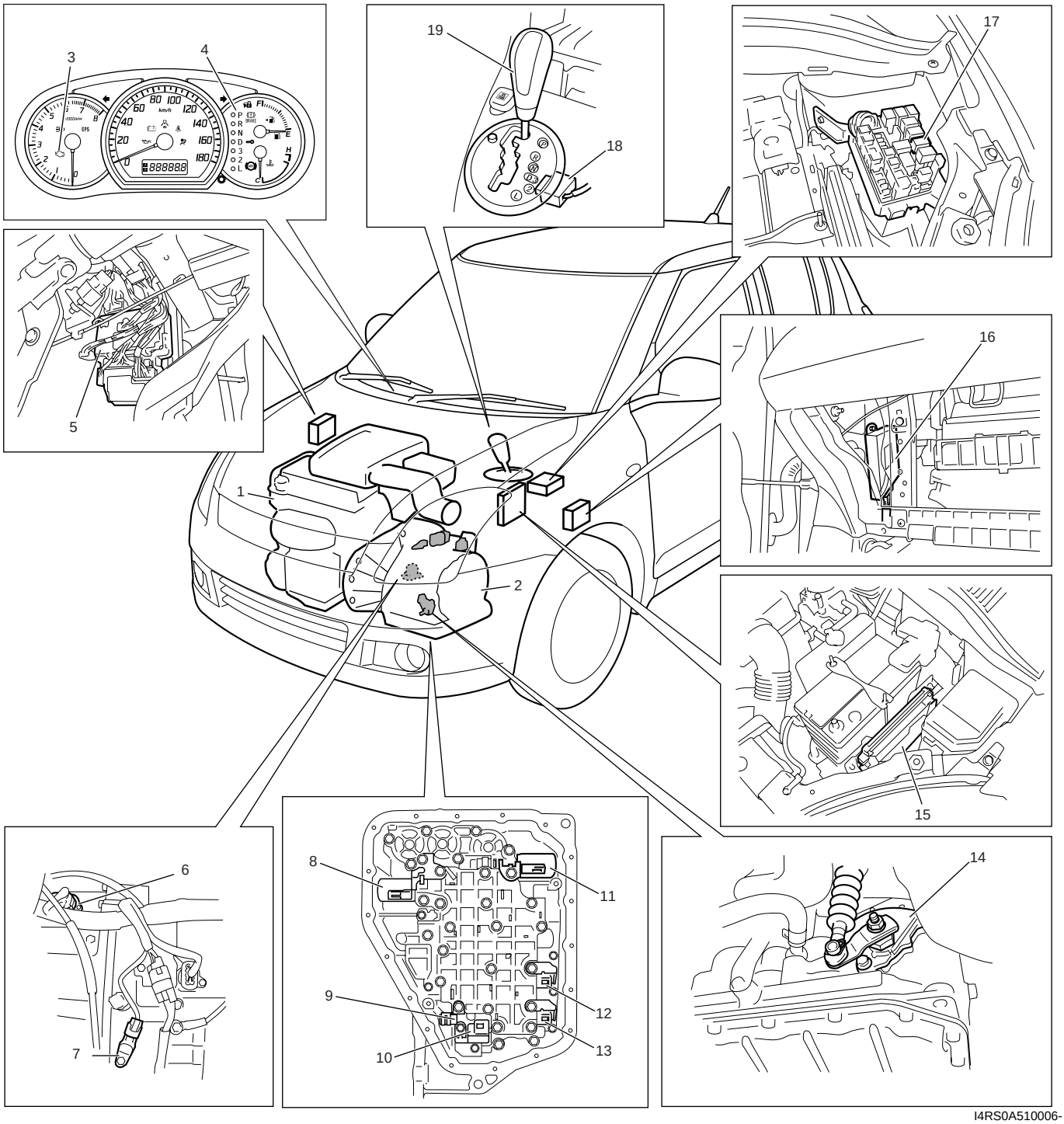
3. Slip lock-up point in D and/or 3 position

	Slip Lock-up clutch status	Throttle opening (%)	Vehicle speed km/h (mph)	Remark
3rd gear	Slip ON	15 – 20%	32 – 37 (20 – 23)	Without lock-up condition
	Slip OFF	15 – 20%	30 – 35 (19 – 22)	
4th gear	Slip ON	15 – 20%	46 – 51 (29 – 32)	Without lock-up condition
	Slip OFF	15 – 20%	43 – 48 (27 – 30)	

Component Location

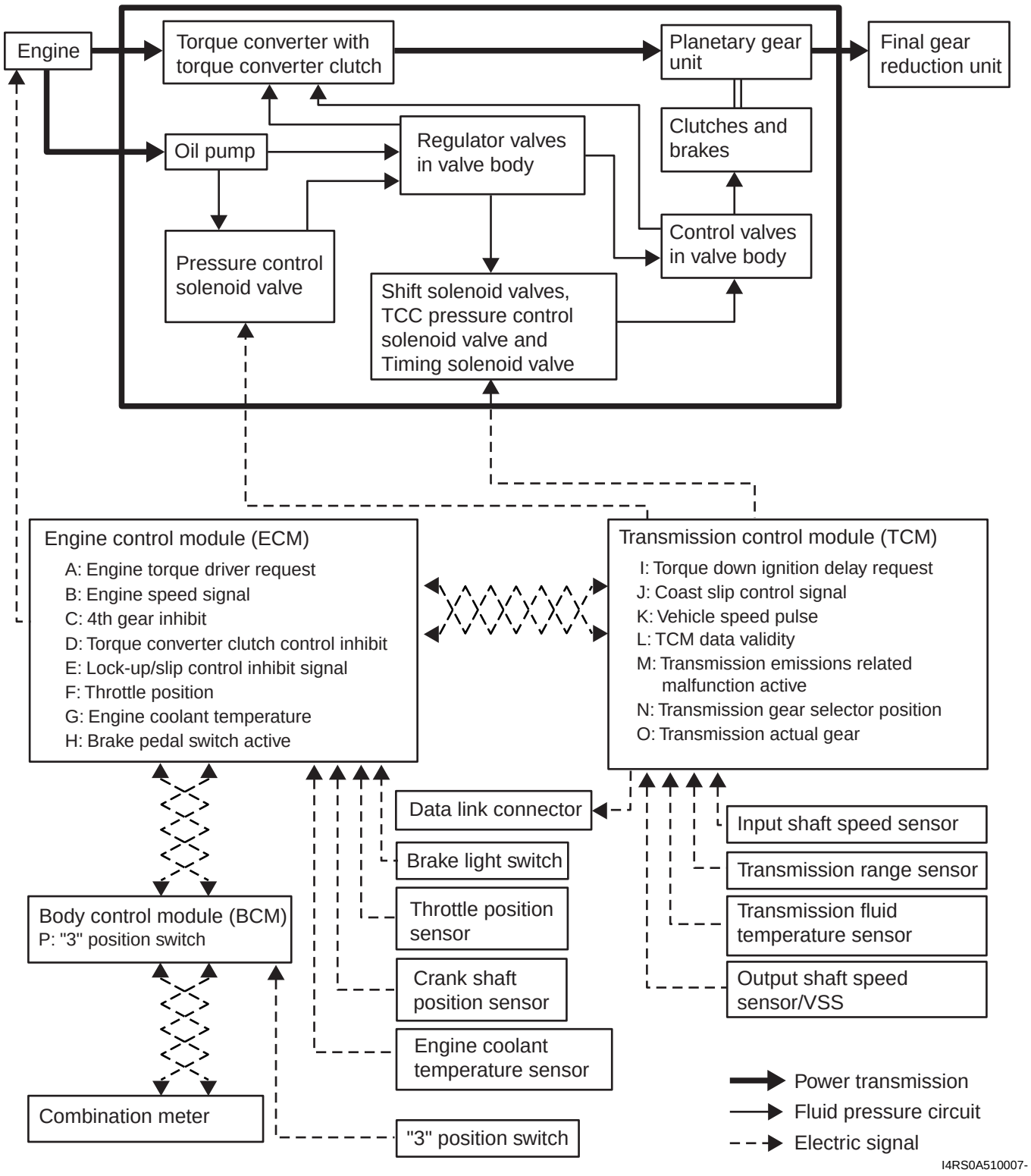
Electronic Shift Control System Components Location

S4RS0A5103001



I4RS0A510006-

1. Engine	8. TCC pressure control solenoid valve	15. ECM
2. Transaxle	9. Transmission fluid temperature sensor	16. TCM
3. MIL	10. Timing solenoid valve	17. AT relay
4. Shift position indicator lamp	11. Pressure control solenoid valve	18. “3” position switch
5. Junction block assembly (included in BCM)	12. Shift solenoid valve-B (No.2)	19. Select lever
6. Output shaft speed sensor (VSS)	13. Shift solenoid valve-A (No.1)	
7. Input shaft speed sensor	14. Transmission range sensor	


Engine
Torque converter with torque converter clutch
Planetary gear unit
Final gear reduction unit
Oil pump
Regulator valves in valve body
Clutches and brakes
Pressure control solenoid valve
Control valves in valve body
Shift solenoid valves, TCC pressure control solenoid valve and Timing solenoid valve
Engine control module (ECM)
A: Engine torque driver request
B: Engine speed signal
C: 4th gear inhibit
D: Torque converter clutch control inhibit
E: Lock-up/slip control inhibit signal
F: Throttle position
G: Engine coolant temperature
H: Brake pedal switch active
Transmission control module (TCM)
I: Torque down ignition delay request
J: Coast slip control signal
K: Vehicle speed pulse
L: TCM data validity
M: Transmission emissions related malfunction active
N: Transmission gear selector position
O: Transmission actual gear
Data link connector
Brake light switch
Throttle position sensor
Crank shaft position sensor
Engine coolant temperature sensor
Input shaft speed sensor
Transmission range sensor
Transmission fluid temperature sensor
Output shaft speed sensor/VSS
Body control module (BCM)
P: "3" position switch
Combination meter
"3" position switch
Power transmission
Fluid pressure circuit
Electric signal
I4RS0A510007-

Diagnostic Information and Procedures

A/T System Check

S4RS0A5104001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	☞ **DTC / freeze frame data check, record and clearance** 1) Check for DTC. *Is there any DTC(s)?*	Print DTC or write them down and clear them by referring to “DTC Clearance: ”. Go to Step 3.	Go to Step 4.
3	☞ **Visual inspection** 1) Perform visual inspection. *Is there any faulty condition?*	Repair or replace malfunction part. Go to Step 11.	Go to Step 5.
4	☞ **Visual inspection** 1) Perform visual inspection. *Is there any faulty condition?*	Repair or replace malfunction part. Go to Step 11.	Go to Step 8.
5	☞ **Trouble symptom confirmation** 1) Confirm trouble symptom. *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	☞ **Rechecking and record of DTC / freeze frame data** 1) Recheck for DTC referring to “DTC Check: ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 8.
7	☞ **Rechecking and record of DTC / freeze frame data** 1) Recheck for DTC referring to “DTC Check: ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	☞ **A/T basic check and A/T symptom diagnosis** 1) Check and repair according to “A/T Basic Check: ” and “A/T Symptom Diagnosis: ”. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
9	☞ **Troubleshooting for DTC** 1) Check and repair according to applicable DTC flow. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
10	☞ **Check for intermittent problems** 1) Check for intermittent problems. *Is there any faulty condition?*	Repair or replace malfunction part(s). Go to Step 11.	Go to Step 11.
11	☞ **Final confirmation test** 1) Clear DTC if any. 2) Perform final confirmation test. *Is there any problem symptom, DTC or abnormal condition?*	Go to Step 6.	End.

Step 1. Customer Complaint Analysis

Record details of the problem such as failure, complaint and how it occurred as described by the customer.
For this purpose, use of such an inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date of Reg.:	Date of problem:	Mileage:

PROBLEM SYMPTOMS
☐ Vehicle does not move (R, D, 2, L or any range)
☐ No upshift automatically (☐ 1st to 2nd ☐ 2nd to 3rd ☐ 3rd to 4th (O/D) ☐ 2 range ☐ D range)
☐ No downshift automatically (☐ 3rd to 2nd ☐ 2nd to 1st ☐ 4th (O/D) to 3rd ☐ 2 range ☐ D range)
☐ No gear change manually (☐ 1st ↔ 3rd ☐ 3rd ↔ 4th)
☐ TCC no lock-up ☐ TCC no lock-up off
☐ Automatic shift point too high or too low
☐ Excessive gear change shock (1st/2nd/3rd/4th (O/D)/Reverse)
☐ No kickdown
☐ Transmission slipping in (1st/2nd/3rd/4th (O/D)/Reverse)
☐ Others _____

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather Temperature Frequency Read	☐ Fair ☐ Cloudy ☐ Rain ☐ Always ☐ Other _____ (°F/ °C) ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ always ☐ Always ☐ Sometimes (times/ day, month) ☐ Only once ☐ Under certain condition ☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous ☐ Uphill ☐ Downhill ☐ Tarmacadam ☐ Gravel ☐ Other _____
Vehicle Condition	
Engine & transmission condition	☐ Cold/ ☐ Warming up phase/ ☐ Warmed up Engine speed (r/min.) Throttle opening (☐ Idle/ ☐ About % ☐ full) O/D cut switch (☐ ON/ ☐ OFF)
Vehicle condition	☐ At stop/ ☐ During driving (☐ Constant speed ☐ Accelerating ☐ Decelerating ☐ Braking) ☐ Right hand corner ☐ Left hand corner ☐ Vehicle speed (km/h mile/h) ☐ Other _____

"O/D OFF" lamp	☐ Blink ☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Malfunction indicator lamp	☐ Blink ☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Diagnostic trouble code	First check: ☐ No code ☐ Malfunction code ( )
	Second check: ☐ No code ☐ Malfunction code ( )

I2RH01510008-

NOTE:

The form is a standard sample. It should be modified according to conditions characteristic of each market.

Step 2. DTC / Freeze Frame Data Check, Record and Clearance
First, referring to “DTC Check: ”, check DTC and pending DTC. If DTC exists, print or write down DTC and freeze frame data and then clear malfunction DTC(s) by referring to “DTC Clearance: ”. Malfunction DTC indicates malfunction in the system but it is not possible to know from it whether the malfunction is occurring now or it occurred in the past and normal condition has been restored. In order to know that, check symptom in question according to Step 5 and then recheck DTC according to Step 6.
Diagnosing a trouble based on the DTC in this step only or failure to clear the DTC in this step may result in an faulty diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting which is otherwise unnecessary.

Step 3 and 4. Visual Inspection
As a preliminary step, be sure to perform visual check of the items that support proper function of the engine and automatic transaxle referring to “Visual Inspection: ”.

Step 5. Trouble Symptom Confirmation
Check trouble symptoms based on information obtained in “Step 1. Customer Complaint Analysis: ” and “Step 2. DTC / Freeze Frame Data Check, Record and Clearance: ”.
Also, reconfirm DTC according to “DTC Confirmation Procedure” described in each DTC flow.

Step 6 and 7. Rechecking and Record of DTC and Freeze Frame Data
Refer to “DTC Check: ” for checking procedure.

Step 8. A/T Basic Check and A/T Symptom Diagnosis
Perform basic check of A/T according to “A/T Basic Check: ” first. When the end of the flow has been reached, check the parts of the system suspected as a possible cause referring to “A/T Symptom Diagnosis: ” and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or A/T basic check) and repair or replace faulty parts, if any.

Step 9. Troubleshooting for DTC
Based on the DTC indicated in Step 6 / 7 and referring to “applicable DTC flow”, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, TCM or other part and repair or replace faulty parts.

Step 10. Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g. wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection: in Section 00” and related circuit of DTC recorded in Step 2.

Step 11. Final Confirmation Test
Confirm that the problem symptom has gone and the vehicle is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once and check to ensure that no malfunction DTC is indicated.

Visual Inspection

S4RS0A5104002

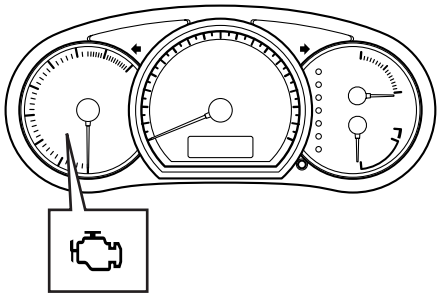
Visually check the following parts and systems.

Inspection item	Referring
• A/T fluid ----- level, leakage, color	"Automatic Transaxle Fluid Level Inspection: in Section 0B"
• A/T fluid hoses ----- disconnection, looseness, deterioration	"A/T Fluid Cooler Hoses Replacement: "
• Throttle cable ----- play (under warm engine), installation	"Accelerator Cable Adjustment: in Section 1D"
• A/T select cable ----- installation	"Select Cable Removal and Installation: "
• Engine oil ----- level, leakage	"Engine Oil and Filter Change: in Section 0B"
• Engine coolant ----- level, leakage	"Engine Coolant Change: in Section 0B"
• Engine mountings ----- play, looseness, damage	"Engine Assembly Removal and Installation: in Section 1D"
• Suspension ----- play, looseness	"Suspension, Wheels and Tires Symptom Diagnosis: in Section 2A"
• Drive shafts ----- damage	"Front Drive Shaft Assembly On-Vehicle Inspection: in Section 3A"
• Battery ----- indicator condition, corrosion of terminal	"Battery Inspection: in Section 1J"
• Connectors of electric wire harness ----- disconnection, friction	"Electronic Shift Control System Components Location: "
• Fuses ----- burning	
• Parts ----- installation, damage	
• Bolts ----- looseness	
• Other parts that can be checked visually	
Also check the following items at engine start, if possible.	
• Malfunction indicator lamp ----- Operation	"Malfunction Indicator Lamp (MIL) Check: "
• Charge warning lamp ----- Operation	"Generator Symptom Diagnosis: in Section 1J"
• Engine oil pressure warning lamp ----- Operation	"Oil Pressure Warning Light Symptom Diagnosis: in Section 9C"
• Engine coolant temp. meter ----- Operation	"Engine Coolant Temperature (ECT) Meter Symptom Diagnosis: in Section 9C"
• Other parts that can be checked visually	

Malfunction Indicator Lamp (MIL) Check

S4RS0A5104003

Refer to the same item in "Malfunction Indicator Lamp (MIL) Check: in Section 1A" for checking procedure.



I4RS0A510008-

DTC Table

S4RS0A5104005

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when MIL lighted
☞ P0705	Transmission range sensor circuit malfunction (PRNDL input)	Multiple signals are inputted simultaneously.	1 driving cycle
☞ P0707	Transmission range sensor circuit low	No sensor signal is inputted.	2 driving cycles
☞ P0712	Transmission fluid temperature sensor circuit low	Sensor output voltage is too low.	1 driving cycle
☞ P0713	Transmission fluid temperature sensor circuit high	Sensor output voltage is too high.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when MIL lighted
☞ P0717	Input / Turbine speed sensor circuit no signal	No sensor signal is detected although output speed sensor signal is inputted.	1 driving cycle
☞ P0722	Output speed sensor circuit no signal	No sensor signal is inputted although input speed sensor signal is inputted.	1 driving cycle
☞ P0741	Torque converter clutch circuit performance or stuck off	Difference in revolution between engine and input shaft is too large although TCM is commanding TCC solenoid to turn ON.	2 driving cycles
☞ P0742	Torque converter clutch circuit stuck on	Difference in revolution between engine and input shaft is too small although TCM is commanding TCC solenoid to turn OFF.	2 driving cycles
☞ P0751	Shift solenoid-A (No.1) performance or stuck off	Actual gear position is 3rd gear although TCM command is for 2nd gear.	2 driving cycles
☞ P0752	Shift solenoid-A (No.1) stuck on	Actual gear position is 2nd gear although TCM command is for 3rd gear.	2 driving cycles
☞ P0756	Shift solenoid-B (No.2) performance or stuck off	Actual gear position is 3rd gear although TCM command is for 4th gear.	2 driving cycles
☞ P0757	Shift solenoid-B (No.2) stuck on	Actual gear position is 4th gear although TCM command is for 3rd gear.	2 driving cycles
☞ P0787	Shift / Timing solenoid control circuit low	Voltage of timing solenoid terminal is low although TCM is commanding timing solenoid to turn ON.	1 driving cycle
☞ P0788	Shift / Timing solenoid control circuit high	Voltage of timing solenoid terminal is high although TCM is commanding timing solenoid to turn OFF.	1 driving cycle
☞ P0962	Pressure control solenoid control circuit low	No electric flow is detected on pressure control solenoid circuit.	1 driving cycle
☞ P0963	Pressure control solenoid control circuit high	Too much electric flow is detected on pressure control solenoid circuit.	1 driving cycle
☞ P0973	Shift solenoid-A (No.1) control circuit low	Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON.	1 driving cycle
☞ P0974	Shift solenoid-A (No.1) control circuit high	Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF.	1 driving cycle
☞ P0976	Shift solenoid-B (No.2) control circuit low	Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON.	1 driving cycle
☞ P0977	Shift solenoid-B (No.2) control circuit high	Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF.	1 driving cycle
☞ P1702	Internal control module memory check sum error	Calculation of current data stored in TCM is not correct comparing with pre-stored checking data in TCM.	1 driving cycle
☞ P1703	CAN invalid data - from other ECU(s)	TCM receives malfunction signal of throttle position, engine coolant temperature, engine revolution and engine torque from ECM.	*1
☞ P1723	Range select switch malfunction	“3” position switch ON signal is inputed although transmission range switch signal is inputed P, R, N or L. range.	*1
☞ P1774	Control module communication bus off	Transmitting and receiving error detected to TCM for specified time continuously.	1 driving cycle
☞ P1775	High speed can communication bus (Transmission error)	Transmitting error detected to TCM for specified time continuously.	1 driving cycle
☞ P1777	TCM lost communication with ECM (Reception error)	Receiving error from ECM detected to TCM for specified time continuously.	1 driving cycle
☞ P1778	TCM lost communication with BCM (Reception error)	Receiving error from BCM detected to TCM for specified time continuously.	*1
☞ P1878	Torque converter clutch shudder	Variation in the output revolution speed of the specified amplitude and specified cycle is detected under slip lock-up condition.	*1

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when MIL lighted
☞ P2763	Torque converter clutch pressure control solenoid control circuit high	Too much electric flow is detected on TCC solenoid circuit.	1 driving cycle
☞ P2764	Torque converter clutch pressure control solenoid control circuit low	No electric flow is detected on TCC solenoid circuit.	1 driving cycle

NOTE:

***1: TCM does not desire turning on malfunction indicator lamp to ECM but DTC is stored in TCM memory. This item can not be read generic scan tool.**

DTC Check

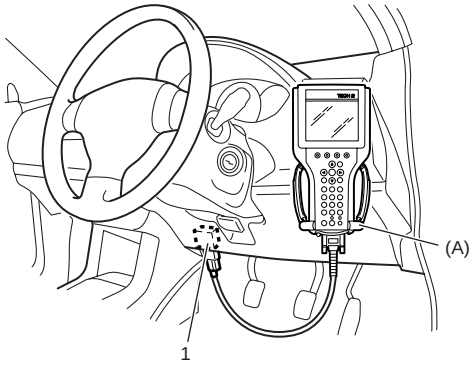
S4RS0A5104006

NOTE:

The MIL is turned on when the ECM and/or TCM detect malfunction(s). Each control module stores diagnostic information as the diagnostic trouble code (DTC) in its memory and outputs the DTC to the scan tool. Therefore, check both of the control modules for any DTC with the scan tool because the DTC stored in ECM and TCM is not read and displayed at a time. However, each of the control modules needs not to be checked with the generic scan tool because the DTC stored in ECM and TCM is read and displayed at a time. In case using generic scan tool, refer to "DTC Table: in Section 1A".

1) Turn ignition switch to OFF position.
2) Connect scan tool to data link connector (DLC) (1).

Special tool
(A): SUZUKI scan tool



I4RS0A510009-

3) Turn ignition switch ON.
4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print it down. Refer to scan tool operator's manual for further details.
   If communication between scan tool and TCM is not possible, check if scan tool is communicable by connecting it to TCM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector.

DTC Clearance

S4RS0A5104007

WARNING:

When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure.

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for "DTC Check: ".
2) Turn ignition switch ON.
3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector (DLC).

NOTE:

DTC and freeze frame data stored in TCM memory are also cleared in the following cases. Be careful not to clear them before keeping their record.

- **When power to TCM is cut off (by disconnecting battery cable, removing fuse or disconnecting TCM connectors).**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles.**

Fail-Safe Table

S4RS0A5104008

This function is provided by the safe mechanism that assures safe driveability even when the solenoid valve, sensor or its circuit fails. The following table shows the fail-safe function for each fail condition of sensor, solenoid or its circuit.

DTC No.	Trouble area	Fail-safe operation
☞ P0705	Transmission range sensor circuit malfunction (PRNDL input)	• Selected range is set in priority order shown below. D > 2 > L > R > N > P • Slip controlled lock-up function is inhibited to operate. • Learning control is inhibited.
☞ P0707	Transmission range sensor circuit low	• Selected range is assumed to be “D” range. • Slip controlled lock-up function is inhibited to operate. • Learning control is inhibited.
☞ P0712 ☞ P0713	Transmission fluid temperature sensor circuit low	• A/T fluid temperature is assumed to be 200 °C (392 °F). • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P0717	Input / Turbine speed sensor circuit no signal	• Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P0722	Output speed sensor circuit no signal	• Vehicle speed which is calculated by input shaft speed sensor signal is used for gear shifting control instead of vehicle speed calculated by output shaft speed sensor (VSS) signal. • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P0787	Shift / Timing solenoid Control Circuit Low	• Power supply for all solenoid valves is cut. • Gear position is fixed in 3rd gear. • Line pressure control at gear shifting is inhibited. • Look-up function is inhibited to operate.
☞ P0788	Shift / Timing solenoid Control Circuit High	
☞ P0962	Pressure control solenoid control circuit low	
☞ P0963	Pressure control solenoid control circuit high	
☞ P0973	Shift solenoid-A (No.1) control circuit low	
☞ P0974	Shift solenoid-A (No.1) control circuit high	
☞ P0976	Shift solenoid-B (No.2) control circuit low	
☞ P0977	Shift solenoid-B (No.2) control circuit high	
☞ P1702	Internal control module memory check sum error	• Power supply for all solenoid valves is cut. • Gear position is fixed in 3rd gear. • Line pressure control at gear shifting is inhibited. • Lock-up function is inhibited to operate.

DTC No.	Trouble area	Fail-safe operation
☞ P1703	CAN invalid data - TCM	In case of throttle position signal malfunction: • Throttle opening used for line pressure control is assumed to be 100%. • Throttle opening used for gear shifting control is assumed to be 0%. • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Garage shift control is inhibited. • Learning control is inhibited. In case of engine coolant temperature signal malfunction: • Slip controlled lock-up function is inhibited to operate. • After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be normal operating temperature, and controls of overdrive and lock-up is released from inhibition. In case of engine revolution signal malfunction: • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Garage shift control is inhibited. • Learning control is inhibited. In case of engine torque signal malfunction: • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Upshifting to 4th gear is inhibited. • Learning control is inhibited.
☞ P1723	Range select switch malfunction	“3” position switch is assumed to be OFF.
☞ P1774	Control module communication bus off	• Throttle opening used for line pressure control is assumed to be 100%. • Throttle opening used for gear shifting control is assumed to be 0%. • Engine revolution is assumed to be 0 RPM. • After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be 90 °C (194 °F). • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Upshifting to 4th gear is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.

DTC No.	Trouble area	Fail-safe operation
☞ P1777	TCM lost communication with ECM (Reception error)	• Throttle opening used for line pressure control is assumed to be 100%. • Throttle opening used for gear shifting control is assumed to be 0%. • Engine revolution is assumed to be 0 RPM. • After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be 90 °C (194 °F). • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Upshifting to 4th gear is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P1878	Torque converter clutch shudder	Slip controlled lock-up function is inhibited to operate.
☞ P2763	Torque converter clutch pressure control solenoid control circuit high	• Lock-up function is inhibited to operate. • Upshifting to 4th gear is inhibited when A/T fluid temperature is more than 150 °C (302 °F). • Vehicle speed is slower than 15 km/h (9 mile/h), gear position is fixed in 1st gear for prevention of engine stall.
☞ P2764	Torque converter clutch pressure control solenoid control circuit low	• Lock-up function is inhibited to operate. • Upshifting to 4th gear is inhibited when A/T fluid temperature is more than 150 °C (302 °F).

Scan Tool Data

S4RS0A5104009

As the data values given in the following table are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.
Also, condition in the following table that can be checked by the scan tool are those detected by TCM and output from TCM as commands and there may be cases where the automatic transaxle or actuator is not operating (in the condition) as indicated by the scan tool.

NOTE:

The following scan tool data related to automatic transaxle can be checked only by communicating with TCM.

Scan tool data	Vehicle condition		Normal condition / reference values
☞ GEAR POSITION	Ignition switch ON	Selector lever is in “P” position	P or N
		Selector lever is in “R” position	R
		Selector lever is in “N” position	P or N
		Selector lever is in “D” position	1
		Selector lever is in “3” position	1
		Selector lever is in “2” position	1
		Selector lever is in “L” position	1
☞ ENGINE SPEED	At engine idle speed		Engine idle speed is displayed
☞ INPUT SHAFT REVOLUTION	Ignition switch ON and engine stop		0 RPM
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear (“3” range)		2300 RPM (displayed in increments of 50 rpm)
☞ OUTPUT SHAFT REVOLUTION	At vehicle stop		0 RPM
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear (“3” range)		2300 RPM (displayed in increments of 50 rpm)
☞ BATTERY VOLTAGE	Ignition switch ON and engine stop		Battery voltage is displayed (8 – 16 V)

Scan tool data	Vehicle condition		Normal condition / reference values
☞ ATF TEMPERATURE	After driving at 60 km/h (37.5 mile/h) for 15 minutes or more, and A/T fluid temperature around sensor reaches 70 – 80 °C (158 – 176 °F)		70 – 80 °C (158 – 176 °F)
☞ SHIFT SOLENOID-A COMMAND	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, O/D off switch ON, 20% or less throttle opening and 3rd gear		OFF
☞ SHIFT SOLENOID-A MONITOR	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, O/D off switch ON, 20% or less throttle opening and 3rd gear		OFF
☞ SHIFT SOLENOID-B COMMAND	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, O/D off switch ON, 20% or less throttle opening and 3rd gear		OFF
☞ SHIFT SOLENOID-B MONITOR	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, O/D off switch ON, 20% or less throttle opening and 3rd gear		OFF
☞ TIMING SOLENOID COMMAND	Ignition switch ON and selector lever is in “N” range		OFF
	For about 0.5 sec. while on gear shifting between 3rd and 4th or gear shifting “N” to “D”		ON
☞ TIMING SOLENOID MONITOR	Ignition switch ON and selector lever is in “N” range		OFF
	For about 0.5 sec. while on gear shifting between 3rd and 4th or gear shifting “N” to “D”		ON
☞ TCC SOLENOID	At vehicle stop, closed throttle, engine idle speed and 1st gear		0%
☞ PRESSURE CONTROL SOLENOID	At vehicle stop, closed throttle, engine idle speed and 1st gear		0%
☞ VEHICLE SPEED	At vehicle stop		0 km/h, 0 MPH
☞ O/D OFF SWITCH	Ignition switch ON	Shift selector lever to “3” or “2” range	ON
		Shift selector lever to other above range	OFF
☞ TRANSAXLE RANGE	Ignition switch ON	Selector lever is in “P” position	P
		Selector lever is in “R” position	R
		Selector lever is in “N” position	N
		Selector lever is in “D” position	D
		Selector lever is in “3” position	D
		Selector lever is in “2” position	2
		Selector lever is in “L” position	L
☞ D RANGE SIGNAL	Ignition switch ON	Selector lever is in “P” position	OFF
		Selector lever is in “R” position	ON
		Selector lever is in “N” position	OFF
		Selector lever is in “D” position	ON
		Selector lever is in “3” position	ON
		Selector lever is in “2” position	ON
		Selector lever is in “L” position	ON
☞ THROTTLE POSITION	Ignition switch ON	Accelerator pedal is depressed	0 – 100% (Varies depending on depressed value)
		Accelerator pedal is released	0%
☞ BRAKE SWITCH	Ignition switch ON	Brake pedal is depressed	ON
		Brake pedal is released	OFF
☞ TORQUE REDUCTION SIGNAL	While on gear upshifting with 25% or more throttle opening		ON
	Under condition of not shifting gear		OFF
☞ ENGINE COOLANT TEMPERATURE	Ignition switch ON		Engine coolant temperature is displayed
☞ AIR CONDITIONER SIGNAL	Ignition switch ON and air conditioner switch OFF		OFF
☞ ENGINE TORQUE SIGNAL	Ignition switch ON and engine stop		0 N·m

Scan tool data	Vehicle condition	Normal condition / reference values
☞ SLIP RPM	Engine running at idle speed and selector lever is in “P” range	0 RPM
	Engine running, vehicle stop and selector lever is in “D” range	Engine speed is displayed
☞ MIL REQUEST	Ignition switch ON	OFF
☞ FUEL CUT FLAG	Ignition switch ON	OFF

Scan Tool Data Definitions:

GEAR POSITION
Current gear position computed by throttle position coming from ECM and vehicle speed.

ENGINE SPEED (RPM)
Engine speed computed by reference pulses from crankshaft position sensor.

INPUT SHAFT REVOLUTION (RPM)
Input shaft revolution computed by reference pulses coming from input shaft speed sensor on transaxle case.

OUTPUT SHAFT REVOLUTION (RPM)
Output shaft revolution computed by reference pulses coming from output shaft speed sensor (VSS) on transaxle case.

BATTERY VOLTAGE (V)
Battery voltage read by TCM as analog input signal by TCM.

ATF TEMPERATURE (°C, °F)
ATF temperature decided by signal from transmission fluid temperature sensor installed on valve body.

SHIFT SOLENOID-A COMMAND
ON: ON command being outputted to shift solenoid valve-A (No.1)
OFF: ON command not being outputted to shift solenoid valve-A (No.1)

SHIFT SOLENOID-A MONITOR
ON: Electricity being passed to shift solenoid valve-A (No.1)
OFF: Electricity not being passed to shift solenoid valve-A (No.1)

SHIFT SOLENOID-B COMMAND
ON: ON command being outputted to shift solenoid valve-B (No.2)
OFF: ON command not being outputted to shift solenoid valve-B (No.2)

SHIFT SOLENOID-B MONITOR
ON: Electricity being passed to shift solenoid valve-B (No.2)
OFF: Electricity not being passed to shift solenoid valve-B (No.2)

TIMING SOLENOID COMMAND
ON: ON command being outputted to timing solenoid valve
OFF: ON command not being outputted to timing solenoid valve

TIMING SOLENOID MONITOR
ON: Electricity being passed to timing solenoid valve
OFF: Electricity not being passed to timing solenoid valve

TCC SOLENOID
Electric current value ratio between electric current value being outputted from TCM to solenoid and maximum value can be outputted by TCM.

PRESSURE CONTROL SOLENOID
Electric current value ratio between electric current value being outputted from TCM to solenoid and maximum value can be outputted by TCM.

VEHICLE SPEED (KPH/MPH)
Vehicle speed computed by reference pulse signals coming from vehicle speed sensor on transaxle case.

O/D OFF SWITCH (“3” position switch)
Inputted signal from “3” position switch in selector lever assembly.
ON: Shift selector lever to “3” or “2” range
OFF: Shift selector lever to other above range

TRANSAXLE RANGE
Transaxle range detected by signal fed from transmission range sensor.

D RANGE SIGNAL
ON: Signal which TCM require ECM to increase idle speed
OFF: Signal which TCM does not require ECM to increase idle speed

THROTTLE POSITION (%)
Throttle opening ratio computed by duty signal from ECM.

BRAKE SWITCH
Inputted signal from brake light switch on pedal bracket.
ON: Brake pedal depressed
OFF: Brake pedal released

TORQUE REDUCTION SIGNAL
ON: Signal which TCM require ECM to reduce output torque at shifting gear
OFF: Signal which TCM does not require ECM to reduce output torque

ENGINE COOLANT TEMPERATURE (°C, °F)
Engine coolant temperature computed by duty signal from ECM.

AIR CONDITIONER SIGNAL
ON: Signal which inform that air conditioner compressor is turned ON.
OFF: Signal which inform that air conditioner compressor is not turned ON.

ENGINE TORQUE SIGNAL (N·m)
Engine torque computed by duty pulse signal outputted from ECM.

SLIP RPM (RPM)
This parameter indicates slipping rotation in the torque converter (difference between input shaft rotation and engine rotation)

MIL REQUEST
ON: Signal which TCM requires combination meter to turn on malfunction indicator lamp.
OFF: Signal which TCM does not require combination meter to turn on malfunction indicator lamp.

FUEL CUT FLAG
ON: Signal which inform that fuel cut is operating.
OFF: Signal which inform that fuel cut is not operating.

A/T Basic Check

S4RS0A5104010

This check is important for troubleshooting when TCM has detected no DTC and no abnormality has been noted in "Visual Inspection: ". Follow the flow carefully.

Step	Action	Yes	No
1	*Was "A/T System Check" preformed?*	Go to Step 2.	Go to "A/T System Check: ".
2	Perform "Road Test". *Is it OK?*	Go to Step 3.	Proceed to "Troubleshooting" in "Road Test: ".
3	Perform "Manual Road Test". *Is it OK?*	Go to Step 4.	Proceed to "Troubleshooting" in "Manual Road Test: ".
4	Perform "Engine Brake Test". *Is it OK?*	Go to Step 5.	Proceed to "Troubleshooting" in "Engine Brake Test: ".
5	Perform "Stall Test". *Is it OK?*	Go to Step 6.	Proceed to "Troubleshooting" in "Stall Test: ".
6	Perform "Time Lag Test". *Is it OK?*	Go to Step 7.	Proceed to "Troubleshooting" in "Time Lag Test: ".
7	Perform "Line Pressure Test". *Is it OK?*	Go to Step 8.	Proceed to "Troubleshooting" in "Line Pressure Test: ".
8	Proceed to "Trouble Diagnosis 1" in "A/T Symptom Diagnosis: ". *Is trouble identified?*	Repair or replace faulty parts.	Go to Step 9.
9	Proceed to "Trouble Diagnosis 2" in "A/T Symptom Diagnosis: ". *Is trouble identified?*	Repair or replace faulty parts.	Proceed to "Trouble Diagnosis 3" in "A/T Symptom Diagnosis: ".

Road Test

S4RS0A5104011

This test is to check if upshift, downshift and lock-up take place at specified speeds while actually driving vehicle on a level road.

WARNING:

- **Carry out test in very little traffic area to prevent an accident.**
- **Test requires 2 persons, a driver and a tester.**

1) Warm up engine.
2) With engine running at idle, shift selector lever “D” range.
3) Accelerate vehicle speed by depressing accelerator pedal gradually.
4) While driving in “D” range, check if gear shift and lock-up occur properly as shown in “Automatic Gear Shift Table: ”.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty valve body component	*Replace valve body assembly.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Seized or broken planetary gear	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Damaged drive plate	*Inspect. If NG, replace.*
	Faulty torque converter	*Replace.*
No gear shift as 3rd gear	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
1 → 2 upshift fails to occur	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty 2nd brake	*Inspect. If NG, replace.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
2 → 3 upshift fails to occur	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty direct clutch	*Inspect. If NG, replace.*

Condition	Possible cause	Correction / Reference Item
3 → 4 upshift fails to occur	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of "3" position switch	*Inspect. If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of crankshaft position sensor	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Gear shift point is incorrect	Abnormal engine condition	*Inspect and repair engine.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
O/D → 3 downshift fails to occur	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of "3" position switch	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty forward clutch	*Inspect. If NG, replace.*
3 → 2 downshift fails to occur	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
2 → 1 downshift fails to occur	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*

Condition	Possible cause	Correction / Reference Item
TCC (lock-up) function pressure control does not operate	Malfunction of TCC pressure control solenoid valve	*Inspect. If NG, replace.*
	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of brake light switch	*Inspect. If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty torque converter	*Replace.*

Manual Road Test

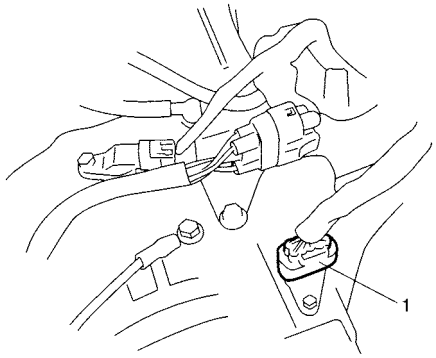
S4RS0A5104012

This test checks the gears being used in “L”, “2” “3” or “D” range when driven with unoperated gear shift control system. Test drive vehicle on a level road.

NOTE:

Before this test, check DTC.

1) With select lever in “P”, start engine and warm it up.
2) After warming up engine, turn ignition switch OFF and disconnect valve body harness connector (1).



I3RM0B510010-

3) With select lever in “L” range, start vehicle and check that 3rd gear is being used referring to the following table.

Vehicle speed per 1000 rpm in engine speed

Gear position	Vehicle speed
1st	**9.2 km/h (5.7 mile/h)**
2nd	**16.8 km/h (10.4 mile/h)**
3rd	**26.4 km/h (16.4 mile/h)**
4th	**37.9 km/h (23.6 mile/h)**
Reverse	**11.7 km/h (7.3 mile/h)**

4) While vehicle is running, shift select lever to “2” range and check that 3rd gear is being used.
5) While vehicle is running, shift select lever to “3” or “D” range and check that 3rd gear is being used.
6) After the checks, stop vehicle then turn ignition switch OFF, and connect valve body harness connector.
7) Clear DTC.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Operated gear is not correct	Faulty valve body component	*Replace valve body assembly.*
	Faulty clutch or brake	*Inspect clutch and brake. If any parts are faulty, replace them.*

Engine Brake Test

S4RS0A5104016

WARNING:

Before test, make sure that there is no vehicle behind so as to prevent rear-end collision.

1) While driving vehicle in 3rd gear of “D” range, shift select lever down to “2” range and check if engine brake operates.
2) In the same way as in Step 1), check engine brake for operation when select lever is shifted down to “L” range.
3) Engine brake should operate in the test.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Failure to operate when shifted down to “2” range	Faulty valve body component	*Replace valve body assembly.*
	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Failure to operate when shifted down to “L” range	Faulty valve body component	*Replace valve body assembly.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*

Stall Test

S4RS0A5104013

This test is to check overall performance of automatic transaxle and engine by measuring stall speed at “D” and “R” ranges. Be sure to perform this test only when transaxle fluid is at normal operating temperature and its level is between FULL and LOW marks.

CAUTION:

- **Do not run engine at stall more than 5 seconds continuously, or fluid temperature may rise excessively high.**
- **After performing stall test, be sure to leave engine running at idle for longer than 1 minute before another stall test.**

1) Apply parking brake and block wheels.
2) Install tachometer.
3) Start engine with select lever shifted to “P” range.
4) Depress brake pedal fully.
5) Shift select lever to “D” range and depress accelerator pedal fully while watching tachometer. Read engine rpm quickly when it has become constant (stall speed).
6) Release accelerator pedal immediately after stall speed is checked.
7) In the same way, check stall speed in “R” range.
8) Stall speed should be within the following specification.

Engine stall speed
Standard: 2,250 – 2,550 rpm

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Lower than standard level in both "D" and "R" range	Engine output torque failure	*Inspect and repair engine.*
	Faulty one-way clutch of torque converter	*Replace torque converter.*
Higher than standard level in "D" range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Slippery forward clutch	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Leakage from "D" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Higher than standard level in "R" range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Slippery reverse clutch	*Inspect. If NG, replace.*
	Slippery 1st and reverse brake	*Inspect. If NG, replace.*
	Leakage from "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Higher than standard level in both "D" and "R" range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Leakage from both "D" and "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*

Time Lag Test

S4RS0A5104014

This test is to check conditions of clutch, brake and fluid pressure. “Time lag” means time elapsed since select lever is shifted with engine idling till shock is felt.

1) With chocks placed before and behind front and rear wheels respectively, depress brake pedal.
2) Start engine.
3) With stop watch ready, shift select lever from “N” to “D” range and measure time from that moment till shock is felt.
4) Similarly measure time lag by shifting select lever from “N” to “R” range.

Gear shifting time lag
“N” → “D”: Less than 0.7 sec.
“N” → “R”: Less than 1.2 sec.

NOTE:

- **When repeating this test, be sure to wait at least one minute after select lever is shifted back to “N” range.**
- **Engine should be warmed up fully for this test.**
- **Repeat test 3 times and take average of those data for final time lag data.**

Troubleshooting

Condition	Possible cause	Correction / Reference Item
“N” → “D” time lag exceeds specification	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Leakage from “D” range fluid pressure circuit	*Overhaul or replace valve body assembly.*
“N” → “R” time lag exceeds specification	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Leakage from “R” range fluid pressure circuit	*Overhaul or replace valve body assembly.*

Line Pressure Test

S4RS0A5104015

Purpose of this test is to check operating conditions of each part by measuring fluid pressure in fluid pressure line. Line pressure test requires the following conditions.

- Automatic fluid is at normal operating temperature (70 – 80 °C / 158 – 176 °F).
- Fluid is replenished to proper level (between FULL and LOW on dipstick).
- Air conditioner switch is turned OFF.

1) Apply parking brake securely and place chocks against wheels.
2) Remove fluid pressure check hole plug bolt.
3) Attach oil pressure gauge to fluid pressure check hole in transaxle case.

Special tool
(A): 09925-37811-001

CAUTION:

After attaching oil pressure gauge, check that no fluid leakage exists.

4) Depress foot brake fully, run engine at idle and stall then check fluid pressure in “D” or “R” range.

CAUTION:

- **Do not continue running engine at stall speed longer than 5 seconds.**
- **After performing line pressure test, be sure to leave engine running at idle for longer than one minute before performing another line pressure test.**

Automatic transaxle line pressure

	“D” range	“R” range
At idle speed	**3.6 – 4.0 kg/cm^2, 51 – 57 psi**	**5.8 – 6.7 kg/cm^2, 82 – 95 psi**
At stall speed	**12.3 – 13.4 kg/cm^2, 175 – 191 psi**	**16.2 – 18.6 kg/cm^2, 230 – 264 psi**

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Higher than standard level in each range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
Lower than standard level in each range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Leakage from both “D” and “R” range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Lower than standard level only in “D” range	Leakage from “D” range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Lower than standard level only in “R” range	Leakage from “R” range fluid pressure circuit	*Overhaul or replace valve body assembly.*

"P" Range Test

S4RS0A5104017

1) Stop vehicle on a slope of 5 degrees or more, shift select lever to "P" range and at the same time apply parking brake.
2) After stopping engine, depress brake pedal and release parking brake.
3) Then, release brake pedal gradually and check that vehicle remains stationary.
4) Depress brake pedal and shift select lever to "N" range.
5) Then, release brake pedal gradually and check that vehicle moves.

WARNING:

Before test, make sure no one is around vehicle or down on a slope and keep watchful for safety during test.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Vehicle moves at "P" range or remains stationary at "N" range	Defective parking lock pawl or spring	*Inspect. If NG, repair.*

A/T Symptom Diagnosis

S4RS0A5104018

Trouble Diagnosis 1

Electrical repair

Condition	Possible cause	Correction / Reference Item
Excessive shift shock	Shift solenoid valve-A and/or -B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty only when N → D or 3 ↔ 4 shifting	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	Crankshaft position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0335: Crankshaft Position (CKP) Sensor Circuit: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
No gear shift as 3rd gear	Shift solenoid valve-A and/or -B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*

Condition	Possible cause	Correction / Reference Item
Poor 1 → 2 shift	Shift solenoid valve-B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Poor 2 → 3 shift	Shift solenoid valve-A circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
Poor 3 → 4 shift	Shift solenoid valve-B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	Engine coolant temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0117: Engine Coolant Temperature Circuit Low: in Section 1A" and/or "DTC P0118: Engine Coolant Temperature Circuit High: in Section 1A". If NG, repair.*
	Crankshaft position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0335: Crankshaft Position (CKP) Sensor Circuit: in Section 1A". If NG, repair.*
	"3" position switch circuit faulty	*Refer to "No Gear Shift to 4th gear: ".*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Poor 4 → 3 shift	Shift solenoid valve-B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	"3" position switch circuit faulty	*Refer to "No Gear Shift to 4th gear: ".*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
Poor 3 → 2 shift	Shift solenoid valve-A circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Poor 2 → 1 shift	Shift solenoid valve-A circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Incorrect gear shift point	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
Non operate TCC (lock-up) system	TCC pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Shift solenoid valve-A and/or -B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor Circuit Low: in Section 1A" and/or "DTC P0123: Throttle Position Sensor Circuit High: in Section 1A". If NG, repair.*
	Engine coolant temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0117: Engine Coolant Temperature Circuit Low: in Section 1A" and/or "DTC P0118: Engine Coolant Temperature Circuit High: in Section 1A". If NG, repair.*
	Brake light switch circuit faulty	*Refer to "No Lock-Up Occurs: ".*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Higher or lower stall speed	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
Excessive "N" → "D" or "N" → "R" time lag	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
Higher or lower line pressure	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*

Trouble Diagnosis 2

On-vehicle repair

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty valve body component	*Replace valve body assembly.*
Excessive shift shock	Engine abnormal condition	*Inspect and repair engine.*
	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve only when N → D or 3 ↔ 4 shifting	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Malfunction of brake light switch except N → D or N → R shifting	*Inspect referring to "Stop (Brake) Lamp Switch Inspection: in Section 9B". If NG, replace.*
	Malfunction of crankshaft position sensor	*Inspect referring to "Camshaft Position (CMP) Sensor Inspection: in Section 1C". If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 1 → 2 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 2 → 3 shift	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*

Condition	Possible cause	Correction / Reference Item
Poor 3 → 4 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of "3" position switch	*Inspect. If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect referring to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 4 → 3 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of "3" position off switch	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 3 → 2 shift	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 2 → 1 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Incorrect shift point	Engine abnormal condition	*Inspect and repair engine.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*

Condition	Possible cause	Correction / Reference Item
Non operate TCC (lock-up) system	Malfunction of TCC solenoid valve	*Inspect. If NG, replace.*
	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Malfunction of throttle position sensor	*Inspect referring to "Throttle Position (TP) Sensor On-Vehicle Inspection: in Section 1C". If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect referring to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C". If NG, replace.*
	Malfunction of brake light switch	*Inspect referring to "Stop (Brake) Lamp Switch Inspection: in Section 9B". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Excessive "N" → "D" or "N" → "R" time lag	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Pressure control solenoid valve circuit faulty	*Inspect. If NG, replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty valve body component	*Replace valve body assembly.*

Trouble Diagnosis 3

Off-vehicle repair

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty oil pump	*Inspect. If NG, replace.*
	Seized or broken planetary gear	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Damaged drive plate	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Faulty torque converter	*Replace.*
Excessive "N" → "D" shift shock	Faulty forward clutch	*Inspect. If NG, replace.*
Excessive "N" → "R" shift shock	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
Poor 1 → 2 shift, excessive shock or slippage	Faulty 2nd brake	*Inspect. If NG, replace.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
Poor 2 → 3 shift, excessive shock or slippage	Faulty direct clutch	*Inspect. If NG, replace.*
Poor 3 ↔ O/D shift, excessive shock or slippage	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Poor 3 → 2 shift, excessive shock or slippage	Faulty direct clutch	*Inspect. If NG, replace.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*

Condition	Possible cause	Correction / Reference Item
Poor 2 → 1 shift, excessive shock or slippage	Faulty 2nd brake	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
Non operate TCC (lock-up) system	Faulty torque converter	*Replace.*
Excessive "N" → "D" time lag	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Leakage from "D" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Excessive "N" → "R" time lag	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Leakage from "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Poor engine brake in downshift to "2" range	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Poor engine brake in downshift to "L" range	Faulty 1st and reverse brake	*Inspect. If NG, replace.*

No Gear Shift to 4th gear

S4RS0A5104019

System Description

TCM does not shift to 4th gear under any of the following condition.

- "3" position switch is turned ON.
- Engine coolant temperature is less than 50 °C (122 °F).
- A/T fluid temperature is less than 20 °C (68 °F).
- A/T fluid temperature is more than 130 °C (266 °F) while TCM is detecting P2763 and P2764.
- TCM detects the following DTCs.
  P0712 / P0713 / P0717 / P0722 / P0787 / P0788 / P0962 / P0963 / P0973 / P0974 / P0976 / P0977 / P1702 / P1703 / P1774 / P1777

Troubleshooting

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** *Is DTC P0712, P0713, P0717, P0722, P0785, P0962, P0963, P0973, P0974, P0976, P0977, P1702, P1703, P1774 and/or P1777 detected?*	Perform DTC flow to repair and retry.	Go to Step 3.

Step	Action	Yes	No
3	1) Perform running test under the following conditions and measure voltage between terminal “C39-16” of TCM connector and ground, terminal “C39-15” of TCM connector and ground. • Engine coolant temperature is in normal operating temperature. • Select lever is in “D” range. • Drive vehicle with 4th gear condition referring to “Automatic Gear Shift Table: ”. **Voltage between TCM connector and ground** **Between terminal “C39-16” of TCM connector and ground: 0 – 1 V** **Between terminal “C39-15” of TCM connector and ground: 9 – 14 V** *Do results satisfy the value?*	Faulty shift solenoid valve, circuit or transaxle.	“BRN” circuit shorted to power circuit or open, or “BLK/YEL” circuit shorted to ground. If wire is OK, go to Step 4.
4	**O/D off switch signal inspection** 1) With ignition switch ON, check voltage between terminal “C38-9” of TCM connector and ground. **O/D off switch specification** **O/D off switch OFF (“O/D OFF” lamp does not light): 8 – 14 V** **O/D off switch ON (“O/D OFF” lamp lights): 0 – 1 V** *Is result as specified?*	Substitute a known-good TCM and recheck.	Faulty O/D off switch or its circuit. If OK, substitute a know-good TCM and recheck.

No Lock-Up Occurs

S4RS0A5104020

System Description

TCM turns TCC solenoid OFF under any of the following conditions.

- Brake light switch is turned ON (Brake pedal is depressed).
- Transmission fluid temperature is less than 60 °C (140 °F).
- Throttle opening is as much as 0%.
- TCM detects the following DTCs.
  P0705 / P0707 / P0712 / P0713 / P0717 / P0722 / P0787 / P0788/ P0962 / P0963 / P0973 / P0974/ P0976 / P0977 / P1702 / P1703 / P1774 / P1777 / P2763 / P2764

Troubleshooting

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

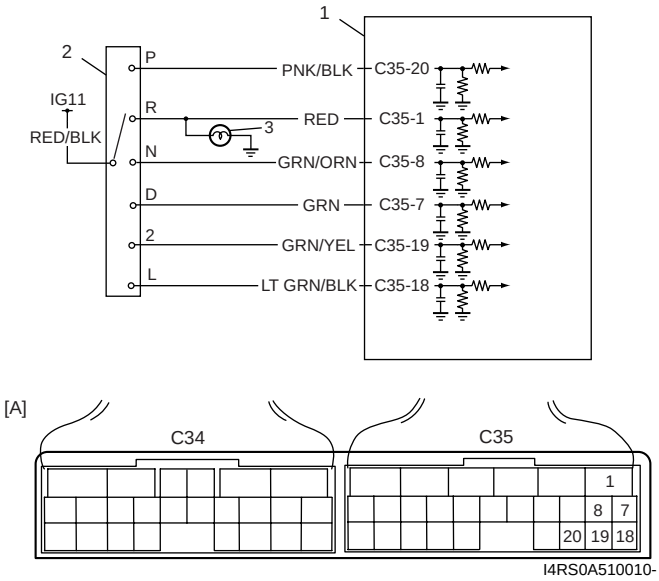
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check DTC** *Is DTC P0705, P0707, P0712, P0713, P0717, P0722, P0787, P0788, P0962, P0963, P0973, P0974, P0976, P0977, P1702, P1703, P1774, P1777, P2763 and/or P2764 detected?*	Perform DTC flow to repair and retry.	Go to Step 3.

Step	Action	Yes	No
3	**Brake light switch signal inspection** 1) With ignition switch ON, check voltage between terminal "E23-20" of ECM connector and ground. **Brake light switch signal specification** **Brake pedal is released: 0 – 1 V** **Brake pedal is depressed: 8 – 14 V** *Is result as specified?*	Substitute a known-good TCM and recheck.	Mis-adjusted brake light switch, faulty brake light switch. If OK, substitute a known-good TCM and recheck.

DTC P0705: Transmission Range Sensor Circuit Malfunction

S4RS0A5104021

Wiring Diagram



I4RS0A510010-

1. TCM	3. Backup lamp
2. Transmission range sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Multiple or more signals are inputted simultaneously for 12 seconds.	• Select cable maladjusted • Transmission range sensor (switch) maladjusted • Transmission range sensor (switch) or its circuit malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM memory by using scan tool.
3) Start engine and shift select lever to "D" range.
4) Keep engine running at idle speed for 25 seconds or more.
5) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 4.

Step	Action	Yes	No
3	**Check transmission range sensor (switch) circuit for operation** Check by using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check transmission range signal (“P”, “R”, “N”, “D”, “2” or “L”) on display when shifting select lever to each range. *Is applicable range indicated?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.	Go to Step 5.
4	**Check transmission range sensor (switch) circuit for operation** Check by not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminals “C35-1”, “C35-7”, “C35-8”, “C35-18”, “C35-19” and “C35-20” respectively with select lever shifted to each range. Taking terminal “C35-19” as an example, is battery voltage indicated only when select lever is shifted to “2” range and 0 V for other ranges as shown in the following table. Check voltage at other terminals likewise, referring to the following table. *Are check results satisfactory?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.	Go to Step 5.
5	1) Check select cable for adjustment referring to “Select Cable Adjustment: ”. *Is it adjusted correctly?*	Go to Step 6.	Adjust.
6	**Check transmission range sensor for installation position** 1) Shift select lever to “N” range. 2) Check that “N” reference line on sensor and needle direction shaped on lock washer are aligned. *Are they aligned?*	Go to Step 7.	Adjust.
7	1) Check transmission range sensor (switch) referring to “Transmission Range Sensor (Shift Switch) Inspection and Adjustment: ”. *Are check results satisfactory?*	“RED/BLK”, “PNK/BLK”, “RED”, “GRN/ORN”, “GRN”, “GRN/YEL” or “LT GRN/BLK” circuit shorted to power circuit or shorted each other. If wires and connections are OK, substitute a know-good TCM and recheck.	Replace transmission range sensor.

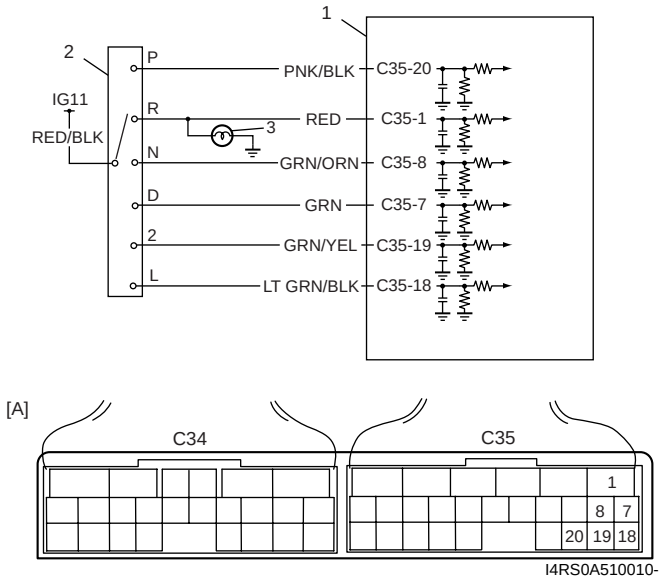
Table for Step 4

		Terminal					
		C35-20	**C35-1**	**C35-8**	**C35-7**	**C35-19**	**C35-18**
Select lever position	P	8 – 14 V	0 V	0 V	0 V	0 V	0 V
	R	0 V	8 – 14 V	0 V	0 V	0 V	0 V
	N	0 V	0 V	8 – 14 V	0 V	0 V	0 V
	D or 3	0 V	0 V	0 V	8 – 14 V	0 V	0 V
	2	0 V	0 V	0 V	0 V	8 – 14 V	0 V
	L	0 V	0 V	0 V	0 V	0 V	8 – 14 V

DTC P0707: Transmission Range Sensor Circuit Low

S4RS0A5104045

Wiring Diagram



1. TCM	3. Backup lamp
2. Transmission range sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission range switch signal (P, R, N, D, 2, or L) is not inputted for more than 32 seconds when vehicle speed is faster than 30 km/h (19 mile/h) and engine speed is faster than 1500 rpm.	• Select cable maladjusted • Transmission range sensor (switch) maladjusted • Transmission range sensor (switch) or its circuit malfunction • TCM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM memory by using scan tool.
3) Start engine and shift select lever to “D” range.
4) Start vehicle and increase vehicle speed to 40 km/h (25 mile/h) or more for 1 minutes.
5) Stop vehicle and turn ignition switch OFF.
6) Repeat Step 3) to 4) one time.
7) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 4.

Step	Action	Yes	No
3	**Check transmission range sensor (switch) circuit for operation** Check by using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check transmission range signal (P, R, N, D, 2 or L) on display when shifting select lever to each range. *Is applicable range indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 5.
4	**Check transmission range sensor (switch) circuit for operation** Check by not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminals "C35-1", "C35-7", "C35-8", "C35-18", "C35-19" and "C35-20" respectively with select lever shifted to each range. Taking terminal "C35-19" as an example, is battery voltage indicated only when select lever is shifted to "2" range and 0 V for other ranges as shown in the following table. Check voltage at other terminals likewise, referring to the following table. *Are check results satisfactory?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 5.
5	1) Check select cable for adjustment referring to "Select Cable Adjustment: ". *Is it adjusted correctly?*	Go to Step 6.	Adjust.
6	**Check transmission range sensor for installation position** 1) Shift select lever to "N" range. 2) Check that "N" reference line on sensor and needle direction shaped on lock washer are aligned. *Are they aligned?*	Go to Step 7.	Adjust.
7	1) Check transmission range sensor (switch) referring to "Transmission Range Sensor (Shift Switch) Inspection and Adjustment: ". *Are check results satisfactory?*	"RED/BLK", "PNK/BLK", "RED", "GRN/ORN", "GRN", "GRN/YEL" or "LT GRN/BLK" circuit open or short to ground. If wires and connections are OK, substitute a know-good TCM and recheck.	Replace transmission range sensor.

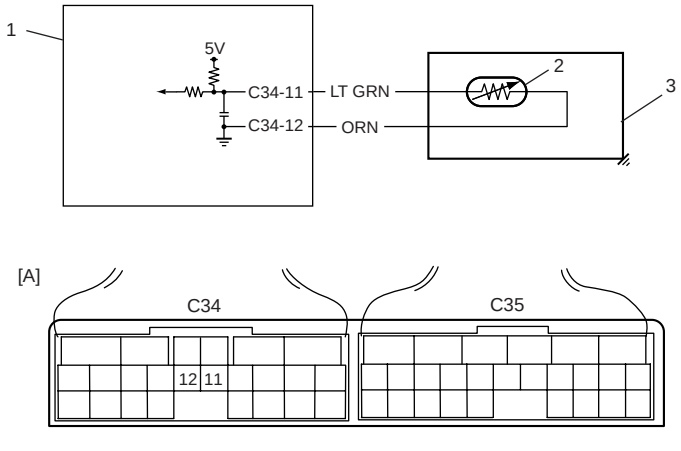
Table for Step 4

		Terminal					
		C35-20	**C35-1**	**C35-8**	**C35-7**	**C35-19**	**C35-18**
Select lever position	P	8 – 14 V	0 V	0 V	0 V	0 V	0 V
	R	0 V	8 – 14 V	0 V	0 V	0 V	0 V
	N	0 V	0 V	8 – 14 V	0 V	0 V	0 V
	D or 3	0 V	0 V	0 V	8 – 14 V	0 V	0 V
	2	0 V	0 V	0 V	0 V	8 – 14 V	0 V
	L	0 V	0 V	0 V	0 V	0 V	8 – 14 V

DTC P0712: Transmission Fluid Temperature Sensor Circuit Low

S4RS0A5104046

Wiring Diagram



I4RS0A510011-

1. TCM	3. A/T
2. Transmission fluid temperature sensor	4. Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission temperature sensor terminal voltage is less than specified value for 5 minutes or more after turning ignition switch ON.	• Transmission fluid temperature sensor or its circuit malfunction • TCM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Keep engine running at idle speed for 10 minutes or more.
4) Stop vehicle and check DTC.

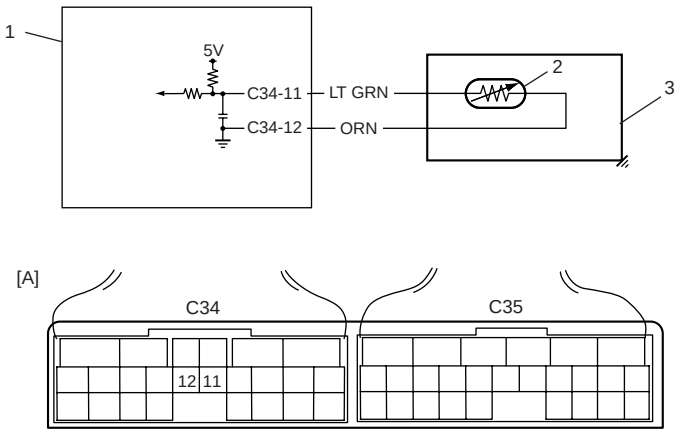
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check transmission fluid temperature circuit for ground short** 1) Check continuity between terminal "C34-11" of disconnected harness side TCM connector and ground. *Is continuity indicated?*	"LT GRN" circuit shorted to ground.	Go to Step 3.
3	**Inspect transmission fluid temperature sensor** 1) Inspect transmission fluid temperature sensor referring to "Transmission Fluid Temperature Sensor Inspection: ". *Is result satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.	Replace transmission fluid temperature sensor.

DTC P0713: Transmission Fluid Temperature Sensor Circuit High

S4RS0A5104023

Wiring Diagram



I4RS0A510011-

1. TCM	3. A/T
2. Transmission fluid temperature sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission fluid temperature sensor terminal voltage is more than specified value and sensor variation is less than specified value evan though engine was running in “R”, “D”, “3”, “2” or “L” range for 15 minutes after starting engine.	• Transmission fluid temperature sensor or its circuit malfunction • TCM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Start vehicle and increase vehicle speed to about 40 km/h (25 mile/h) for 20 minutes or more.
4) Stop vehicle and check DTC.

DTC Troubleshooting

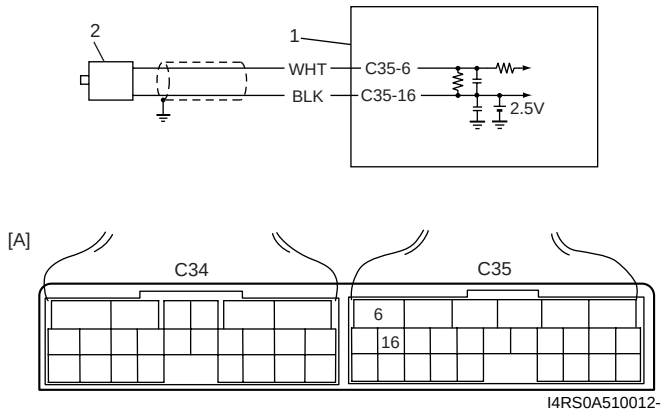
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check transmission fluid temperature circuit for open** 1) Turn ignition switch OFF. 2) Disconnect TCM connectors from TCM. 3) Check for proper connection to transmission fluid temperature sensor at terminals “C34-11” and “C34-12”. 4) If OK, check continuity between terminals “C34-11” and “C34-12” of disconnected harness side TCM connector. *Is continuity indicated?*	Go to Step 3.	“LT GRN” or “ORN” circuit open.

Step	Action	Yes	No
3	**Check transmission fluid temperature circuit for IG short** 1) Cool down A/T fluid temperature under ambient temperature. 2) Connect TCM connectors to TCM with ignition switch OFF. 3) Turn ignition switch ON. 4) Measure voltage between terminal “C34-11” of TCM connector and ground. *Is it 4.6 V or more?*	“LT GRN” circuit shorted to power circuit. If circuit is OK, go to Step 4.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.
4	**Inspect transmission fluid temperature sensor** 1) Inspect transmission fluid temperature sensor referring to “Transmission Fluid Temperature Sensor Inspection: ”. *Is result satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Replace transmission fluid temperature sensor.

DTC P0717: Input / Turbine Speed Sensor Circuit Malfunction

S4RS0A5104024

Wiring Diagram



1. TCM	2. Input shaft speed sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No input shaft speed sensor signal is detected although output shaft speed sensor signals are detected.	• Input shaft speed sensor or its circuit malfunction • Improper input shaft speed sensor installation • Damaged direct clutch drum • Foreign material attachment to sensor or drum • TCM

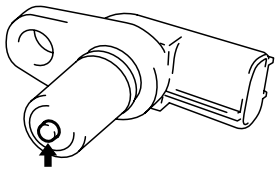
DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Shift selector lever to “D” range and drive vehicle at 50 km/h (31 mile/h) or more with 3rd gear at least for 5 minutes.
4) Stop vehicle and check DTC.

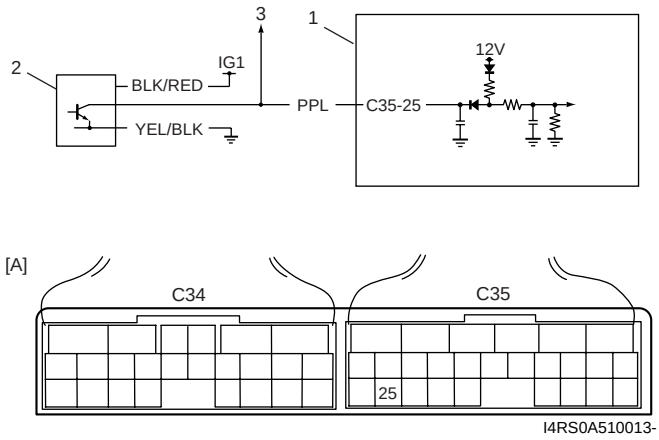
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check input shaft speed sensor circuit** 1) Disconnect TCM connectors with ignition switch OFF. 2) Check for proper connection to input shaft speed sensor at “C35-6” and “C35-16” terminals. 3) If OK, check resistance of sensor circuit. **Input shaft speed sensor specification** **Between terminals “C35-6” and “C35-16”: 560 – 680 Ω at 20 °C (68 °F)** **Between terminal “C35-6” / “C35-16” and ground: No continuity** *Are check result satisfactory?*	Go to Step 4.	Go to Step 3.
3	**Inspect input shaft speed sensor** 1) Inspect input shaft speed sensor referring to “Input Shaft Speed Sensor Inspection: ”. *Is result satisfactory?*	“WHT” or “BLK” circuit open or short.	Replace input shaft speed sensor.
4	**Check visually input shaft speed sensor and direct clutch drum for the following** • No damage • No foreign material attached • Correct installation  I2RH0B510020- *Are they in good condition?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Clean, repair or replace.

DTC P0722: Output Speed Sensor (VSS) Circuit No Signal

S4RS0A5104025

Wiring Diagram



I4RS0A510013-

1. TCM	3. To ECM
2. Output shaft speed sensor (VSS)	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No output shaft speed sensor signal is detected although input shaft speed sensor signals are detected while vehicle is running at 5 km/h (3 mile/h) or more in vehicle speed with “D”, “2” or “L” range.	• Output shaft speed sensor or its circuit malfunction • Damaged sensor gear (driven gear) • Damaged output shaft speed sensor (VSS) drive gear • TCM

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Shift selector lever to “D” range and drive vehicle at 50 km/h (31 mile/h) or more vehicle speed at least for 3 minutes.
4) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check output shaft speed sensor (VSS) power circuit** 1) Turn ignition switch OFF. 2) Disconnect output shaft speed sensor connector. 3) Turn ignition switch ON. 4) Measure voltage between “BLK/RED” wire terminal of disconnected output shaft speed sensor harness side connector and ground. *Is it 10 – 14 V?*	Go to Step 3.	“BLK/RED” wire open or shorted to ground.

Step	Action	Yes	No
3	**Check output shaft speed sensor (VSS) ground circuit** 1) Turn ignition switch OFF. 2) Check continuity between “YEL/BLK” wire terminal of disconnected output shaft speed sensor harness side connector and ground. *Is continuity indicated?*	Go to Step 4.	“YEL/BLK” wire open.
4	**Check output shaft speed sensor (VSS) signal circuit for short** 1) Disconnect TCM connectors. 2) Check continuity between “PPL” wire terminal of disconnected output shaft speed sensor harness side connector and ground. *Is continuity indicated?*	“PPL” wire shorted to ground.	Go to Step 5.
5	**Check output shaft speed sensor (VSS) signal circuit for open** 1) Check continuity between “PPL” wire terminal of disconnected output shaft speed sensor harness side connector and terminal “C35-25” of disconnected harness side TCM connector. *Is continuity indicated?*	Go to Step 6.	“PPL” wire open.
6	**Inspect output shaft speed sensor (VSS)** 1) Inspect output shaft speed sensor referring to “Output Shaft Speed Sensor (VSS) Inspection: ”. *Is check result satisfactory?*	Go to Step 7.	Replace output shaft speed sensor (VSS).
7	**Check output shaft speed sensor (VSS) gears visually** 1) Check output shaft speed sensor gears for the followings. • No damage in drive gear on differential case • No damage in driven gear in output shaft speed sensor *Is result satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Replace drive gear and/or driven gear of output shaft speed sensor.

DTC P0741 / P0742: TCC Circuit Performance or Stuck OFF / TCC Circuit Stuck ON

S4RS0A5104027

DTC Detecting Condition and Trouble Area

DTC P0741

DTC detecting condition	Trouble area
When driving vehicle with 3rd or 4th gear in “D” range, difference in revolution between engine and A/T input (input shaft speed) is larger than specification although TCM commanded TCC solenoid to turn ON.	• Mechanical malfunction of TCC solenoid valve • Malfunction of valve body assembly • Fluid passage clogged or leaking • Torque converter clutch malfunction

DTC P0742

DTC detecting condition	Trouble area
When driving vehicle with 2nd, 3rd or 4th gear in “D” range, difference in revolution between engine and A/T input (input shaft speed) is smaller than specification although TCM commanded TCC solenoid to turn OFF.	• Mechanical malfunction of TCC solenoid valve • Malfunction of valve body assembly • Fluid passage clogged or leaking • Torque converter clutch malfunction

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and warm it up to normal operating temperature.
4) Shift select lever to “N” and “D” range for each 10 seconds.
5) Drive vehicle with 4th gear in “D” range and lock-up ON for 20 seconds or longer referring to “Automatic Gear Shift Table: ”.
6) Shift select lever to “3” range.
7) Drive vehicle with 2nd or 3rd gear in “3” range, 15 – 20% throttle opening and at vehicle speed of 25 – 40 km/h (16 – 25 mile/h).
8) Stop vehicle and turn ignition switch OFF.
9) Repeat Step 3) to 7) one time.
10) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	1) Check TCC solenoid valve for operation referring to “Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection: ”. *Are they in good condition?*	Clean fluid passage or replace valve body assembly.	Replace TCC solenoid valve.

DTC P0751 / P0752 / P0756 / P0757: Shift Solenoid Malfunction

S4RS0A5104030

DTC P0751: Shift Solenoid-A (No.1) Performance or Stuck OFF
DTC P0752: Shift Solenoid-A (No.1) Stuck ON
DTC P0756: Shift Solenoid-B (No.2) Performance or Stuck OFF
DTC P0757: Shift Solenoid-B (No.2) Stuck ON

DTC Detecting Condition and Trouble Area

DTC P0751

DTC detecting condition	Trouble area
3rd gear ratio is detected although TCM command is for 2nd gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-A (No.1) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC P0752

DTC detecting condition	Trouble area
2nd gear ratio is detected although TCM command is for 3rd gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-A (No.1) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC P0756

DTC detecting condition	Trouble area
3rd gear ratio is detected although TCM command is for 4th gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-B (No.2) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC P0757

DTC detecting condition	Trouble area
4th gear ratio is detected although TCM command is for 3rd gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-B (No.2) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and warm it up to normal operating temperature.

4) Shift select lever to “N” and “D” range for 10 seconds.
5) Start vehicle and increase vehicle speed to 65 km/h (40 mile/h) with throttle position 10% or more.
6) Stop vehicle and turn ignition switch OFF.
7) Repeat Step 3) to 5) one time.
8) Stop vehicle and check DTC.

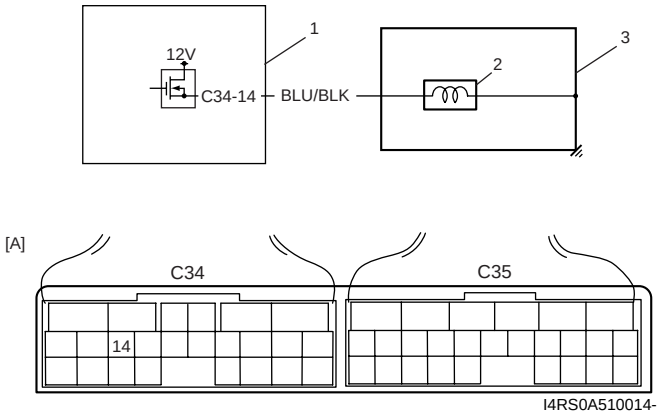
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	1) Check shift solenoid valve-A (No.1) or -B (No.2) for operation referring to “Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection: ”. *Are they in good condition?*	Clean fluid passage or replace valve body assembly.	Replace shift solenoid valve-A or -B.

DTC P0787: Shift / Timing Solenoid Control Circuit Low

S4RS0A5104042

Wiring Diagram



1. TCM	3. A/T
2. Timing solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

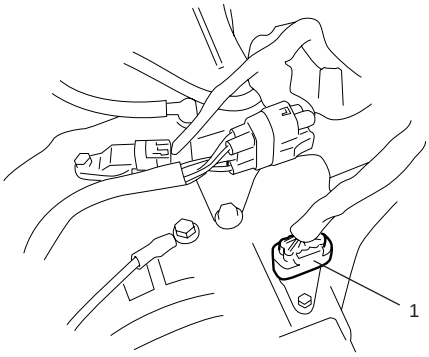
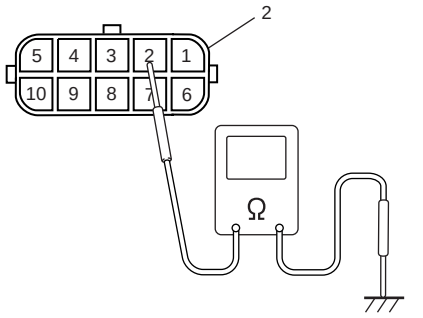
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of timing solenoid valve TCM terminal is low although TCM is commanding timing solenoid valve to turn ON.	• Timing solenoid valve circuit shorted to ground • Timing solenoid valve malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and shift select lever to “N” range.
4) Repeat shifting select lever from “N” range to “D” range and vice versa for 3 times.
5) Check DTC.

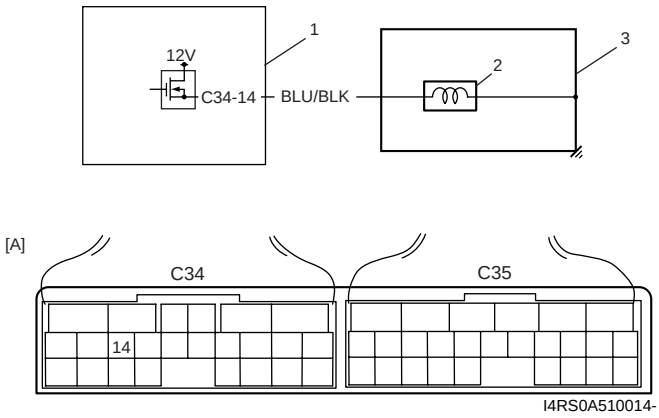
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check timing solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on transaxle. 3) Check for proper connection to solenoid valve at "BLU/BLK" circuit. 4) Check resistance of solenoid valve. **Timing solenoid valve resistance** **Between terminal of transaxle side valve body harness connector and transaxle: 11 – 15 Ω at 20 °C (68 °F)**   I3RM0B510018- *Is check result satisfactory?*	Go to Step 3.	Replace timing solenoid valve or lead wire.
3	**Check timing solenoid valve circuit for ground short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Measure resistance between terminal "C34-14" of disconnected harness side TCM connector and ground. *Is it 11 – 15 Ω at 20 °C (68 °F)?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.	"WHT/GRN" circuit shorted to ground.

DTC P0788: Shift / Timing Solenoid Control Circuit High

S4RS0A5104050

Wiring Diagram



I4RS0A510014-

1. TCM	3. A/T
2. Timing solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

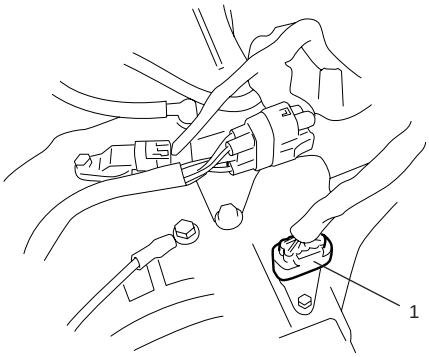
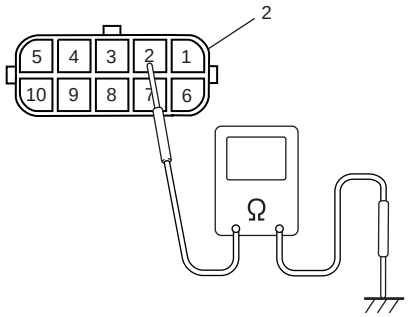
DTC detecting condition	Trouble area
Voltage of timing solenoid valve TCM terminal is high although TCM is commanding timing solenoid valve to turn OFF.	• Timing solenoid valve circuit open or shorted to power circuit • Timing solenoid valve malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and shift select lever to “N” range.
4) Repeat shifting select lever from “N” range to “D” range and vice versa for 3 times.
5) Check DTC.

DTC Troubleshooting

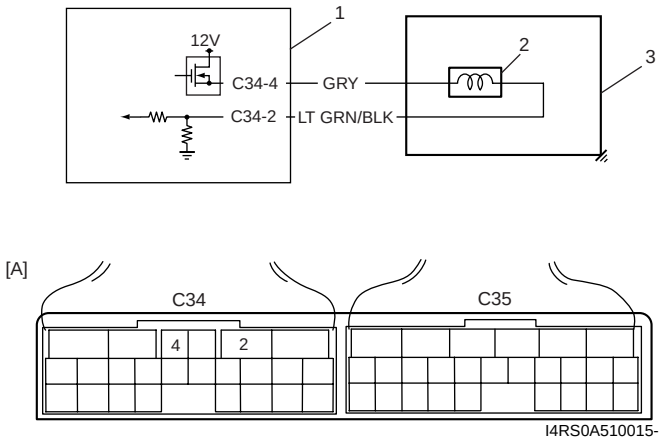
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	**Check timing solenoid valve circuit for IG short** 1) Disconnect TCM connectors. 2) Turn ignition switch ON and measure voltage between terminal “C34-14” of harness side TCM connector and ground. *Is it 0 – 1 V?*	Go to Step 3.	“BLU/BLK” circuit shorted to power circuit.
3	**Check timing solenoid valve circuit for open** 1) Measure resistance between terminal “C34-14” of disconnected harness side TCM connector and ground. *Is it 11 – 15 Ω at 20 °C (68 °F)?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Go to Step 4.

Step	Action	Yes	No
4	**Check timing solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on transaxle. 3) Check for proper connection to solenoid valve at “BLU/BLK” circuit. 4) Check resistance of solenoid valve. **Timing solenoid valve resistance** **Between terminal of transaxle side valve body harness connector and transaxle: 11 – 15 Ω at 20 °C (68 °F)**   I3RM0B510018- *Is check result satisfactory?*	“BLU/BLK” circuit open.	Replace timing solenoid valve or lead wire.

DTC P0962: Pressure Control Solenoid Control Circuit Low

S4RS0A5104032

Wiring Diagram



1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

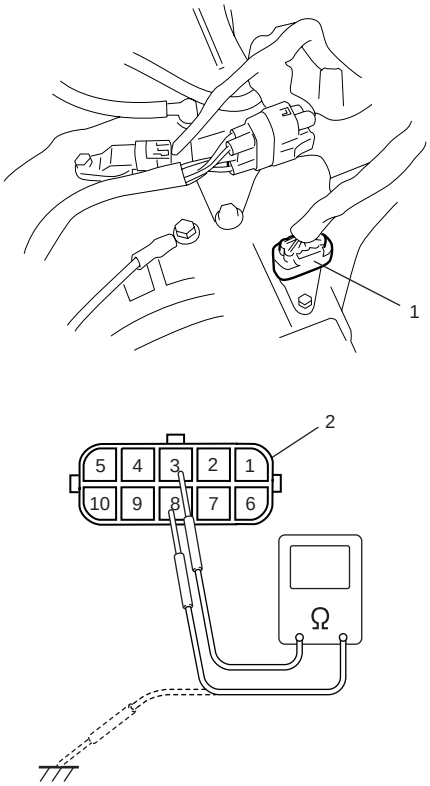
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Pressure control solenoid valve output voltage is too low comparing with TCM command value.	• Pressure control solenoid valve circuit open or shorted to ground • Malfunction of pressure control solenoid valve • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed for 30 seconds or more.
5) Stop vehicle and check DTC.

DTC Troubleshooting

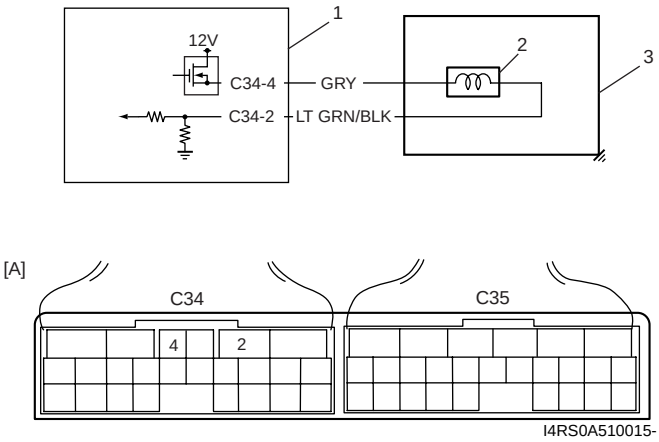
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "GRY" and "LT GRN/BLK" circuit. 4) Check resistance of pressure control solenoid. **Pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle side valve body harness connector and Transaxle: Infinity**  I3RM0B510020- *Is check results satisfactory?*	Go to Step 3.	Replace pressure control solenoid valve or valve body harness.
3	**Check pressure control solenoid valve circuit for ground short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminals "C34-2" and "C34-4". If connection is OK, check continuity between terminal "C34-4" of disconnected harness side TCM connector and ground. *Is continuity indicated?*	"GRY" or "LT GRN/BLK" circuit shorted to ground.	Go to Step 4.

Step	Action	Yes	No
4	**Check pressure control solenoid valve circuit for open** 1) Check resistance continuity between terminals “C34-2” and “C34-4” of disconnected harness side TCM connector. *Is it infinite?*	“GRY” or “LT GRN/BLK” circuit open.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.

DTC P0963: Pressure Control Solenoid Control Circuit High

S4RS0A5104047

Wiring Diagram



1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

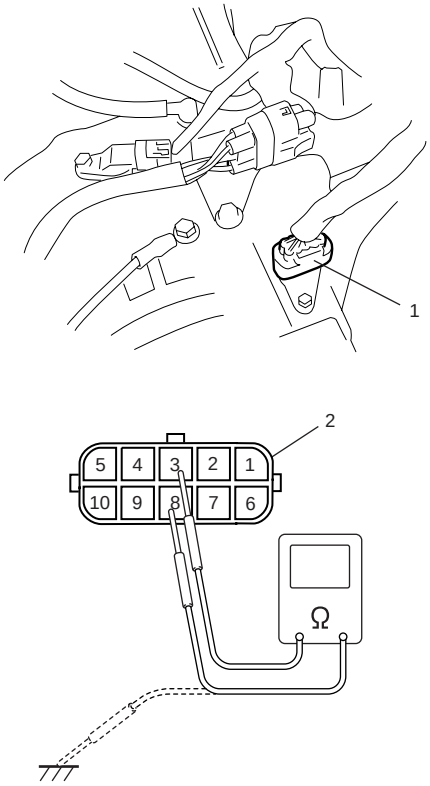
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Pressure control solenoid valve output voltage is too high comparing with TCM command value.	• Pressure control solenoid valve circuit shorted to power circuit • Pressure control solenoid valve malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed for 10 seconds or more.
5) Check DTC.

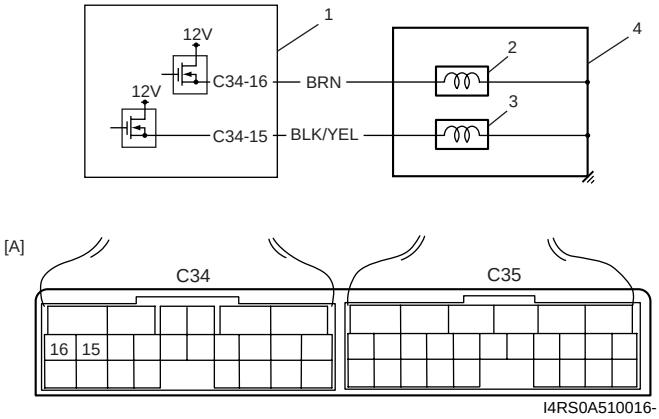
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check pressure control solenoid circuit for IG short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal "C34-2" and "C34-4". 4) If connection is OK, turn ignition switch ON and measure voltage between terminal "C34-4" of disconnected harness side TCM connector and ground. *Is it 0 – 2 V?*	Go to Step 3.	"BRN/YEL" or "LT GRN" circuit shorted to power circuit.
3	**Check pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "GRY" and "LT GRN/BLK" circuit. 4) Check resistance of pressure control solenoid. **Pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle valve body harness connector and transaxle: Infinity**  *Is check results satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.	Replace pressure control solenoid valve or valve body harness.

DTC P0973 / P0976: Shift Solenoid-A (No.1) Control Circuit Low / Shift Solenoid-B (No.2) Control Circuit Low

S4RS0A5104051

Wiring Diagram



1. TCM	3. Shift solenoid valve-B (No.2)
2. Shift solenoid valve-A (No.1)	[A]: Terminal arrangement of TCM connector (Viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of shift solenoid valve TCM terminal is low although TCM is commanding shift solenoid to turn ON	• Shift solenoid valve circuit shorted to ground • Malfunction of shift solenoid valve • TCM

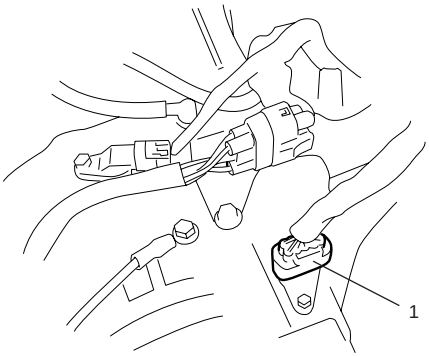
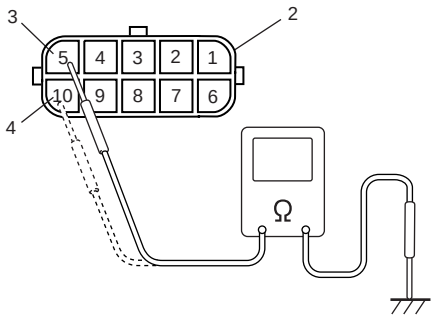
DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine shift select lever to “D” range.
4) Start vehicle and increase vehicle speed until gear position reaches 3rd or 4th gear.
5) Decrease vehicle speed and stop vehicle.
6) Check DTC.

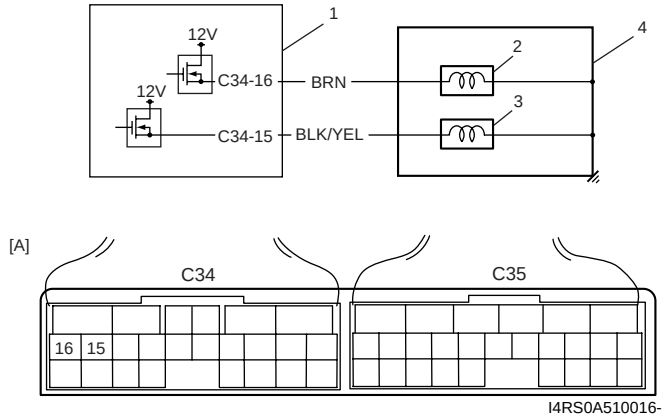
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automatic Transaxle Diagnostic Flow Table" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check shift solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transmission. 3) Check for proper connection to solenoid at "BRN" (for shift solenoid valve-A (No.1)) or "BLK/YEL" (for shift solenoid valve-B (No.2)) circuit. Check resistance of solenoid valve. **Shift solenoid valve resistance** **Between shift solenoid valve-A (No.1) terminal (3) and transaxle: 11 – 15 Ω at 20 °C (68 °F)** **Between shift solenoid valve-B (No.2) terminal (4) and transaxle: 11 – 15 Ω at 20 °C (68 °F)**   I3RM0B510022- *Is check results satisfactory?*	Go to Step 3.	Replace applicable shift solenoid valve or valve body harness.
3	**Check shift solenoid valve circuit for ground short** 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)). 3) If connection is OK, check continuity between terminal "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)) of disconnected harness side TCM connector and ground. *Is continuity indicated?*	DTC P0973: "BRN" circuit shorted to ground. DTC P0976: "BLK/YEL" circuit shorted to ground.	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.

DTC P0974 / P0977: Shift Solenoid-A (No.1) / Shift Solenoid-B (No.2) Control Circuit High

S4RS0A5104048

Wiring Diagram



1. TCM	3. Shift solenoid valve-B (No.2)	[A]: Terminal arrangement of TCM connector (viewed from harness side)
2. Shift solenoid valve-A (No.1)	4. A/T	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of shift solenoid valve TCM terminal is high although TCM is commanding shift solenoid to turn OFF	• Shift solenoid valve circuit open or shorted to power circuit • Malfunction of shift solenoid valve • TCM

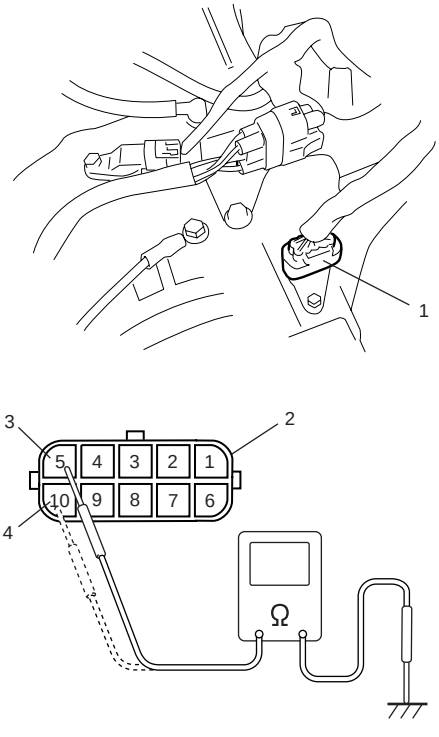
DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and shift select lever to “D” range.
4) Start vehicle and increase vehicle speed until gear position reaches 3rd or 4th gear.
5) Decrease vehicle speed and stop vehicle.
6) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check shift solenoid valve circuit for IG short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)). 4) If connection is OK, turn ignition switch ON and measure voltage between terminal "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)) of disconnected harness side TCM connector and ground. *Is it 0 – 2 V?*	Go to Step 3.	DTC P0974: "BRN" circuit shorted to power circuit. DTC P0977: "BLK/YEL" circuit shorted to power circuit.
3	**Check shift solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "BRN" (for shift solenoid valve-A (No.1)) or "BLK/YEL" (for shift solenoid valve-B (No.2)) circuit. Check resistance of solenoid valve. **Shift solenoid valve resistance** **Between shift solenoid valve-A (No.1) terminal (3) and transaxle: 11 – 15 Ω at 20 °C (68 °F)** **Between shift solenoid valve-B (No.2) terminal (4) and transaxle: 11 – 15 Ω at 20 °C (68 °F)**  *Is check results satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute a known-good TCM and recheck.	Replace applicable shift solenoid valve or valve body harness.

DTC P1702: Internal Control Module Memory Check Sum Error

S4RS0A5104033

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Calculation of current data stored in TCM is not correct comparing with pre-stored checking data in TCM.	TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTC in TCM memory.
3) After 10 seconds passed from turning ignition switch ON, check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1702 detected after performing "DTC Confirmation Procedure"?*	Faulty TCM. Replace TCM.	Could be a temporary malfunction of TCM.

DTC P1703: Can Invalid Data - TCM

S4RS0A5104034

DTC Detecting Condition and Trouble Area

When abnormality either on the gear shift control signal from ECM is detected by TCM, TCM sets DTC P1703.

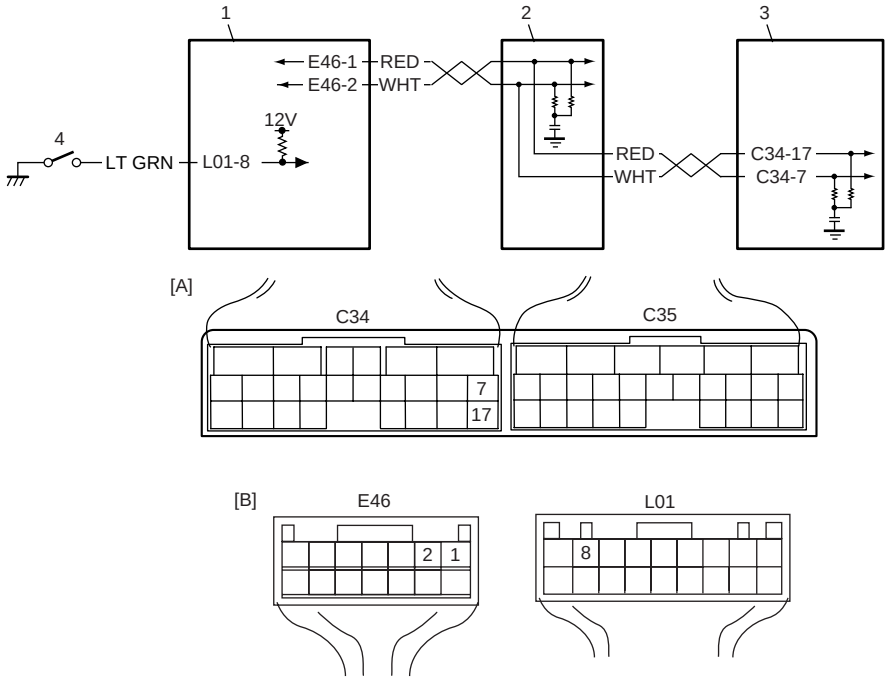
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**DTC check** 1) Check DTC of ECM referring to "DTC Check: in Section 1A". *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good TCM and recheck. If OK, substitute a known-good ECM and recheck.

DTC P1723: Range Select Switch Malfunction

S4RS0A5104052

Wiring Diagram



I4RS0A510017-

1. BCM	3. TCM	[A]: BCM connector (viewed from harness side)
2. ECM	4. "3" position switch	[B]: TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
"3" position switch ON signal is inputed although transmission range switch signal is inputed P, R, N or L. range.	• "3" position switch or its circuit malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool and turn ignition switch ON.
3) Shift selector lever to each of "L", "2", "3", "D", "N", "R" and "P" ranges for 20 seconds each.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

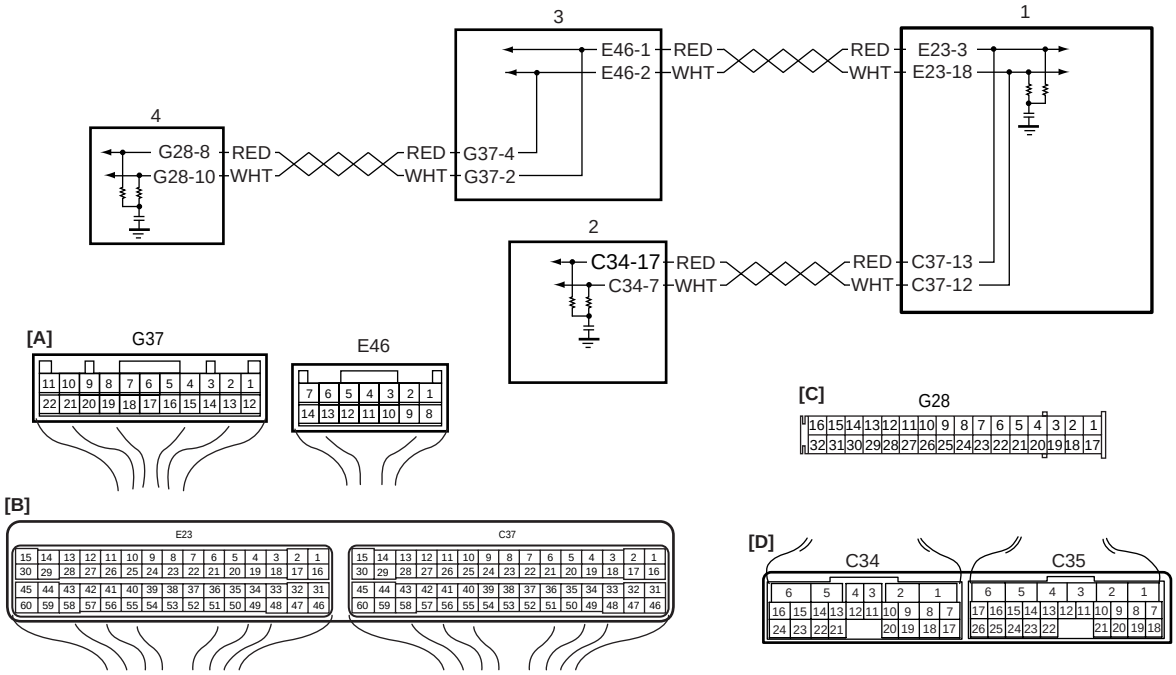
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**"3" position switch circuit for operation** 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check "3" position switch signal on scan tool data display when shifting select lever to each range. *Does indicate "3" position switch (O/D OFF switch) condition OFF when shifting select lever to "P", "R", "N" and "L" range?*	Substitute a known-good TCM and recheck.	Go to Step 3.

Step	Action	Yes	No
3	**“3” position switch signal inspection** With ignition switch ON, check voltage between “L01-8” terminal of BCM coupler and ground. **“3” position switch specifications** **Shift selector lever to “3” or “2” range: Battery voltage** **Shift selector lever to other above range: 0 V** *Is the result as specified?*	Substitute a known-good BCM and recheck.	Go to Step 4.
4	**Check “3” position switch operation** *Is it in good condition?*	“LT GRN” wire shorted to ground.	Replace “3” position switch.

DTC P1774: Control Module Communication Bus Off

S4RS0A5104053

Wiring Diagram



I4RS0A510018-

1. ECM	4. Combination meter	[C]: Terminal arrangement of Combination meter connector (viewed from harness side)
2. TCM	[A]: Terminal arrangement of BCM connector (viewed from harness side)	[D]: Terminal arrangement of TCM connector (viewed from harness side)
3. BCM	[B]: Terminal arrangement of ECM connector (viewed from harness side)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	• ECM • BCM • TCM • Combination meter • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM and BCM. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check ECM, TCM, BCM and combination meter connectors** 1) Check for proper connection at each ECM, TCM, BCM and combination meter connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1774?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
4	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check: ". *Is it in good condition?*	Go to Step 5.	Repair TCM power and/or ground circuits.
5	**Check DTC in BCM and ECM (bus off)** 1) Check DTC(s) in ECM and BCM. *Is there DTC(s) P1674 in ECM and/or U1073 in BCM?*	Go to Step 6.	Go to Step 7.
6	**Check DTC in BCM and ECM (bus off)** 1) Disconnect connectors from TCM with ignition switch turned OFF. 2) Check DTC(s) in ECM and BCM. *Is there DTC(s) P1674 in ECM and/or U1073 in BCM?*	Go to Step 7.	Substitute a known-good TCM and recheck.
7	**Check DTC in TCM** 1) Connect connectors to TCM and disconnect connectors from combination meter with ignition switch turned OFF. 2) Check DTC in TCM. *Is there DTC 1774?*	Go to Step 8.	Substitute a known-good combination meter and recheck.
8	**Check DTC in TCM** 1) Disconnect connector from ECM with ignition switch turned OFF. 2) Check DTC in TCM. *Is there DTC 1774?*	Go to Step 9.	Substitute a known-good ECM and recheck.

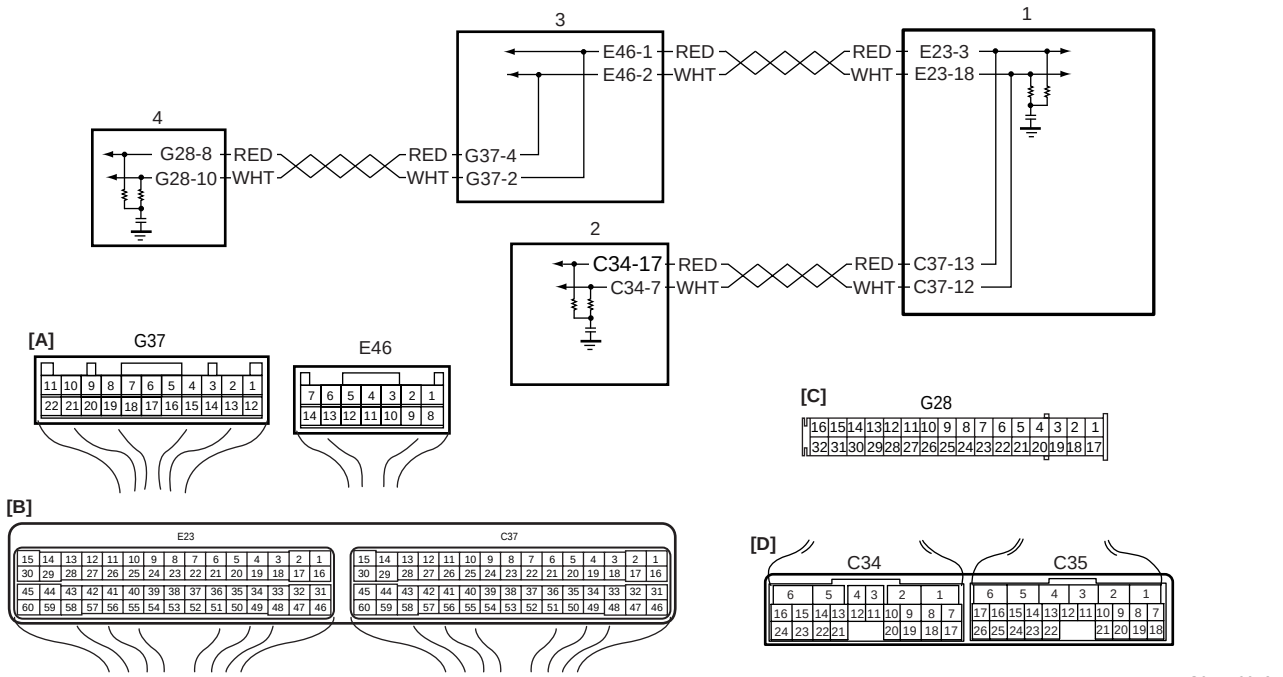
Step	Action	Yes	No
9	**Check CAN communication line circuit insulation** 1) Disconnect connectors from ECM, BCM, TCM and combination meter with ignition switch OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” and “E23-18” terminals of ECM connector • Between “C37-13” and “C37-12” terminals of ECM connector • Between “G37-4” and “G37-2” terminals of BCM connector *Is each resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
10	**Check CAN communication line circuit continuity** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and “E46-1” terminal of BCM connector • Between “E23-18” terminal of ECM connector and “E46-2” terminal of BCM connector • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector • Between “G37-4” terminal of BCM connector and “G28-8” terminal of combination meter connector • Between “G37-2” terminal of BCM connector and “G28-10” terminal of combination meter connector *Is each resistance below 1 Ω?*	Go to Step 11.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 12.	Repair shorted to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.

Step	Action	Yes	No
12	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Substitute a known-good BCM (included in junction block assembly) and recheck. If DTC is still detected, substitute a known-good ECM and recheck.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.

DTC P1775: High Speed CAN Communication Bus Off (Transmission Error)

S4RS0A5104054

Wiring Diagram



I4RS0A510018-

1. ECM	4. Combination meter	[C]: Terminal arrangement of Combination meter connector (viewed from harness side)
2. TCM	[A]: Terminal arrangement of BCM connector (viewed from harness side)	[D]: Terminal arrangement of TCM connector (viewed from harness side)
3. BCM	[B]: Terminal arrangement of ECM connector (viewed from harness side)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for TCM is detected more than specified time continuously.	• ECM • BCM • TCM • Combination meter • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

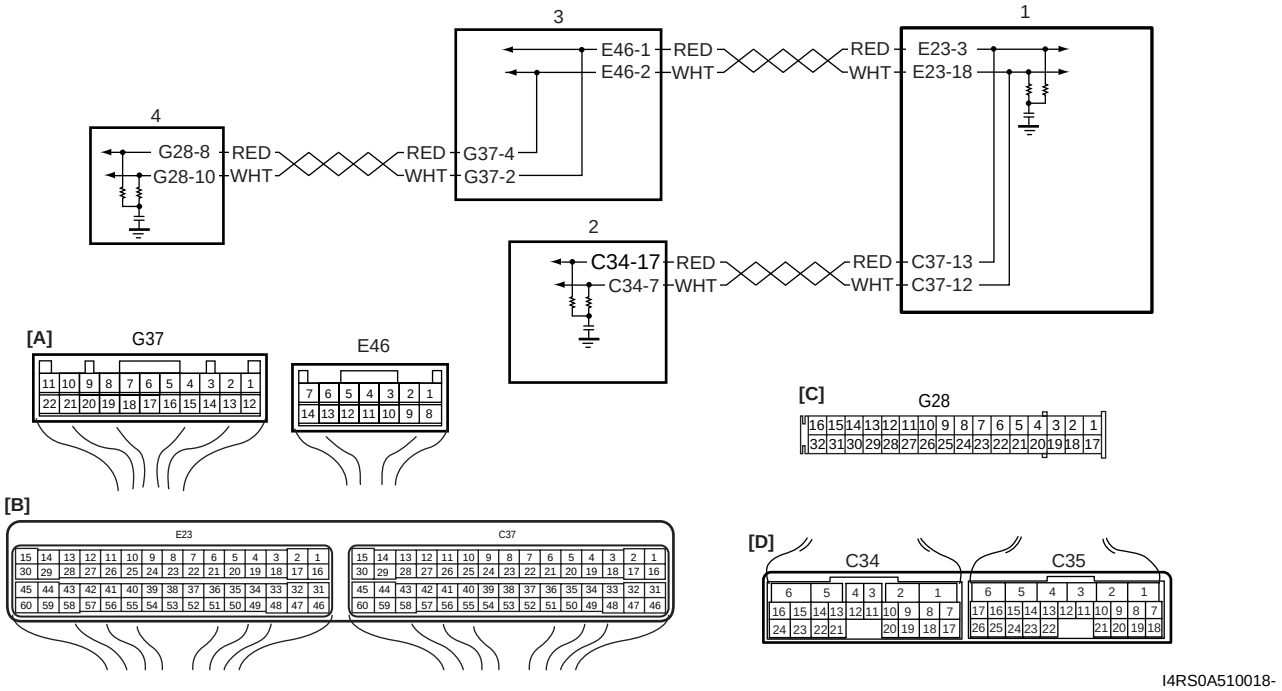
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM and BCM. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check TCM for CAN communication error** 1) Check DTC in TCM. *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off: ".	Go to Step 4.
4	**Check ECM and TCM connectors** 1) Check for proper connection at each ECM and TCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1775?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check: ". *Is it in good condition?*	Go to Step 6.	Repair TCM power and/or ground circuits.
6	**Check DTC in ECM and BCM** 1) Check DTC P1674 in ECM and DTC U1073 in BCM. *Is it indicated?*	Go to applicable DTC diag. flow.	Go to Step 7.
7	**Check CAN communication line circuit continuity** 1) Disconnect connectors from ECM and TCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "C37-13" terminal of ECM connector and "C34-17" terminal of TCM connector • Between "C37-12" terminal of ECM connector and "C34-7" terminal of TCM connector *Is each resistance below 1 Ω?*	Go to Step 8.	Repair open or high resistance CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".

Step	Action	Yes	No
8	**Check CAN communication line circuit insulation** 1) Measure resistance between “C34-17” and “C34-7” terminals of TCM connector. *Is resistance infinity?*	Go to Step 9.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
9	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between “C34-17” terminal of TCM connector and vehicle body ground • Between “C34-7” terminal of TCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 10.	Repair shorted to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
10	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “C34-17” terminal of TCM connector and vehicle body ground • Between “C34-7” terminal of TCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 11.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check ECM internal circuit** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connector • Between “E23-18” and “C37-12” terminals of ECM connector *Is resistance below 1 Ω?*	Substitute a known-good TCM and recheck.	Substitute a known-good ECM and recheck.

DTC P1777: TCM Lost Communication with ECM (Reception Error)

S4RS0A5104055

Wiring Diagram



I4RS0A510018-

1. ECM	4. Combination meter	[C]: Terminal arrangement of Combination meter connector (viewed from harness side)
2. TCM	[A]: Terminal arrangement of BCM connector (viewed from harness side)	[D]: Terminal arrangement of TCM connector (viewed from harness side)
3. BCM	[B]: Terminal arrangement of ECM connector (viewed from harness side)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for ECM is detected more than specified time continuously.	• ECM • BCM • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

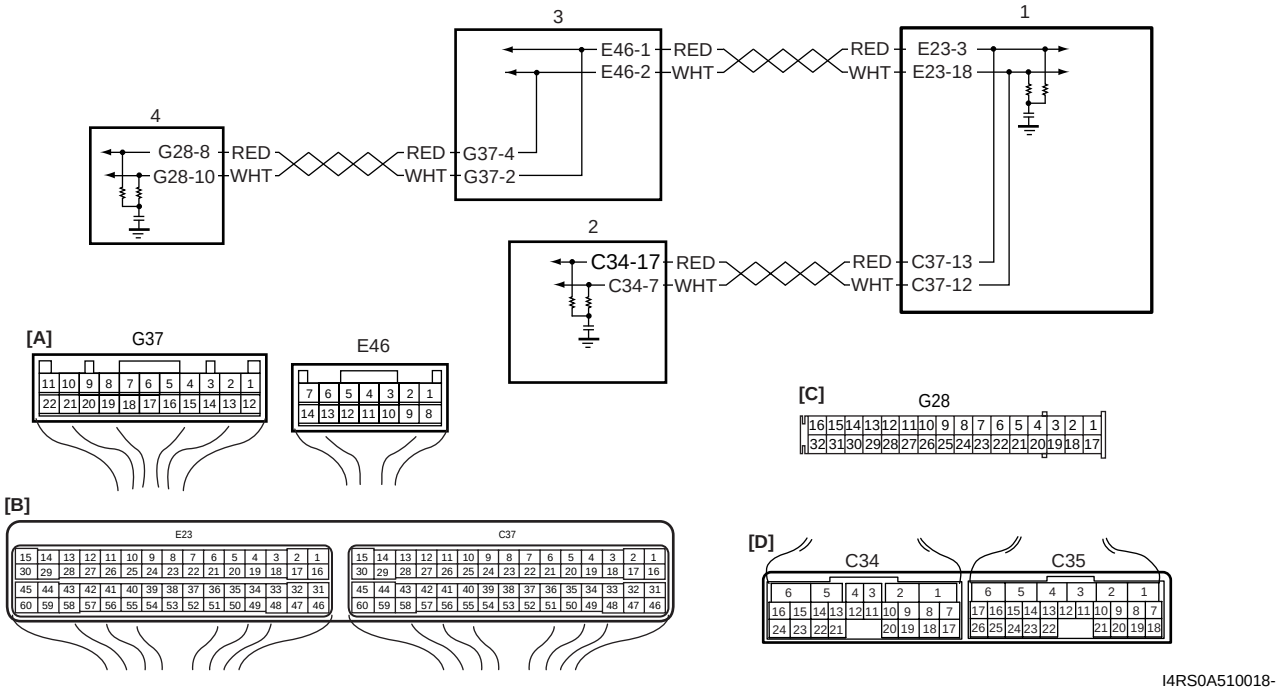
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM and BCM. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check TCM for CAN communication error** 1) Check DTC in TCM. *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off: ".	Go to Step 4.
4	**Check ECM and TCM connectors** 1) Check for proper connection at each ECM and TCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1777?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check: ". *Is it in good condition?*	Go to Step 6.	Repair TCM power and/or ground circuits.
6	**Check DTC for ECM** 1) Check DTC P1674 in ECM. *Is it indicated?*	Go to "DTC P1674: CAN Communication (Bus Off Error): in Section 1A".	Go to Step 7.
7	**Check CAN communication line circuit continuity** 1) Disconnect connectors from ECM and TCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "C37-13" terminal of ECM connector and "C34-17" terminal of TCM connector • Between "C37-12" terminal of ECM connector and "C34-7" terminal of TCM connector *Is each resistance below 1 Ω?*	Go to Step 8.	Repair open or high resistance CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".
8	**Check CAN communication line circuit insulation** 1) Measure resistance between "C34-17" and "C34-7" terminals of TCM connector. *Is resistance infinity?*	Go to Step 9.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".
9	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between "C34-17" terminal of TCM connector and vehicle body ground • Between "C34-7" terminal of TCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 10.	Repair shorted to ground of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".

Step	Action	Yes	No
10	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “C34-17” terminal of TCM connector and vehicle body ground • Between “C34-7” terminal of TCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 11.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check DTC in BCM** 1) Connect connectors to ECM and TCM with ignition switch turned OFF. 2) Check DTC U1100 in BCM. *Is it indicated?*	Substitute a known-good ECM and recheck.	Go to Step 12.
12	**Check ECM internal circuit** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connector • Between “E23-18” and “C37-12” terminals of ECM connector *Is resistance below 1 Ω?*	Substitute a known-good TCM and recheck.	Substitute a known-good ECM and recheck.

DTC P1778: TCM Lost Communication with BCM (Reception Error)

S4RS0A5104056

Wiring Diagram



I4RS0A510018-

1. ECM	4. Combination meter	[C]: Terminal arrangement of Combination meter connector (viewed from harness side)
2. TCM	[A]: Terminal arrangement of BCM connector (viewed from harness side)	[D]: Terminal arrangement of TCM connector (viewed from harness side)
3. BCM	[B]: Terminal arrangement of ECM connector (viewed from harness side)	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for BCM is detected more than specified time continuously.	• ECM • TCM • BCM • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check: ".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM and BCM. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1775, P1777, P1778 in TCM and DTC U1073, U1001, U1100, U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.

Step	Action	Yes	No
3	**Check TCM for CAN communication error** 1) Check DTC in TCM. *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off: ".	Go to Step 4.
4	**Check ECM, TCM and BCM connectors** 1) Check for proper connection at each ECM, TCM and BCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1778?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
5	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check: ". *Is it in good condition?*	Go to Step 6.	Repair TCM power and/or ground circuits.
6	**Check DTC for BCM** 1) Check DTC U1073 in BCM. *Is it indicated?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: in Section 10B".	Go to Step 7.
7	**Check CAN communication line circuit continuity** 1) Disconnect connectors from TCM and BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "C34-17" terminal of TCM connector and "E46-1" terminal of BCM connector • Between "C34-7" terminal of TCM connector and "E46-2" terminal of BCM connector *Is each resistance below 1 Ω?*	Go to Step 9.	Go to Step 8.
8	**Check ECM internal circuit** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "E23-3" and "C37-13" terminals of ECM connector • Between "E23-18" and "C37-12" terminals of ECM connector *Is resistance below 1 Ω?*	Repair open or high resistance CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".	Substitute a known-good ECM and recheck.
9	**Check CAN communication line circuit insulation** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "E23-3" and "E23-18" terminals of ECM connector • Between "C37-13" and "C37-12" terminals of ECM connector *Is resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System: in Section 00".

Step	Action	Yes	No
10	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 11.	Repair shorted to ground of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
11	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 12.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System: in Section 00”.
12	**Check DTC for ECM** 1) Connect connectors to ECM and BCM with ignition switch turned OFF. 2) Check DTC P1678 in ECM. *Is it indicated?*	Substitute a known-good BCM and recheck.	Substitute a known-good TCM and recheck.

DTC P1878: Torque Converter Clutch Shudder

S4RS0A5104057

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
The acceleration slip control function stops when the variation in the output revolution speed of the specified amplitude and specified cycle is detected within a specified period of time. When the specified variation is not detected after the acceleration slip control stops.	• Mismatching ATF • Torque converter clutch malfunction • Valve body

DTC Confirmation Procedure

WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and warm it up to normal operating temperature.
4) Drive vehicle with 3rd or 4th gear in “D” range and slip controlled lock-up ON for 20 seconds or longer referring to “Automatic Gear Shift Table: ”.
5) Stop vehicle.
6) Check DTC, pending DTC and freeze-frame data.

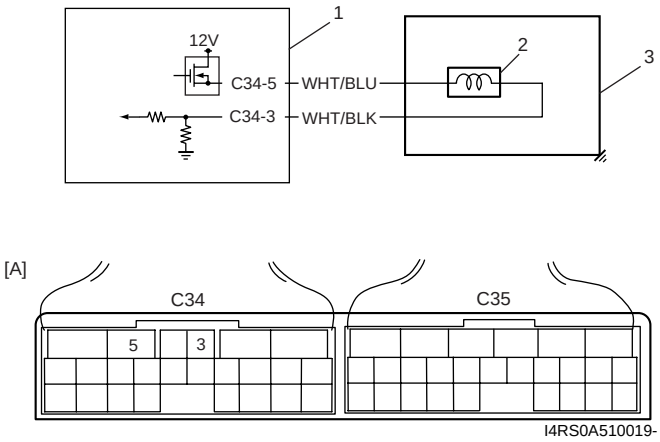
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.
2	Change A/T fluid referring to “A/T Fluid Change: ”. Check DTC after performing “DTC Confirmation Procedure”. *Is DTC P1878 still indicated?*	Faulty torque converter clutch. Replace torque converter.	System is in good condition.

DTC P2763: Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit High

S4RS0A5104037

Wiring Diagram



1. TCC lock-up pressure control solenoid valve	3. A/T
2. TCM	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TCC lock-up pressure control solenoid valve TCM terminal is high although TCM is commanding TCC lock-up pressure control solenoid to turn OFF.	• TCC lock-up pressure control solenoid valve circuit shorted to ground • Malfunction of TCC lock-up pressure control solenoid valve • TCM

DTC Confirmation Procedure

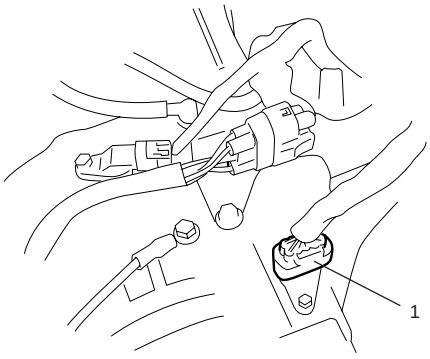
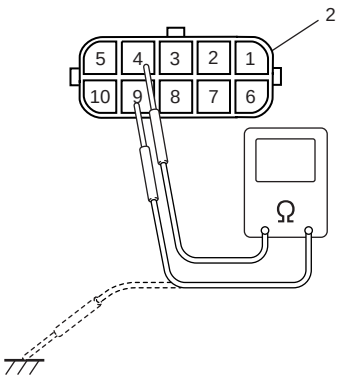
WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed in “P” range for 10 seconds or more.
5) Check DTC.

DTC Troubleshooting

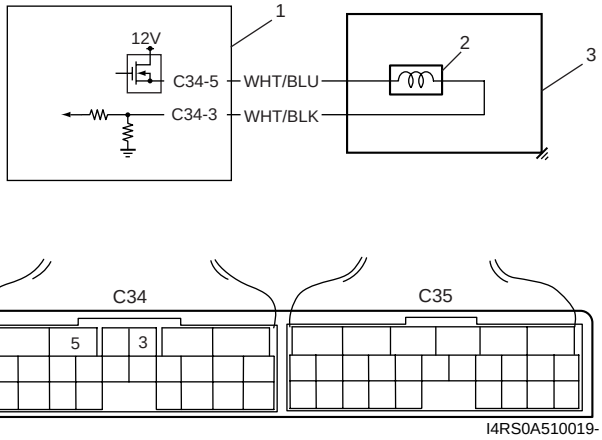
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.

Step	Action	Yes	No
2	**Check TCC solenoid valve circuit for IG short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal “C34-3” and “C34-5”. 4) If connection is OK, turn ignition switch ON and measure voltage between terminal “C34-3” of disconnected harness side TCM connector and ground between terminal “C34-5” of disconnected harness side TCM connector and ground. *Are voltage 1 V or less?*	Go to Step 3.	“WHT/BLU” or “WHT/BLK” circuit shorted to power circuit.
3	**Check TCC lock-up pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at “WHT/BLU” and “WHT/BLK” circuits. 4) Check resistance of TCC lock-up pressure control solenoid valve. **TCC lock-up pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle side valve body harness connector and transaxle: Infinity**   I4RS0A510020- *Is check results satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.	Replace TCC lock-up pressure control solenoid valve or lead wire.

DTC P2764: Torque Converter Clutch (TCC) Circuit Pressure Control Solenoid Control Circuit Low

S4RS0A5104036

Wiring Diagram



I4RS0A510019-

1. TCC pressure control solenoid valve	3. A/T
2. TCM	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TCC lock-up pressure control solenoid valve TCM terminal is low although TCM is commanding TCC lock-up pressure control solenoid to turn ON.	• TCC lock-up pressure control solenoid valve circuit shorted to ground • Malfunction of TCC lock-up pressure control solenoid valve • TCM

DTC Confirmation Procedure

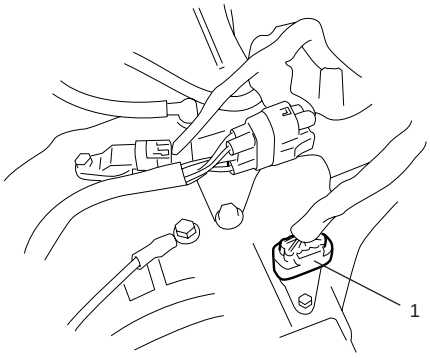
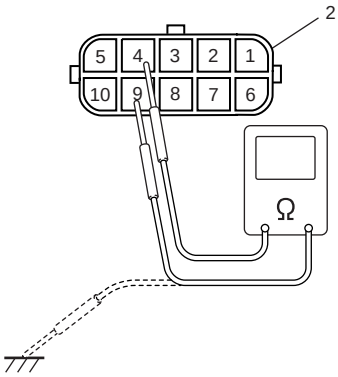
WARNING:

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed in “P” range for 20 seconds or more.
5) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check: ”.

Step	Action	Yes	No
2	**Check TCC lock-up pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at “WHT/BLU” and “WHT/BLK” circuits. 4) Check resistance of TCC lock-up pressure control solenoid valve. **TCC lock-up pressure control solenoid valve resistance** **Between shift terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between shift terminals of transaxle side valve body harness connector and transaxle: Infinity**   I4RS0A510020- *Is check results satisfactory?*	Go to Step 3.	Replace TCC lock-up pressure control solenoid valve or lead wire.
3	**Check TCC lock-up pressure control solenoid valve circuit for ground short** 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals “C34-3” and “C34-5”. 3) If connection is OK, check continuity between terminal “C34-5” of disconnected harness side TCM connector and ground, between terminal “C34-3” of disconnected harness side TCM connector and ground. *Are continuity indicated?*	“WHT/BLU” or “WHT/BLK” circuit shorted to ground.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”. If OK, substitute a known-good TCM and recheck.

Inspection of TCM and Its Circuits

S4RS0A5104038

TCM and its circuits can be checked at TCM wiring connectors by measuring voltage, pulse signal and resistance.

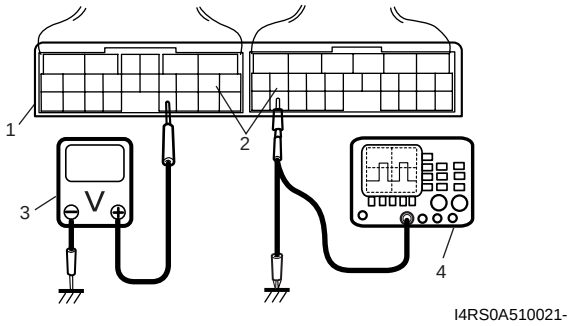
CAUTION:

TCM cannot be checked by itself, it is strictly prohibited to connect voltmeter or ohmmeter to TCM with connector disconnected from it.

1) Remove TCM (1) from vehicle referring to “Transmission Control Module (TCM) Removal and Installation: ”.
2) Connect TCM connectors (2) to TCM.
3) Check voltage and/or pulse signal at each terminal of connectors connected, using voltmeter (3) and oscilloscope (4).

NOTE:

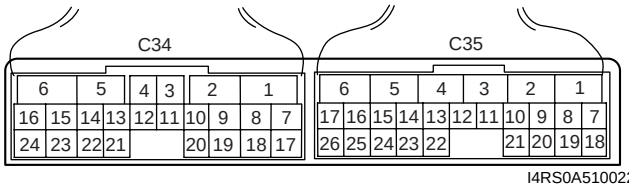
- **As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Voltage with asterisk(*) cannot be measured by voltmeter because it is pulse signal. check it with oscilloscope if necessary.**



I4RS0A510021-

3. Body ground

Terminal arrangement of TCM coupler (Viewed from harness side)



I4RS0A510022-

Connector “C34”

Terminal	Wire color	Circuit	Standard voltage	Condition
1	BLK	Ground	0 – 1 V	Ignition switch ON
2	LT GRN/ BLK	Pressure control solenoid valve (–)	0.6 – 1.0 V	Ignition switch ON
3	WHT/BLK	TCC pressure control solenoid valve (–)	0.6 – 1.0 V	Ignition switch ON
4	GRY	Pressure control solenoid valve (+)	*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No. 1: ”)	Engine running at idling. (Output signal is duty pulse. Duty ratio varies depending on throttle valve opening.)

Terminal	Wire color	Circuit	Standard voltage	Condition
5	WHT/BLU	TCC pressure control solenoid valve (+)	*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No. 2: ”)	Engine running at idling (Output signal is duty pulse. Duty ratio varies depending on torque converter clutch operating condition).
6	YEL/BLK	Power source	10 – 14 V	Ignition switch ON
7	WHT	CAN communication line (Low)	*2.5 – 3.6 V ↑↓ 1.6 – 2.5 V (“Reference waveform No. 3: ”)	Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.))
8	—	—	—	—
9	—	—	—	—
10	—	—	—	—
11	LT GRN	Transmission fluid temperature sensor (+)	2.9 – 3.1 V	Ignition switch ON, fluid temperature is 20 °C (68 °F)
			0.3 – 0.5 V	Ignition switch ON, fluid temperature is 100 °C (212 °F)
12	ORN	Transmission fluid temperature sensor (–)	0 – 1 V	Ignition switch ON
13	—	—	—	—
14	BLU/BLK	Timing solenoid valve	0 – 1 V	Ignition switch ON
15	BLK/YEL	Shift solenoid valve-B (No.2)	9 – 14 V	Ignition switch ON, select lever in “P” range
16	BRN	Shift solenoid valve-A (No.1)	9 – 14 V	Ignition switch ON, select lever in “P” range
17	RED	CAN communication line (High)	*2.5 – 3.6 V ↑↓ 1.6 – 2.5 V (“Reference waveform No. 3: ”)	Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.)
18	—	—	—	—
19	—	—	—	—
20	—	—	—	—
21	—	—	—	—
22	—	—	—	—
23	BLK	Ground	0 – 1 V	Ignition switch ON
24	WHT/RED	Power source for back-up	10 – 14 V	Constantly

Connector “C35”

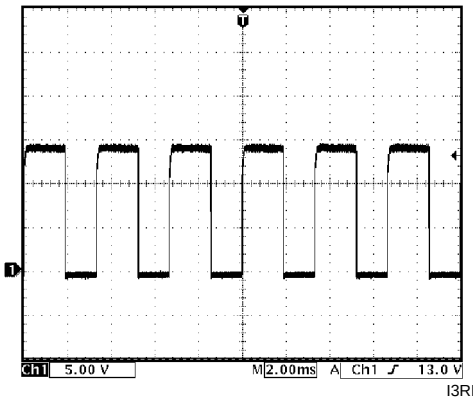
Terminal	Wire color	Circuit	Standard voltage	Condition
1	RED	Transmission range sensor (“R” range)	8 – 14 V	Ignition switch ON, selector lever at “R” range
			0 – 1 V	Ignition switch ON, selector lever at other than “R” range
2	—	—	—	—
3	—	—	—	—
4	—	—	—	—
5	—	—	—	—
6	WHT	Input shaft speed sensor (+)	2 – 3 V	Ignition switch turned ON, engine stops.
			*(“Reference waveform No. 4: ”)	While engine running. (Output signal is waveform. Waveform frequency varies depending on output shaft speed. (16 pulses are generated par 1 input shaft revolution.))

Terminal	Wire color	Circuit	Standard voltage	Condition
7	GRN	Transmission range sensor (“D” range)	8 – 14 V	Ignition switch ON, selector lever at “D” range
			0 – 1 V	Ignition switch ON, selector lever at other than “D” range
8	GRN/ORN	Transmission range sensor (“N” range)	8 – 14 V	Ignition switch ON, selector lever at “N” range
			0 – 1 V	Ignition switch ON, selector lever at other than “N” range
9	—	—	—	—
10	—	—	—	—
11	—	—	—	—
12	—	—	—	—
13	—	—	—	—
14	—	—	—	—
15	—	—	—	—
16	BLK	Input shaft speed sensor (–)	2 – 3 V	Ignition switch ON, engine at stop
17	—	—	—	—
18	LT GRN/ BLK	Transmission range sensor (“L” range)	8 – 14 V	Ignition switch ON, selector lever at “L” range
			0 – 1 V	Ignition switch ON, selector lever at other than “L” range
19	GRN/YEL	Transmission range sensor (“2” range)	8 – 14 V	Ignition switch ON, selector lever at “2” range
			0 – 1 V	Ignition switch ON, selector lever at other than “2” range
20	PNK/BLK	Transmission range sensor (“P” range)	8 – 14 V	Ignition switch ON, selector lever at “P” range
			0 – 1 V	Ignition switch ON, selector lever at other than “P” range
21	—	—	—	—
22	—	—	—	—
23	PPL/WHT	Data link connector	8 – 14 V	Ignition switch ON
24	—	—	—	—
25	PPL	Output shaft speed sensor (VSS)	8 – 14 V	Ignition switch ON
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No. 5: ”)	Vehicle running. (Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (8190 pulses are generated par 60 km/h, 37.5 mile/h)
26	—	—	—	—

Reference waveform No. 1

Pressure control solenoid valve signal at engine idling.

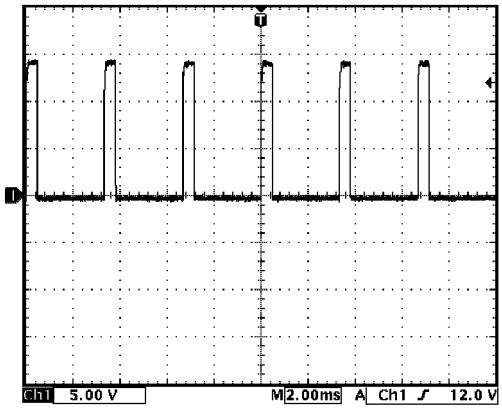
Measurement terminal	CH1: “C34-4” to “C34-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 20 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range.



I3RM0B510029-

Reference waveform No. 2
TCC pressure control solenoid valve signal at engine idling.

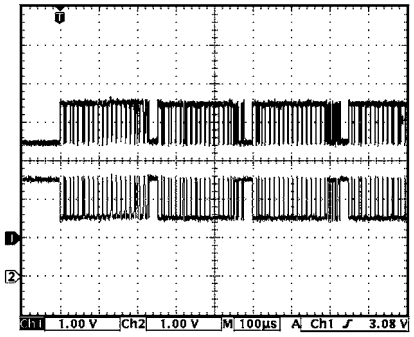
Measurement terminal	CH1: “C34-5” to “C34-1”
Oscilloscope setting	CH1: 5 V/DIV Time: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range



I4RS0A510024-

Reference waveform No. 3
CAN communication line (High & Low) signal at engine idling.

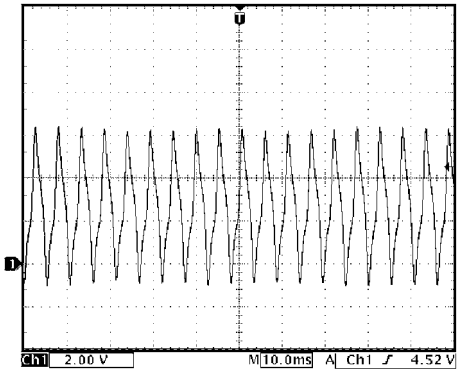
Measurement terminal	CH1: “C34-7” to “C34-1” CH2: “C34-17” to “C34-1”
Oscilloscope setting	CH1: 1 V/DIV TIME: 100 μs/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range.



I3RM0B510030-

Reference waveform No. 4
Input shaft speed sensor signal at engine idling.

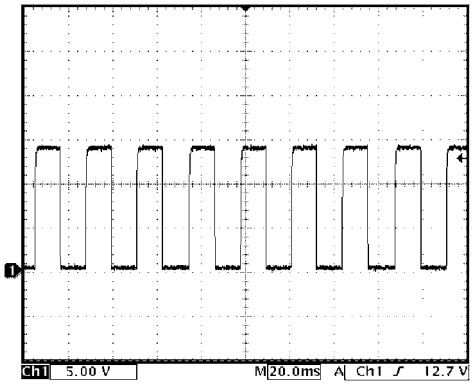
Measurement terminal	CH1: “C35-6” to “C34-1”
Oscilloscope setting	CH1: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range.



I3RM0B510027-

Reference waveform No. 5
Output shaft speed sensor (VSS) signal at vehicle speed 60 km/h (37 mile/h).

Measurement terminal	CH1: “C35-25” to “C34-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 60 km/h (37 mile/h).

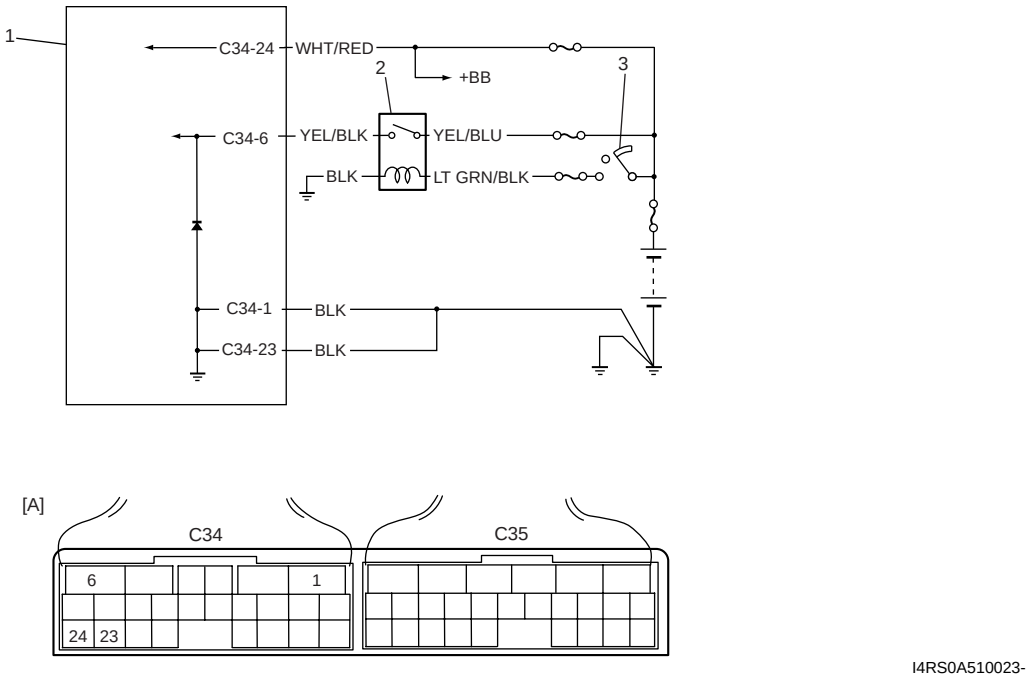


I3RM0B510028-

TCM Power and Ground Circuit Check

S4RS0A5104039

Wiring Diagram



I4RS0A510023-

1. TCM	3. Ignition switch
2. A/T relay	[A]: Terminal arrangement of TCM connector (viewed from harness side)

Troubleshooting

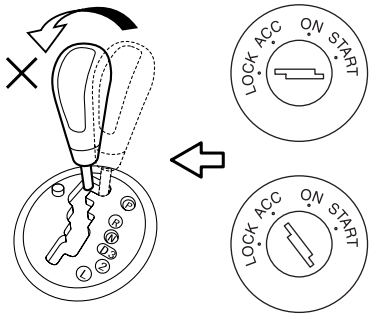
Step	Action	Yes	No
1	**Check TCM back-up power circuit** 1) Disconnect TCM connector with ignition switch OFF. 2) Check for proper connection to TCM at “C34-24” terminal. 3) If OK, check voltage at terminal “C34-24” of disconnected TCM connector. *Is it 10 – 14 V?*	Go to Step 2.	“WHT/RED” circuit open or shorted to ground.
2	**Check TCM power circuit** 1) Disconnect TCM connector with ignition switch OFF. 2) Check for proper connection to TCM at “C34-6” terminal. 3) If OK, turn ignition switch ON and check voltage at terminal “C34-6” of disconnected TCM connector. *Is it 10 – 14 V?*	Go to Step 4.	Go to Step 3.
3	**Check A/T relay operation** 1) Check A/T relay operation referring to “A/T Relay Inspection: ”. *Is check result satisfactory?*	“YEL/BLK”, “YEL/BLU”, “LT GRN/BLK” or “BLK” circuit for power supply open.	Replace A/T relay.

Step	Action	Yes	No
4	**Check TCM ground circuit** 1) Turn ignition switch OFF. 2) With TCM connectors disconnected, check for proper connection to TCM at “C34-1” / “C34-23” terminal. 3) If OK, check resistance between “C34-1” / “C34-23” terminal of disconnected TCM connector and body ground. *Is continuity indicated?*	TCM power and ground circuits are in good condition.	“BLK” circuit for TCM ground open.

Brake Interlock System Inspection

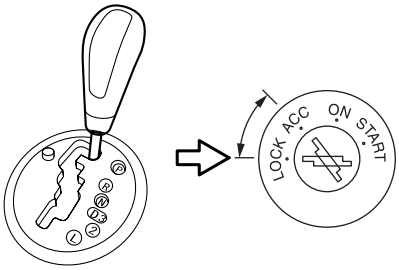
S4RS0A5104058

1) Check that selector lever cannot be moved to any other range from “P” range position when ignition switch key is at ACC position, at LOCK position or it is removed from keyhole of ignition switch, or brake pedal is not depressed.



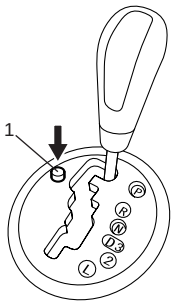
I4RS0A510047-

2) Shift selector lever to “P” range position, release knob button and check for the following.
   - Ignition key can be turned between LOCK and ACC positions back and forth and also it can be removed from ignition switch.



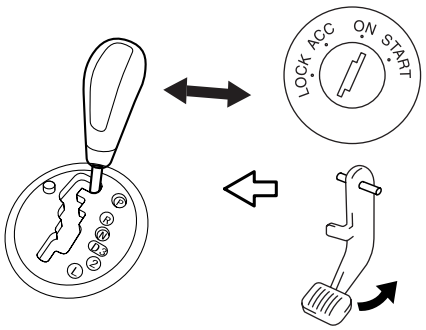
I4RS0A510048-

   - With shift lock solenoid release button (1) pushed and ignition key turned to ACC position, selector lever can be shifted from “P” range position to any other range.
   - With shift lock solenoid release button (1) pushed and ignition key turned to LOCK position, selector lever can not be shifted from “P” range position to any other range.



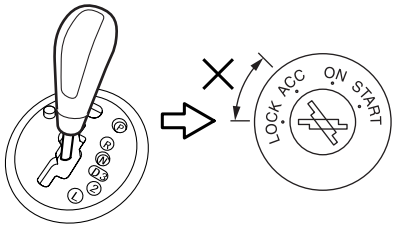
I4RS0A510049-

   - When ignition switch is turned ON and brake pedal is depressed, selector lever can be shifted from “P” range position to any other range.



I4RS0A510050-

3) With ignition lever shifted to any position other than “P” range, check that ignition key cannot be turned LOCK position and it cannot be removed from ignition switch unless it is at LOCK position.



I4RS0A510051-

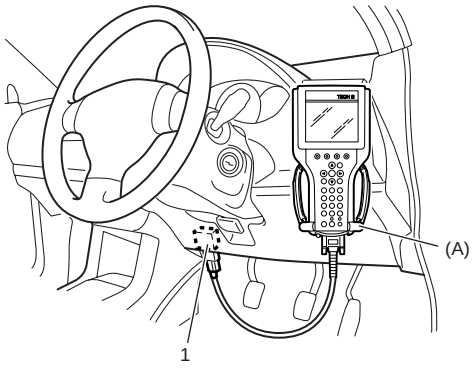
Repair Instructions

Learning Control Initialization

S4RS0A5106067

1) Connect san tool to DLC (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



I4RS0A510009-

2) Start engine and shift selector lever to “P” range.
3) Select “Misc Test” mode on scan tool.
4) Perform “AT learned initialize” on scan tool.

A/T Fluid Level Check

S4RS0A5106001

CAUTION:

Do not use any fluid other than the specified ATF. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.

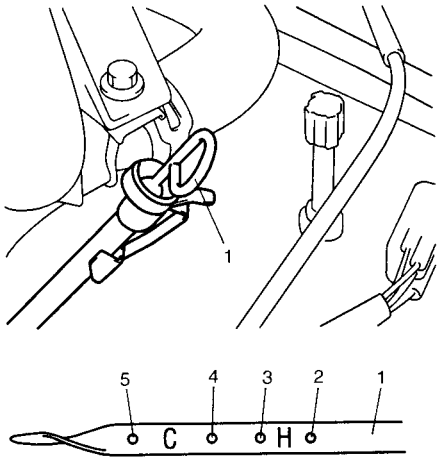
Level Check at Normal Operating (Hot) Temperature – Hot Check

1) Stop vehicle and place it level.
2) Apply parking brake and place chocks against wheels.
3) With selector at “P” position, start engine.
4) Warm up engine till fluid temperature reaches normal operating temperature (70 – 80 °C / 158 – 176 °F). As a guide to check fluid temperature, warm up engine to normal operating.
5) Keep engine idling and shift selector slowly to “L” and back to “P” position.
6) With engine idling, pull out fluid level gauge, wipe it off with a clean cloth and put it back into place.
7) Pull out fluid level gauge (1) again and check fluid level indicated on it. The lowest fluid level should be between FULL HOT (2) and LOW HOT (3). If it is below LOW HOT, add SUZUKI ATF 3317 or Mobil ATF 3309 up to FULL HOT.

Automatic transaxle fluid
SUZUKI ATF 3317 or Mobil ATF 3309

NOTE:

- **Do not race engine while checking fluid level, even after the engine start.**
- **Do not overfill. Overfilling can cause foaming and loss of fluid through breather. Then slippage and transaxle failure can result.**
- **Bringing the level from LOW HOT to FULL HOT requires 0.4 liters (0.85 / 0.70 US/Imp. pt).**
- **If vehicle was driven under high load such as pulling a trailer, fluid level should be checked about half an hour after it is stopped.**



I3RM0B510032-

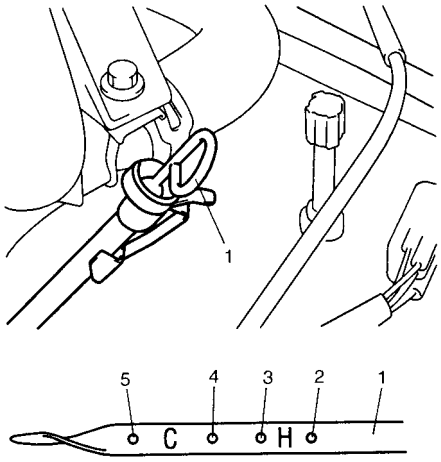
4. “FULL COLD” mark	5. “LOW COLD” mark

Level Check at Room (Cold) Temperature – Cold Check

Fluid level can be checked temporarily at room (cold) temperature which correspond to 20 – 30 °C (68 – 86 °F). This level check is considered to be preparation before performing level check under normal operating (hot) temperature. Checking procedure itself is the same as that described in “Level Check at Normal Operating (Hot) Temperature – Hot Check: ”. If fluid level is between “FULL COLD” (4) and “LOW COLD” (5), proceed to test drive. And when fluid temperature has reached normal operating temperature, check fluid level again and adjust it as necessary.

CAUTION:

Fluid level check at room (cold) temperature is recommended only for preparation of level check under normal (hot) operating condition.
Failure to perform fluid level check under normal (hot) operating temperature may result in damage to transaxle.



I3RM0B510032-

1. Fluid level gauge	3. “LOW HOT” mark
2. “FULL HOT” mark	

A/T Fluid Change

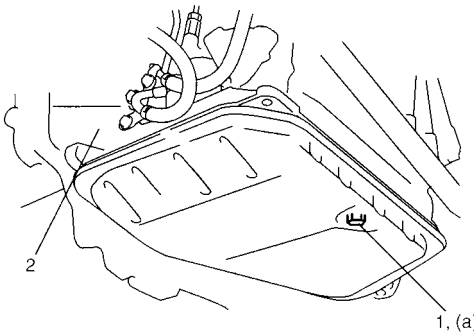
S4RS0A5106002

CAUTION:

Do not use any fluid other than the specified ATF. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.

1) Lift up vehicle.
2) When engine is cool, remove drain plug (1) from transaxle housing (2) and drain A/T fluid.
3) Install drain plug (1).

Tightening torque
A/T fluid drain plug (a): 17 N·m (1.7 kg-m, 12.5 lb-ft)

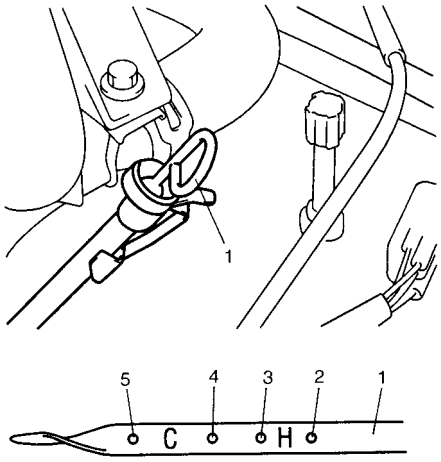


I3RM0B510033-

4) Lower vehicle and pour proper amount of SUZUKI ATF 3317 or Mobil ATF 3309.
5) Check fluid level referring to “A/T Fluid Level Check: ”.

Automatic transaxle fluid
SUZUKI ATF 3317 or Mobil ATF 3309

Automatic transaxle fluid capacity
When draining from drain plug hole: 3.3 liters (6.97 / 5.81 US/Imp. pt.)
When overhauling: 5.6 liters (11.83 / 9.86 US/Imp. pt.)

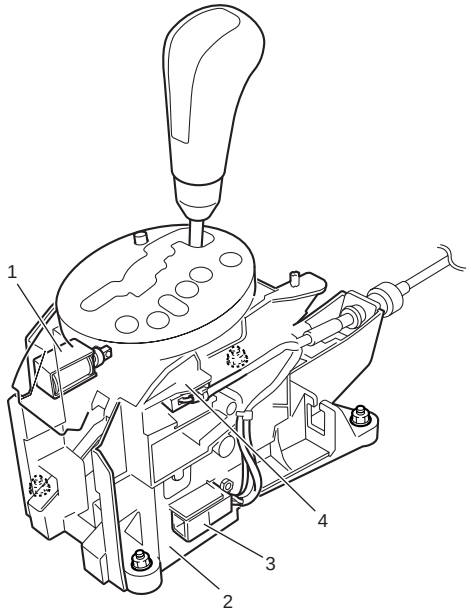


I3RM0B510032-

1. Fluid level gauge	4. “FULL COLD” mark
2. “FULL HOT” mark	5. “LOW COLD” mark
3. “LOW HOT” mark	

Selector Lever Components

S4RS0A5106004



I4RS0A510052-

1. Shift lock solenoid	3. Connector
2. Selector lever assembly	4. “3” position switch

Select Lever Assembly Installation

S4RS0A5106068

Note the following when installing select lever assembly:

- After installing select lever assembly, adjust select cable referring to “Select Cable Adjustment: ”.

Select Lever Knob Installation

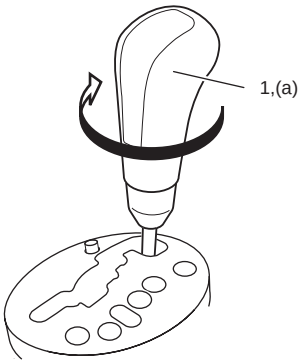
S4RS0A5106069

Screw select lever knob onto select lever by specified numbers of rotation below.

Rotation numbers for select lever knob
Installation (a): 11 – 12 rotations

CAUTION:

When installing select lever knob, do not turn more than specified numbers of rotation. Otherwise select lever knob is damaged.



I4RS0A510058-

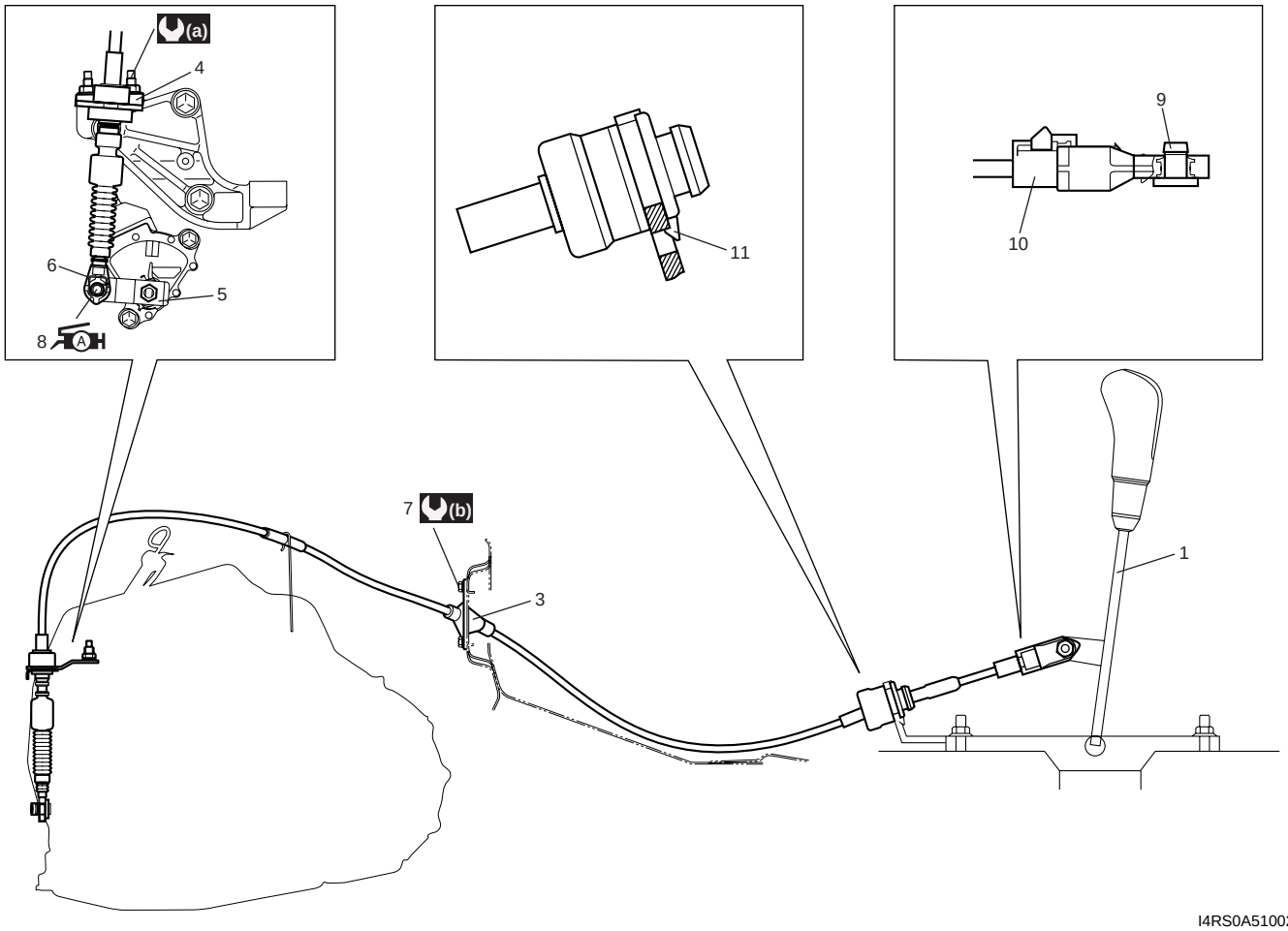
Selector Lever Inspection

S4RS0A5106005

Check select lever for smooth and clear-cut movement individually. If a malfunction is found, replace select lever assembly.

Select Cable Components

S4RS0A5106006



I4RS0A510025-

1. Selector lever assembly	6. Clip	11. Lock
2. Select cable	7. Select cable retainer bolt	(a): 23 N·m (2.0 kg-m, 17.0 lb-ft)
3. Select cable retainer	8. Manual select lever pin : Apply lithium grease 99000-25010 to all around pin (0.15 g)	(b): 5.0 N·m (0.55 kg-m, 4.0 lb-ft)
4. Cable bracket	9. Selector lever pin : Apply lithium grease 99000-25010 to all around pin (0.15 g)	: Tightening torque
5. Manual select lever	10. Adjuster case	

Select Cable Removal and Installation

S4RS0A5106003

Removal

1) Remove parking brake lever cover.
2) Remove console box.
3) Disconnect select cable from selector lever and then detach from bracket.
4) Remove clip and disconnect select cable from manual select lever.
5) Remove select cable retainer from dash panel.

Installation

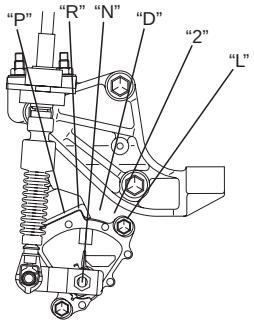
Install select cable by reversing removal procedure.
The important steps in installation are as follows.

- Apply grease to pin and cable joint.
- Tighten bolts to specified torque referring to “Select Cable Components: ”.
- Adjusting procedure is as follows. Refer to “Select Cable Adjustment: ”.

Select Cable Adjustment

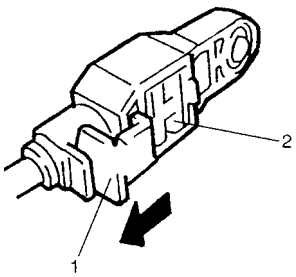
S4RS0A5106007

1) Shift manual shift lever to “N” range (transmission range sensor “N” range).



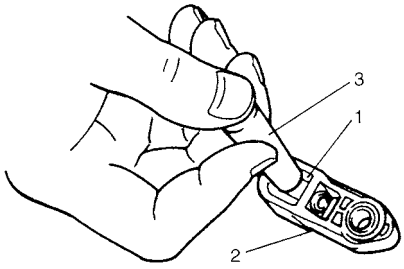
I3RM0B510036-

2) Remove adjuster (cable end) from selector lever pin of selector lever assembly.
3) Release lock plate (1) which restrict moving of cable end holder (2).



I2RH01510046-

4) Push cable end holder (1) out from eye-end (2) using an appropriate tool (3) to disengage cable.

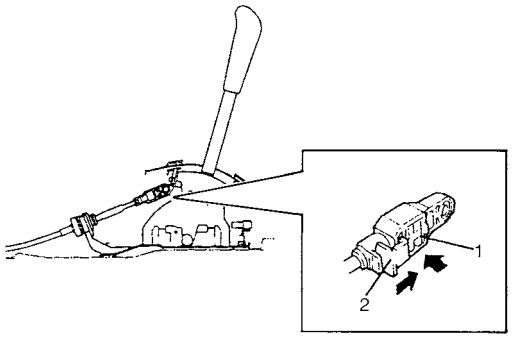


I2RH01510047-

5) Shift selector lever to “N” position.
6) Apply grease to selector lever pin and install adjuster (cable end) to it.

: Grease 99000–25010

7) With both selector lever and transmission range sensor kept each “N” position, drive cable end holder (1) in until it locks cable.
8) Slide lock plate (2) to secure cable end holder in position.



I3RM0B510037-

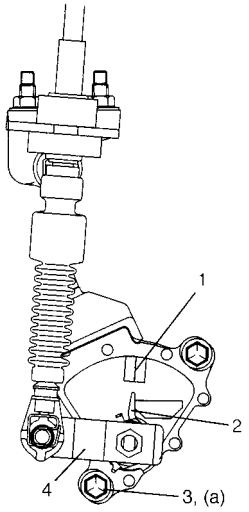
9) After select cable was installed, check for the following.
   - Push vehicle with selector lever shifted to “P” range. Vehicle should not move.
   - Vehicle can not be driven in “N” range.
   - Vehicle can be driven in “D”, “3”, “2” and “L” ranges.
   - Vehicle can be backed in “R” range.

Transmission Range Sensor (Shift Switch) Inspection and Adjustment

S4RS0A5106008

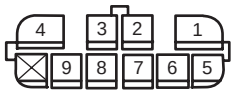
1) Shift manual select lever (4) to “N” range.
2) Check that needle direction shaped on lock washer (2) and “N” reference line (1) on transmission range sensor are aligned. If not, loosen sensor bolts (3) and align them.

Tightening torque
Transmission range sensor bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



I3RM0B510038-

3) Check that engine starts in “N” and “P” ranges but it doesn’t start in “D”, “2”, “L” or “R” range. Also, check that back-up lamp lights in “R” range.
If faulty condition cannot be corrected by adjustment, disconnect transmission range sensor connector and check that continuity exists as shown by moving manual select lever.



Sensor Position	Terminal No. 1	2	3	4	5	6	7	8	9
P	○			○			○		○
R							○	○	
N	○			○	○		○		
D			○				○		
2						○	○		
L		○					○		

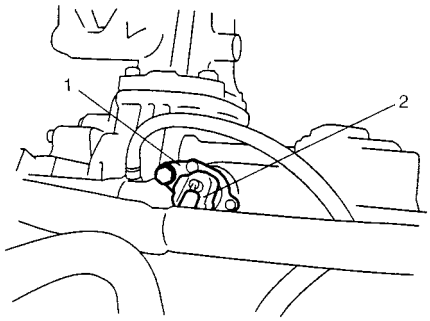
I3RM0B510039-

Output Shaft Speed Sensor (VSS) Removal and Installation

S4RS0A5106009

Removal

1) Disconnect negative cable at battery.
2) Disconnect output shaft speed sensor connector (2).
3) Remove output shaft speed sensor (VSS) (1) by removing its bolt.



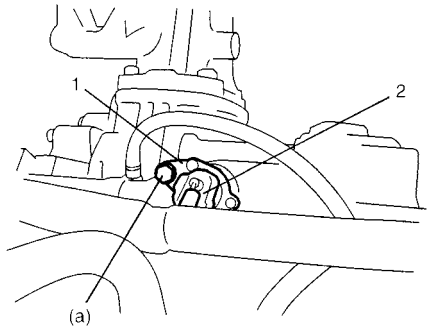
I3RM0B510040-

Installation

1) Apply A/T fluid to output shaft speed sensor O-ring.
2) Install output shaft speed sensor (VSS) (1) to A/T case and tighten bolt to specified torque.

Tightening torque
Output shaft speed sensor (VSS) bolt (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

3) Connect output shaft speed sensor connector (2) to output shaft speed sensor (VSS) (1).



I3RM0B510041-

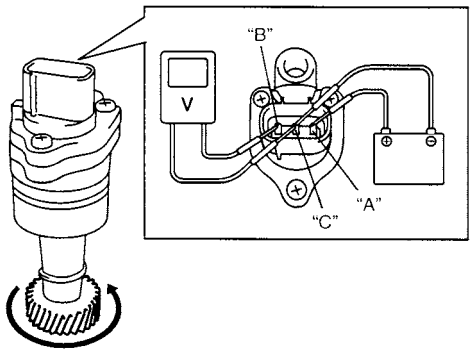
4) Connect negative cable to battery.

Output Shaft Speed Sensor (VSS) Inspection

S4RS0A5106010

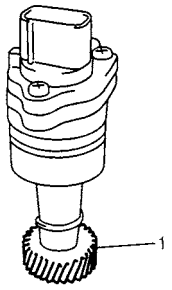
1) Connect positive cable of 12 volt battery to “A” terminal of sensor and ground cable to “C” terminal. Then using voltmeter, check voltage between “B” terminal and “C” terminal with output shaft speed sensor (VSS) driven gear rotated.
If measured voltage (pulse signal) is not as specified, replace sensor.

Output shaft speed sensor (VSS) output voltage
Pulse signal of alternating 0 – 1 V and 10 – 14 V



I2RH0B510045-

2) Check output shaft speed sensor (VSS) driven gear (1) for wear.
Replace if necessary.



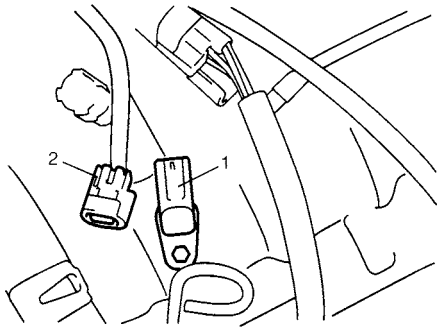
I2RH0B510046-

Input Shaft Speed Sensor Removal and Installation

S4RS0A5106011

Removal

1) Disconnect negative cable at battery.
2) Disconnect input shaft speed sensor connector (2).
3) Remove input shaft speed sensor (1) by removing its bolt.



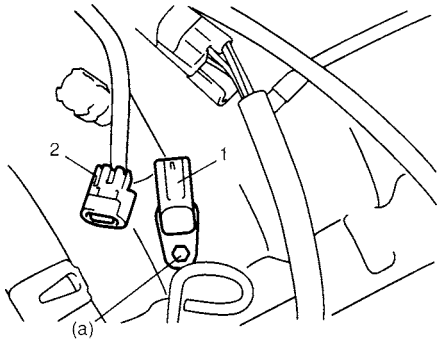
I2RH0B510047-

Installation

1) Apply A/T fluid to input shaft speed sensor O-ring.
2) Install input shaft speed sensor (1) to A/T case and tighten bolt to specified torque.

Tightening torque
Input shaft speed sensor bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

3) Connect input shaft speed sensor connector (2) to input shaft speed sensor (1).



I2RH0B510048-

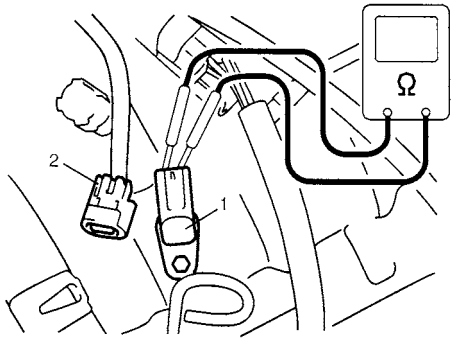
4) Connect negative cable to battery.

Input Shaft Speed Sensor Inspection

S4RS0A5106012

1) Disconnect negative cable at battery.
2) Disconnect input shaft speed sensor connector (2).
3) Check resistance between input shaft speed sensor (1) terminals.

Input shaft speed sensor resistance
Standard: 560 – 680 Ω at 20 °C (68 °F)



I2RH0B510049-

Transmission Fluid Temperature Sensor Removal and Installation

S4RS0A5106059

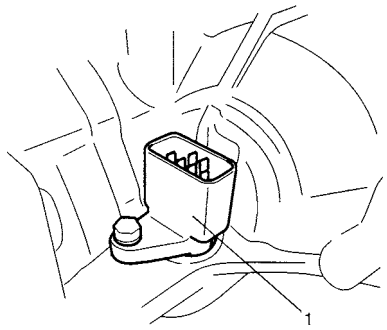
Removal

1) Disconnect negative cable at battery.
2) Lift up vehicle.
3) With engine is cool, remove drain plug and drain A/T fluid.
4) Install drain plug. Refer to “A/T Fluid Change: ”.
5) Remove A/T oil pan.
6) Remove oil strainer assembly.
7) Remove valve body assembly referring to “Automatic Transaxle Unit Disassembly: ”.

CAUTION:

When pulling solenoid wire harness out of transaxle case, take care not to damage transmission fluid temperature sensor at narrow exit of case.
Careless sensor treatment might cause sensor malfunction.

8) Remove solenoid wire harness (1).



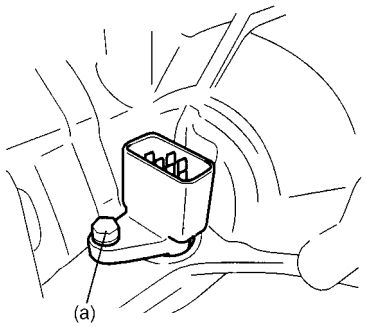
I2RH0B510050-

Installation

Reverse removal procedure to install solenoid wire harness and valve body assembly noting the following points.

- For details of valve body assembly and their connectors installation, refer to “Automatic Transaxle Unit Assembly: ”.
- For details of A/T oil pan installation, refer to “Automatic Transaxle Unit Assembly: ”. Use new oil pan gasket.
- Tighten valve body harness connector bolt to specified torque.

Tightening torque
Valve body harness connector bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



I2RH0B510051-

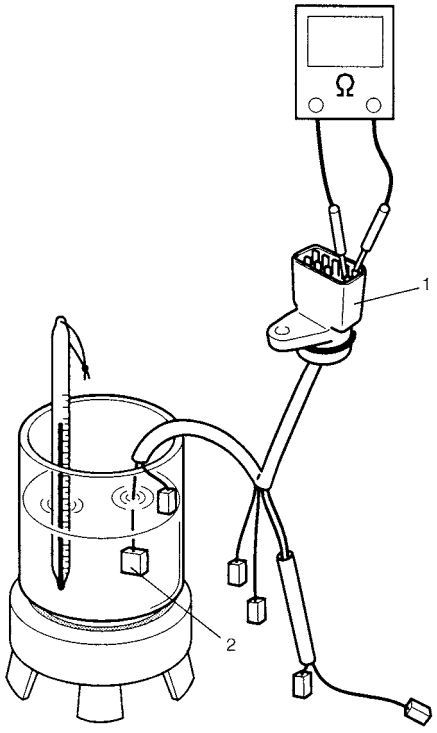
- Pour A/T fluid and check fluid level according to procedure described in “A/T Fluid Change: ”.
- Check for fluid leakage after warming up A/T.

Transmission Fluid Temperature Sensor Inspection

S4RS0A5106013

Warm up transmission fluid temperature sensor (2). Check resistance between terminals of valve body harness connector (1). Thus make sure its resistance decrease as its temperature increase.

Transmission fluid temperature sensor resistance
10 °C (50 °F): 5.8 – 7.1 kΩ
110 °C (230 °F): 231 – 263 Ω
145 °C (293 °F): 105 – 117 Ω



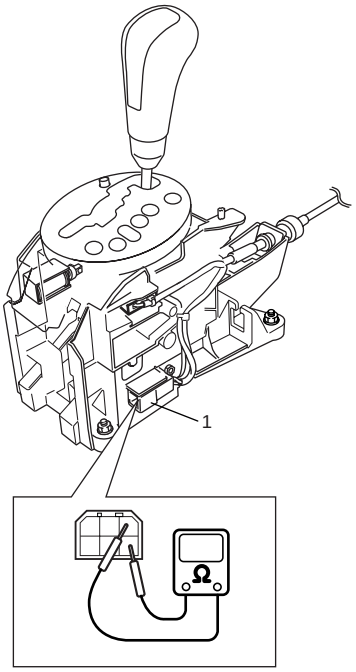
I2RH0B510052-

“3” Position Switch Inspection

S4RS0A5106014

1) Remove console box referring to “Console Box Components: in Section 9H”.
2) Disconnect “3” position switch connector (1).
3) Check continuity between “3” position switch terminals.

“3” position switch specification
Shift selector lever to “3” or “2” range: Continuity
Shift other above range: No continuity



I4RS0A510026-

Solenoid Valves (Shift Solenoid Valves and Timing Solenoid Valve) Removal and Installation

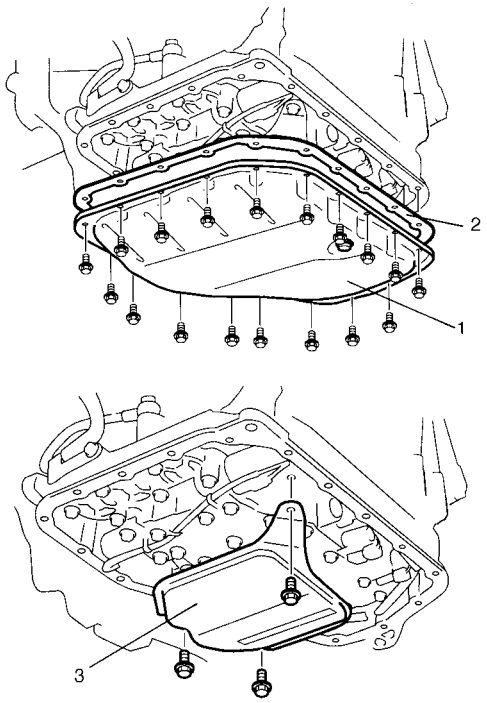
S4RS0A5106015

Removal

1) Disconnect negative cable at battery.
2) Lift up vehicle.
3) Remove drain plug and drain A/T fluid.
4) Install drain plug.

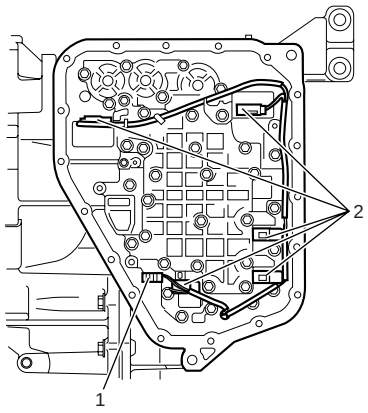
Tightening torque
A/T fluid drain plug: 17 N·m (1.7 kg-m, 12.5 lb-ft)

5) Remove A/T oil pan (1) and oil pan gasket (2).
6) Remove oil strainer assembly (3).



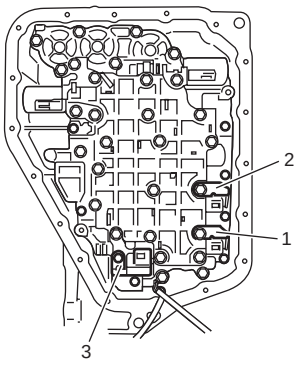
I2RH0B510054-

7) Remove transmission fluid temperature sensor (1) from sensor clamp.
8) Disconnect solenoid connectors (2).



I4RS0A510027-

9) Remove shift solenoid valve-A (No.1) (1), shift solenoid valve-B (No.2) (2) and timing solenoid valve (3) by removing bolts.

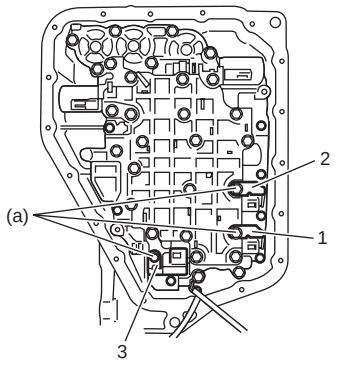


I4RS0A510028-

Installation

1) Install shift solenoid valve-A (No.1) (1), shift solenoid valve-B (No.2) (2) and timing solenoid valve (3).

Tightening torque
Shift solenoid bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

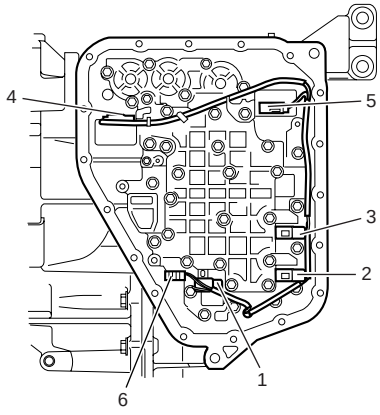


I4RS0A510029-

2) Connect solenoid connectors identifying their installing positions by wire color.

Solenoid coupler	Wire color
Shift solenoid valve-A (No.1) (2)	White
Shift solenoid valve-B (No.2) (3)	Black
Timing solenoid valve (1)	Yellow
TCC pressure control solenoid valve (4)	Light green / Brown
Pressure control solenoid valve (5)	Green / Gray

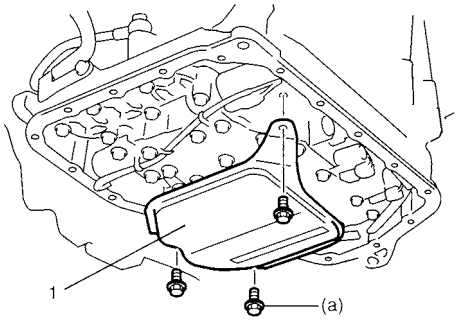
3) Install transmission fluid sensor (6) and sensor wire to clamp.



I4RS0A510030-

4) Install oil strainer assembly (1).

Tightening torque
Oil strainer bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

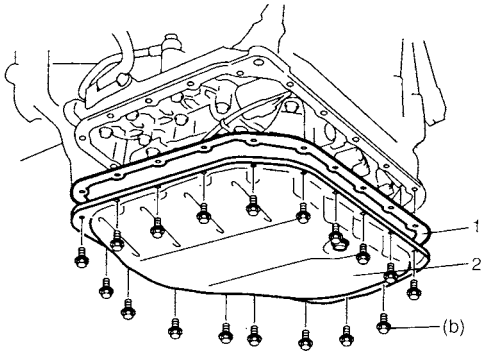


I2RH0B510059-

5) Install new oil pan gasket (1) and oil pan (2).

6) Tighten oil pan bolts to specified torque diagonally and little by little.

Tightening torque
Oil pan bolt (b): 7.0 N·m (0.7 kg-m, 5.0 lb-ft)



I2RH0B510060-

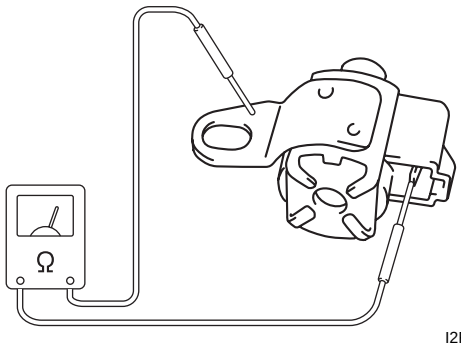
Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection

S4RS0A5106016

Resistance Check

Check shift solenoid valves and timing solenoid valve.

Shift solenoid valves and timing solenoid valve resistance
Standard: 11 – 15 Ω at 20 °C (68 °F)



I2RH0B510061-

Operation Check

Shift solenoid valve-A (No.1) and -B (No.2)

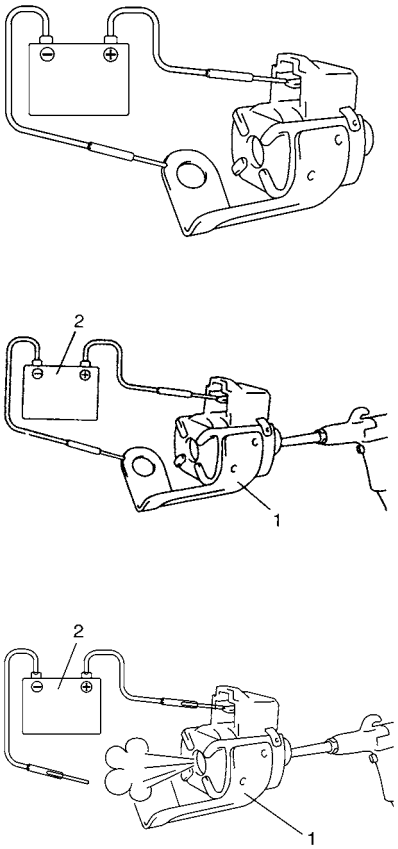
CAUTION:

- **Do not insert air gun against strainer installed on inlet of solenoid valve too deeply, when blowing air into solenoid valve. If not, the strainer will be damaged.**
- **Be very careful as dust etc. does not enter when solenoid valves are inspected.**

- Check that solenoid valve (1) actuate with click sound when battery voltage is conducted.
- When solenoid valve (1) is connected to battery (2), confirm that solenoid valve is close condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.
- When solenoid valve (1) is not connected to battery (2), confirm that solenoid valve is open condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.

NOTE:

Do not fail to inspect with air to prevent mistaken checking because return spring for valve is not installed into solenoid valve.



I2RH0B510062-

Timing solenoid valve

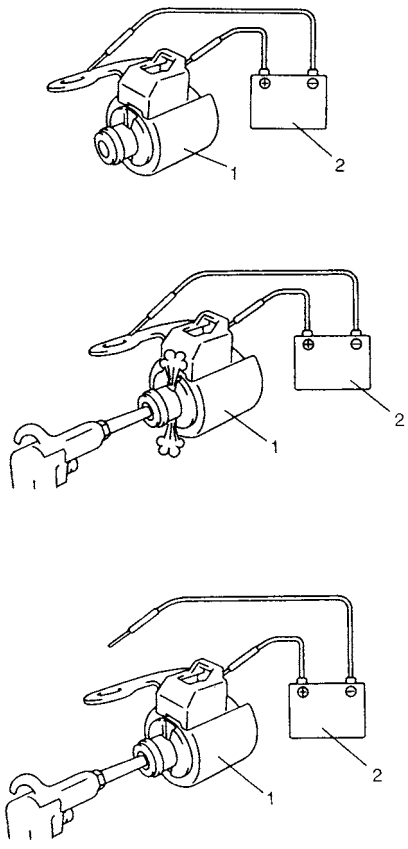
CAUTION:

- **Do not insert air gun against strainer installed on inlet of solenoid valve too deeply, when blowing air into solenoid valve. If not, the strainer will be damaged.**
- **Be very careful as dust etc. does not enter when solenoid valves are inspected.**

- Check that solenoid valve (1) actuate with click sound when battery voltage is conducted.
- When timing solenoid valve (1) is connected to battery (2), confirm that timing solenoid valve is open condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.
- When timing solenoid valve (1) is not connected to battery (2), confirm that timing solenoid valve is close condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.

NOTE:

Do not fail to inspect with air to prevent mistaken checking because return spring for valve is not installed into solenoid valve.



I2RH0B510063-

Pressure Control Solenoid Valves (Pressure Control Solenoid and TCC Pressure Control Solenoid) Removal and Installation

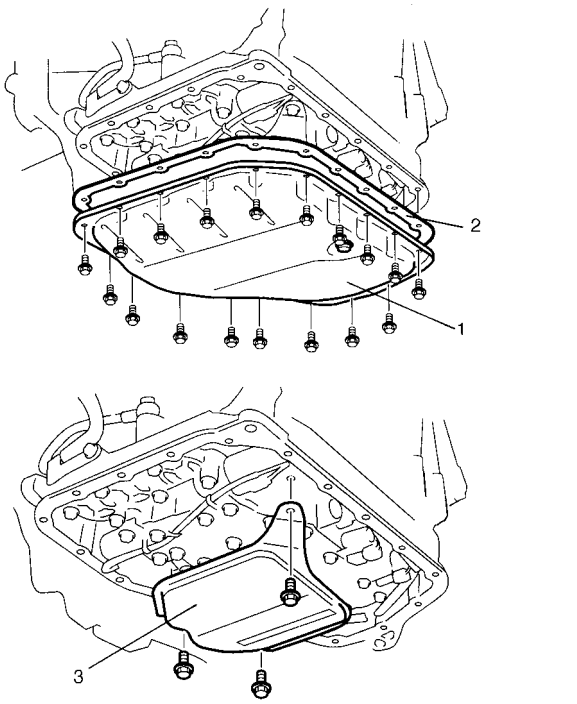
S4RS0A5106060

Removal

1) Disconnect negative cable at battery.
2) Lift up vehicle.
3) Remove drain plug and drain A/T fluid.
4) Install drain plug.

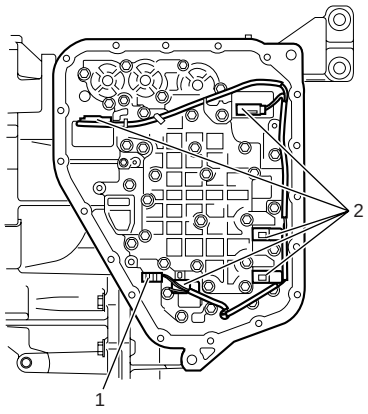
Tightening torque
A/T fluid drain plug: 17 N·m (1.7 kg-m, 12.5 lb-ft)

5) Remove A/T oil pan (1) and oil pan gasket (2).
6) Remove oil strainer assembly (3).



I2RH0B510054-

7) Remove transmission fluid temperature sensor (1) from sensor clamp.
8) Disconnect solenoid connectors (2).



I4RS0A510027-

9) Remove valve body assembly referring to "Automatic Transaxle Unit Disassembly: ".
10) Remove pressure control solenoid valve and TCC pressure control solenoid valve referring to "Valve Body Assembly Disassembly and Reassembly: ".

Installation

Reverse removal procedure to install pressure control solenoid valve and valve body assembly noting the following points.

- For detail of pressure control solenoid valve and TCC pressure control solenoid valve installation, refer to "Valve Body Assembly Disassembly and Reassembly: ".
- For detail of valve body assembly installation, refer to "Automatic Transaxle Unit Assembly: ".
- For detail of installing wire harness for solenoid valves and sensor, refer to "Automatic Transaxle Unit Assembly: ". Use new O-rings.
- For detail of A/T oil pan and oil strainer assembly installation, refer to "Automatic Transaxle Unit Assembly: ". Use new oil pan gasket.
- Pour A/T fluid and check fluid level according to procedure described in "A/T Fluid Change: ".
- Check for fluid leakage after warming up A/T.

Pressure Control Solenoid Valve Inspection

S4RS0A5106017

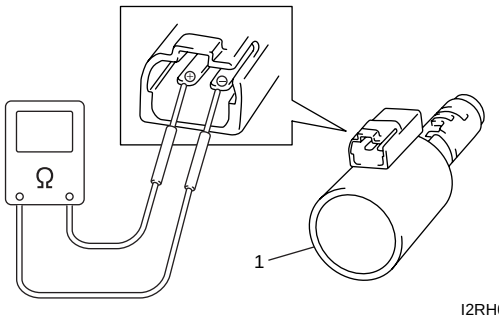
CAUTION:

- **Be very careful as dust etc. does enter when pressure control solenoid valves are inspected.**

Resistance Check

Measure resistance between pressure control solenoid valves (Pressure control solenoid and TCC pressure control solenoid) (1) terminals.

Pressure control solenoid valve and TCC pressure control solenoid valve resistance
Standard: 5.0 – 5.6 Ω at 20 °C (68 °F)



I2RH01510071-

Operation Check

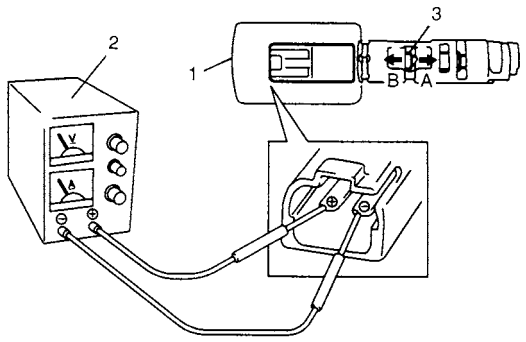
Check pressure control solenoid valves (Pressure control solenoid and TCC pressure control solenoid) operation in the either manner of the following.

Using regulated DC power supply

1) Connect pressure control solenoid valve (1) with regulated DC power supply (2) as shown in figure.
2) Turn regulated DC power supply switch ON and increase voltage of power supply keeping current within 1.0 A.
3) Check for gradual movement of valve (3) in the direction of arrow “A” as voltage is increased.
4) Check movement of valve (3) in the direction of arrow “B” as voltage is decreased.
5) Turn power supply switch OFF.

CAUTION:

Do not pass current 1.0 A or more, or pressure control solenoid is burned out.



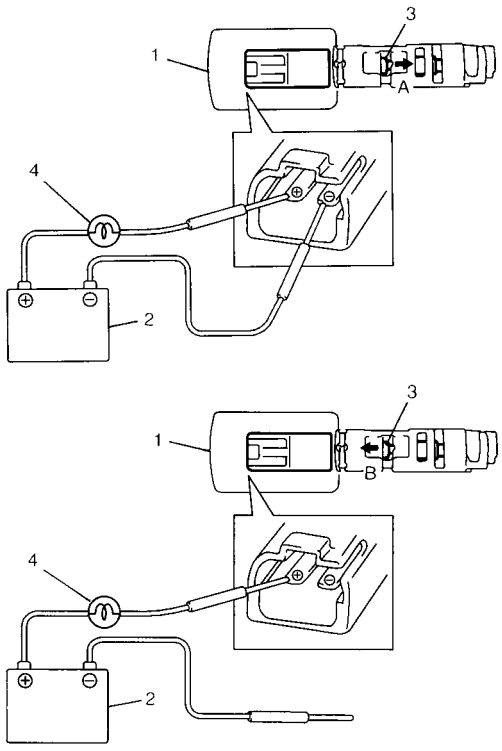
I2RH0B510064-

Not using regulated DC power supply

1) Connect pressure control solenoid valve (1) to battery (2) setting 21 W bulb (4) on the way as shown in figure.
2) Check for movement of valve (3) in the direction of arrow “A”.
3) Disconnect pressure control solenoid valve (1) from battery (2) and check movement of valve (3) in the direction of arrow “B” as shown in figure.

CAUTION:

Set 21 W bulb on the way, or pressure control solenoid valve is burned out.



I4RS0A510031-

Transmission Control Module (TCM) Removal and Installation

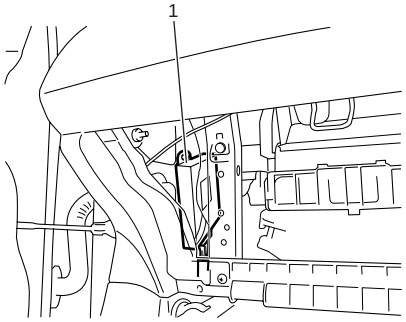
S4RS0A5106018

CAUTION:

- **TCM and ECM consists of highly precise parts, therefore when handling it, be careful not to expose to excessive shock.**
- **When replacing TCM with used one, all learned contents, which have been stored in TCM memory by executing learning control, should be initialized after replacement.**

Removal

1) Disconnect negative cable at battery.
2) If the vehicle is equipped with air bag system, disable air bag system. Refer to “Disabling Air Bag System: in Section 8B”.
3) Disconnect connectors from TCM (1).
4) Remove TCM by removing its bolts.



I4RS0A510032-

Installation

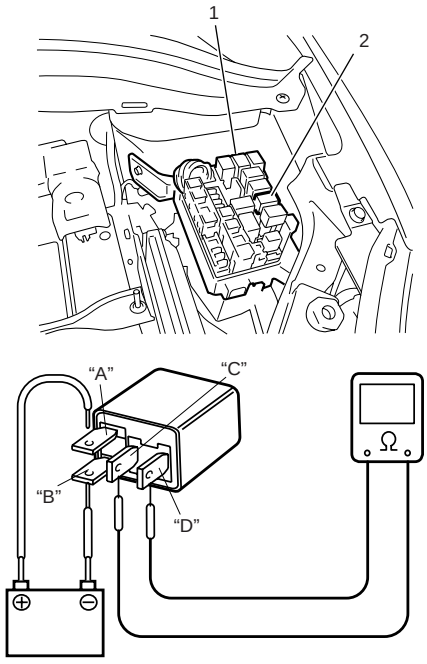
Reverse removal procedure noting the following.

- Connect TCM connectors securely.
- If the vehicle is equipped with air bag system, be sure to enable air bag system after TCM is back in place. Refer to “Enabling Air Bag System: in Section 8B”.

A/T Relay Inspection

S4RS0A5106061

1) Disconnect negative cable at battery.
2) Remove A/T relay (2) from fuse and relay box (1).
3) Check that there is no continuity between terminal “C” and “D”.
   If continuity is indicated, replace A/T relay.
4) Connect battery positive (+) terminal to terminal “A” of A/T relay and battery negative (–) terminal to terminal “B” of A/T relay.
   Check continuity between terminal “C” and “D” of A/T relay.
   If continuity does not indicated, replace A/T relay.

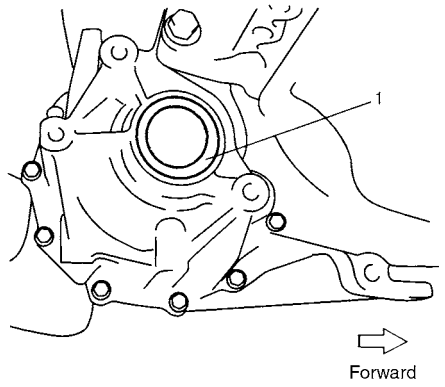


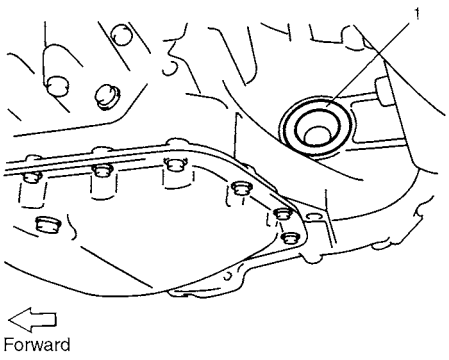
I4RS0A510033-

Differential Side Oil Seal Replacement

S4RS0A5106019

1) Lift up vehicle and drain automatic transaxle fluid.
2) Remove drive shaft joints from differential gear of transaxle. Refer to “Front Drive Shaft Assembly Removal and Installation: in Section 3A” for procedure to disconnect drive shaft joints.
   For differential side oil seal removal, it is not necessary to remove drive shafts from steering knuckle.
3) Remove differential side oil seal (1) by using screwdriver or the like.





I2RH0B510067-

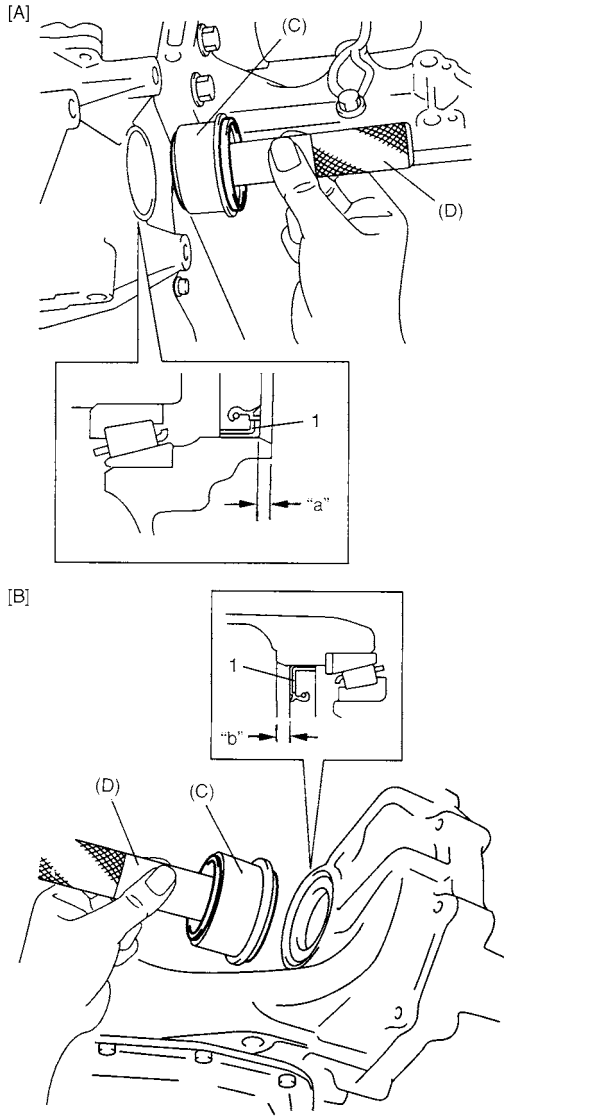
4) Apply grease to new differential side oil seal lips.

   : Grease 99000–25030

5) Install new differential side oil seals (1) by using special tool.

   Special tool
   (C): 09944–88220
   (D): 09924–74510

   Differential side oil seal installing depth
   Right side “a”: 2.6 – 3.6 mm (0.10 – 0.14 in.)
   Left side “b”: 3.8 – 4.8 mm (0.15 – 0.19 in.)



I2RH0B510068-

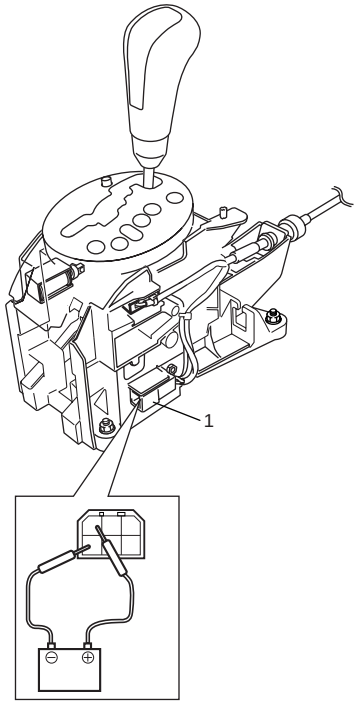
[A]: Right side	[B]: Left side

6) Install drive shaft referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”.
7) Pour A/T fluid referring to “A/T Fluid Change: ”.

Shift Lock Solenoid Inspection

S4RS0A5106064

Check that shift lock solenoid (1) actuate when battery voltage is conducted.

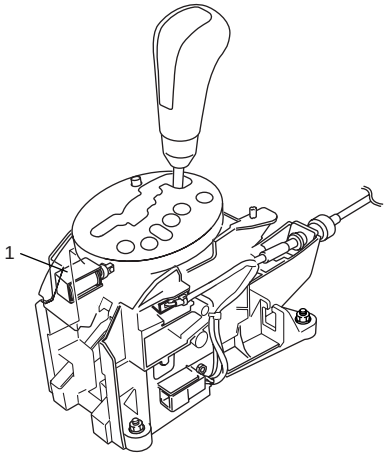


I4RS0A510034-

Shift Lock Solenoid Replacement

S4RS0A5106065

1) Remove console box referring to “Console Box Components: in Section 9H”.
2) Replace shift lock solenoid (1) using flat head or like.
3) Install covers as they were.



I4RS0A510053-

Key Interlock Cable Removal and Installation

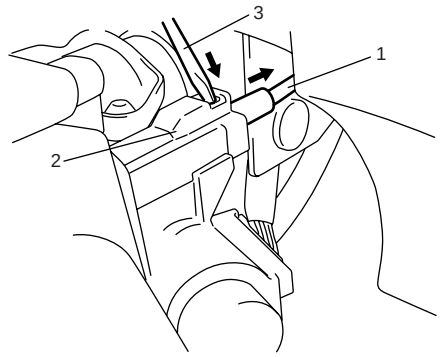
S4RS0A5106066

NOTE:

Don't bend interlock cable excessively when removing and installing it, or system will not operate correctly.

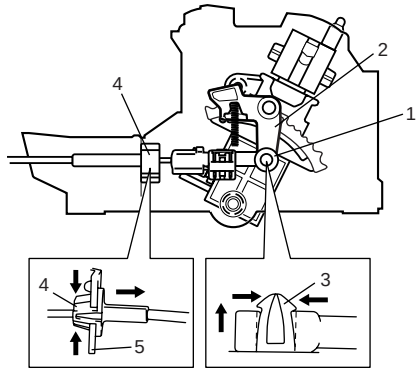
Removal

1) If the vehicle is equipped with air bag system, disconnect negative cable at battery and disable air bag system, referring to "Disabling Air Bag System: in Section 8B".
2) Remove steering column cover.
3) Turn ignition switch to ACC position.
4) Pull out key interlock cable (1) from key cylinder cover (2) while pressing checkhook with slotted screwdriver (3) or the like.



I2RH01510083-

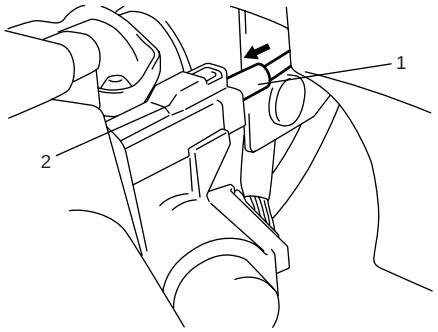
5) Turn ignition switch to LOCK position.
6) Remove parking brake cover and console box.
7) Detach cable end (1) from interlock cam (2) while pressing claws (3) of interlock cam boss.
   At this time, be careful not to cause damage to its claws.
   Detach cable casing cap (4) from selector bracket (5) while pressing checkhook.
8) Remove interlock cable.



I4RS0A510054-

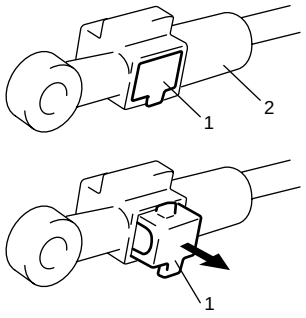
Installation

1) Lay interlock cable to its original cabling route.
2) Turn ignition switch to ACC position.
3) Insert cable casing cap (1) into key cylinder cover (2) securely.



I2RH01510085-

4) Pull out lock button (1) of selector side cable end (2).



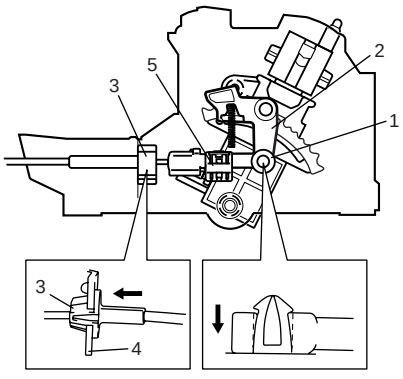
I2RH01510086-

5) Shift selector lever to "N" position.

NOTE:

If selector lever is in "P" position, shift selector lever referring to "Selector Lever Inspection: ".

6) Install cable casing cap (3) to selector bracket (4).
7) Connect cable end (1) to interlock cam (2) with ignition switch turned to ACC position.
8) Drive lock button (5) in cable end until it locks cable expansion and contraction.



I4RS0A510055-

9) With selector lever set at "P" position, turn ignition key to ACC position and then check for the following conditions.
   - With knob button released, ignition key can be turned from ACC position to LOCK position.
   - With knob button pressed, ignition key cannot be turned from ACC position to LOCK position.
10) Install steering column cover.

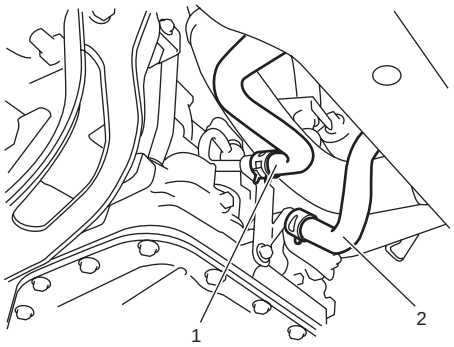
11) If the vehicle is equipped with air bag system, connect negative cable at battery and enable air bag system, referring to “Enabling Air Bag System: in Section 8B”.

A/T Fluid Cooler Hoses Replacement

S4RS0A5106022

The rubber hoses for the A/T fluid cooler should be checked at specified interval. If replacing them, be sure to note the following.

- to replace clamps at the same time
- to insert hose as far as its limit mark
- to clamp clamps securely

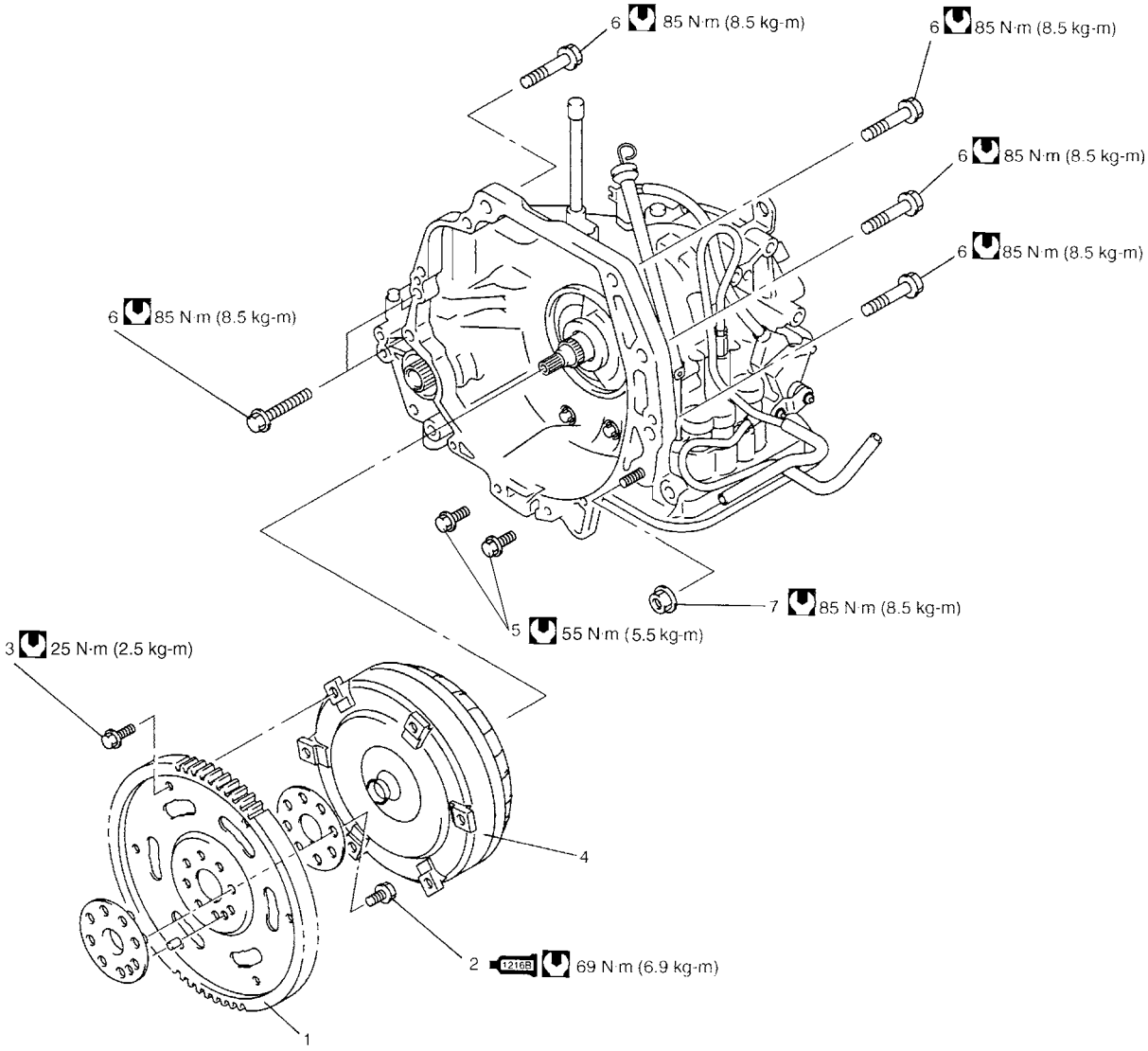


I4RS0A510057-

1.	Inlet hose (Outlet from A/T fluid cooler)
2.	Outlet hose (Inlet to A/T fluid cooler)

Automatic Transaxle Unit Components

S4RS0A5106023



I4RS0A510035-

	1. Drive plate		5. Transaxle stiffener bolt
1216B	2. Drive plate bolt : Apply sealant 99000-31230 to thread.		6. Transaxle and engine fastening bolt
	3. Drive plate to torque converter bolt		7. Transaxle and engine fastening nut
	4. Torque converter		: Tightening torque

Automatic Transaxle Unit Dismounting and Remounting

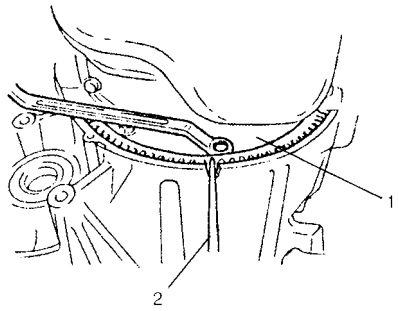
S4RS0A5106024

Dismounting

1) Take down transaxle with engine. For its procedure, refer to “Engine Assembly Removal and Installation: in Section 1D”.
2) Remove transaxle housing lower plates (1).

I4RS0A150004-

3) Remove drive plate to torque converter bolts (1) engage flat head rod or the like (2) with drive plate ring gear.



I3RM0B510047-

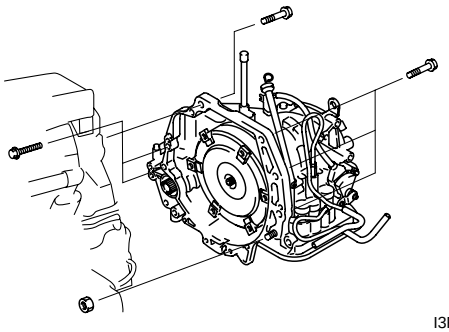
4) Remove starting motor.
5) Remove bolts and nut fastening engine and transaxle, then detach transaxle from engine.

WARNING:

Be sure to keep transaxle with torque converter horizontal or facing up throughout the work. Should it be tilted with torque converter down, converter may fall off and cause personal injury.

NOTE:

When detaching transaxle from engine, move it in parallel with crankshaft and use care so as not to apply excessive force to drive plate and torque converter.



I3RM0B510049-

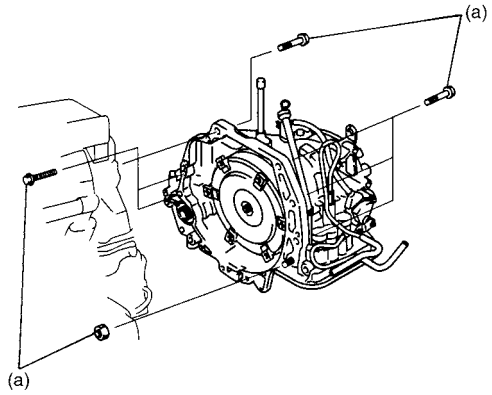
Remounting

1) Make sure that torque converter is installed correctly to transaxle.
   Refer to “Automatic Transaxle Unit Assembly: ”.
2) Attach transaxle to engine.

WARNING:

Be sure to keep transaxle with torque converter horizontal or facing up throughout the work. Should it be tilted with torque converter down, converter may fall off and cause personal injury.

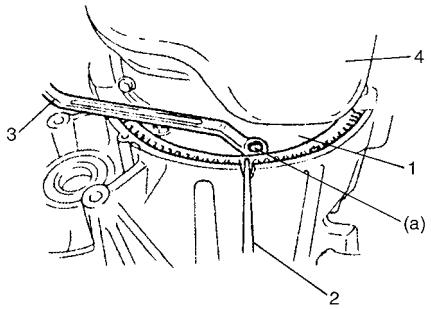
Tightening torque
Transaxle and engine fastening bolt and nut
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



I3RM0B510050-

3) Tighten drive plate to torque converter bolts. Align bolt hole of drive plate and torque converter then tighten bolts through torque converter housing lower plate opening.
Lock drive plate (1) by engaging flat head rod or the like (2) with drive plate gear.

Tightening torque
Drive plate to torque converter bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

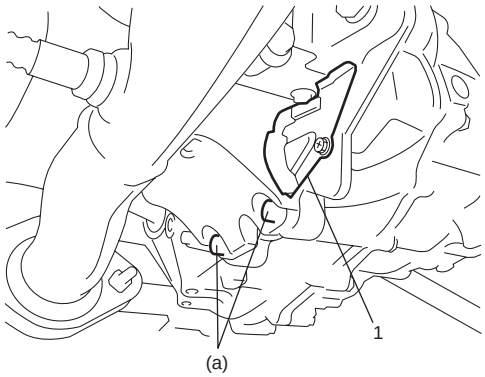


I3RM0B510051-

3. Wrench	4. Engine oil pan

4) Tighten transaxle stiffener bolts to specified torque.
5) Install transaxle housing lower plates (1).

Tightening torque
Transaxle stiffener bolt (a): 55 N·m (5.5 kg-m, 40 lb-ft)



I4RS0A510056-

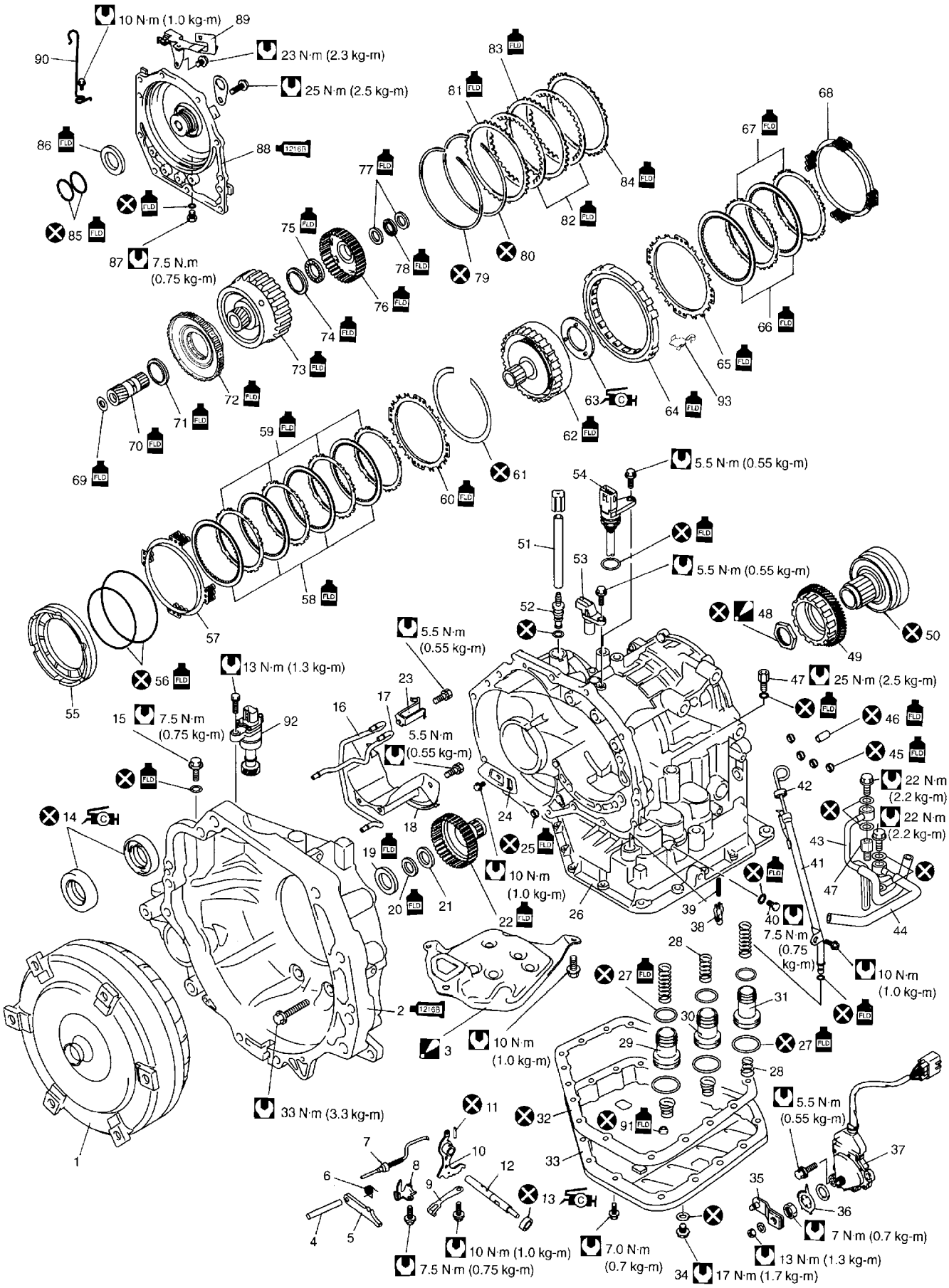
6) Install starter motor.

Tightening torque
Starter motor bolt and nut: 50 N·m (5.0 kg-m, 36.5 lb-ft)

7) Remount engine with transaxle assembly to vehicle. Refer to “Engine Assembly Removal and Installation: in Section 1D” for its procedure.

Automatic Transaxle Assembly Components

S4RS0A5106025



I3RM0B510053-

1. Torque converter	33. Oil pan	65. 2nd brake retaining plate
1216B 2. Torque converter housing : Apply sealant 99000-31230 to mating surface to transaxle case.	34. A/T fluid drain plug	66. 2nd brake disc
3. Oil strainer assembly : Replace oil strainer when overhauling.	35. Manual select lever	67. 2nd brake separator plate
4. Parking lock pawl shaft	36. Lock washer	68. 2nd brake return spring subassembly
5. Parking lock pawl	37. Transmission range sensor	69. Front sun gear thrust bearing race
6. Parking lock pawl return spring	38. Cooler check valve	70. Front planetary sun gear
7. Parking lock pawl rod	39. Spring	71. Planetary gear thrust bearing
8. Parking lock pawl bracket	40. Transaxle case plug	72. One-way clutch No.1 assembly
9. Manual detent spring	41. Fluid filler tube	73. Rear planetary sun gear subassembly
10. Manual valve lever	42. Fluid level gauge	74. Rear sun gear thrust bearing race
11. Manual valve lever pin	43. Fluid cooler inlet pipe	75. Rear sun gear thrust bearing
12. Manual shift shaft	44. Fluid cooler outlet pipe	76. Forward clutch hub
C 13. Manual shift shaft oil seal : Apply grease 99000-25030 to oil seal lip.	45. 2nd brake gasket	77. Intermediate shaft thrust bearing race
C 14. Differential side oil seal : Apply grease 99000-25030 to oil seal lip.	46. Brake drum gasket	78. Intermediate shaft thrust bearing
15. Torque converter housing plug	47. Pipe union	79. 2nd brake piston snap ring
16. Lubrication LH tube	48. Reduction drive gear nut : After tightening nut so as rotational torque of reduction drive gear to be in specified value, caulk nut securely.	80. O/D and 2nd coast brake retaining plate snap ring
17. Lubrication RH tube	49. Reduction drive gear	81. O/D and 2nd coast brake retaining plate
18. Fluid reservoir RH plate	50. Planetary ring gear subassembly	82. O/D and 2nd coast brake disc
19. Input shaft front thrust bearing	51. Breather hose	83. O/D and 2nd coast brake separator plate
20. Input shaft rear thrust bearing	52. Breather union	84. O/D and 2nd coast brake rear plate
21. Input shaft rear thrust bearing race	53. Input shaft speed sensor	85. Rear cover seal ring
22. Direct clutch hub	54. Valve body harness	86. Reverse clutch drum thrust bearing
23. Lubrication tube clamp	55. 1st and reverse brake piston	87. Rear cover plug
24. Fluid reservoir LH plate	56. O-ring	1216B 88. Transaxle rear cover : Apply sealant 99000-31230 to mating surface.
25. Governor apply No.2 gasket	57. 1st and reverse brake return spring subassembly	89. Harness bracket
26. Automatic transaxle case	58. 1st and reverse brake disc	90. Select cable clamp
27. Accumulator piston O-ring	59. 1st and reverse brake separator plate	91. Governor apply No.1 gasket
28. Accumulator spring	60. 1st and reverse brake retaining plate	92. Output shaft speed sensor (VSS)
29. C2 accumulator piston	61. 1st and reverse brake snap ring	93. One-way clutch outer race retainer
30. C1 accumulator piston	62. Planetary gear assembly	: Do not reuse.
31. B1 accumulator piston	C 63. Planetary carrier thrust washer : Apply grease 99000-25030 to slide contact face.	FLD : Apply automatic transaxle fluid.
32. Oil pan gasket	64. One-way clutch No.2 assembly	: Tightening torque

Automatic Transaxle Unit Disassembly

S4RS0A5106026

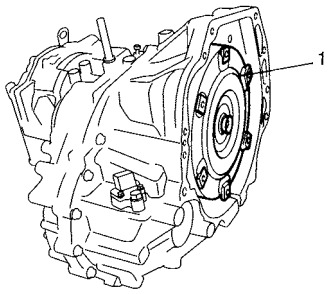
CAUTION:

- **Thoroughly clean transaxle exterior before overhauling it.**
- **Keep working table, tools and hands clean while overhauling.**
- **Use special care to handle aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Keep them always clean.**

1) Remove torque converter (1).

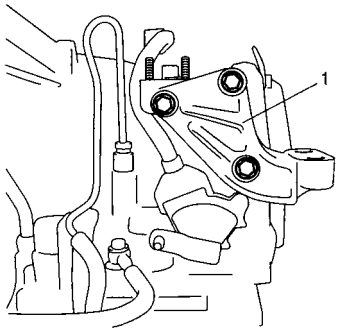
CAUTION:

Remove torque converter as much straight as possible. Leaning it may cause to damage oil seal lip.



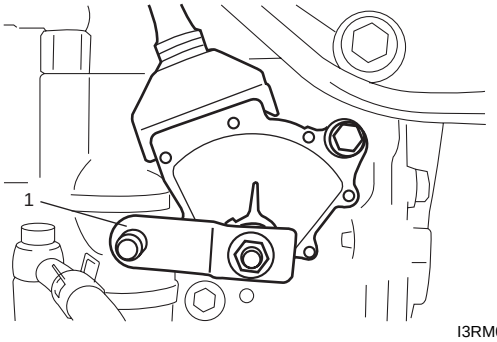
I2RH0B510078-

2) Remove engine mounting LH bracket (1).



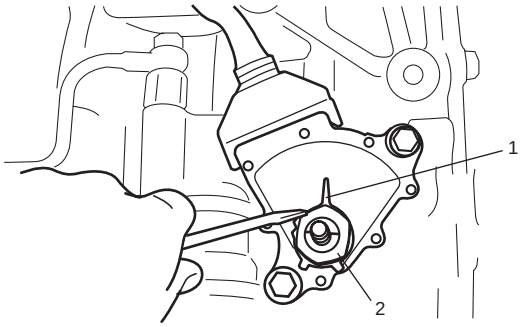
I3RM0B510054-

3) Remove manual select lever (1).



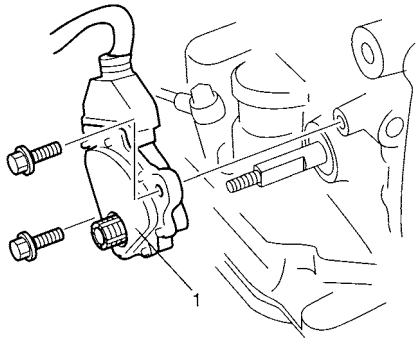
I3RM0B510055-

4) Uncaulk lock washer (1), then remove lock nut (2) and lock washer.



I3RM0B510056-

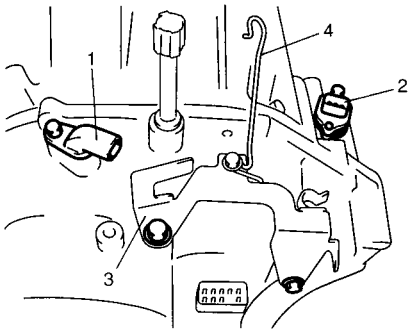
5) Remove transmission range sensor (1).



I3RM0B510057-

6) Remove output shaft speed sensor (VSS) (2) and input shaft speed sensor (1).

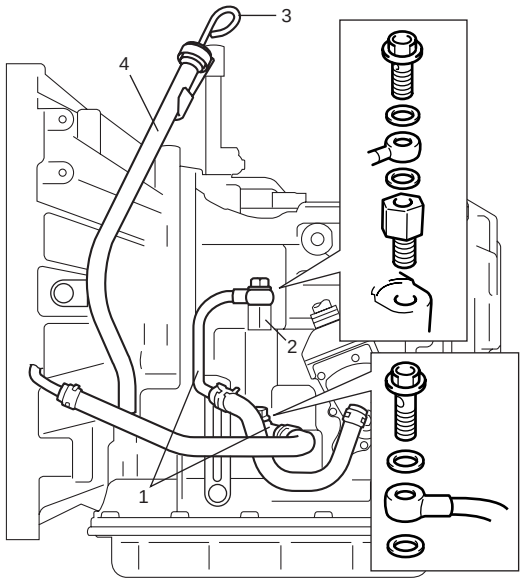
7) Remove harness bracket (3) and select cable clamp (4).



I3RM0B510058-

8) Remove fluid cooler pipes (1) and pipe union (2).

9) Remove fluid level gauge (3) and fluid filler tube (4).

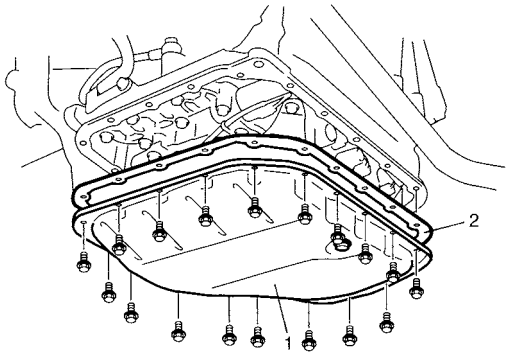


I3RM0B510059-

10) Remove oil pan (1) and oil pan gasket (2).

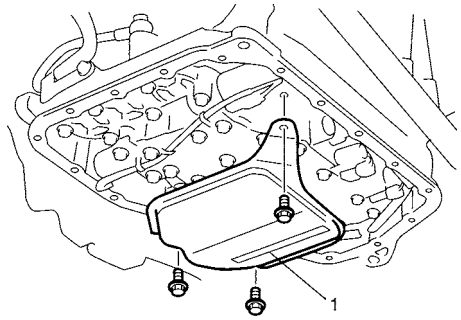
NOTE:

- **For removal of oil pan, do not turn transaxle over as this will contaminate valve body with foreign materials in bottom of oil pan.**
- **When removing oil pan, tap around it lightly with plastic hammer. Do not force it off by using screwdriver or the like.**



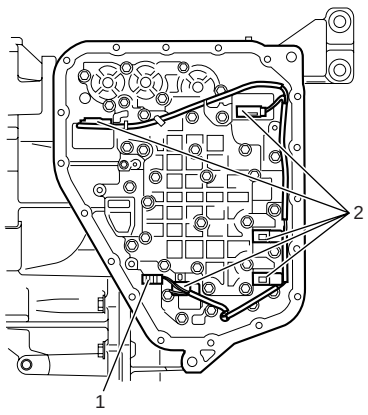
I2RH0B510086-

11) Remove oil strainer assembly (1).



I2RH0B510087-

12) Disconnect connectors (2) from solenoid valves and transmission fluid temperature sensor (1).



I4RS0A510027-

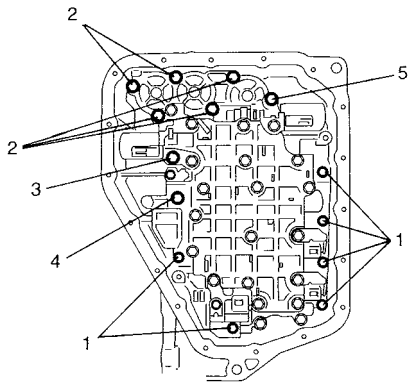
13) Remove valve body assembly bolts.

CAUTION:

Be careful not to let manual valve fall off when removing valve body assembly.

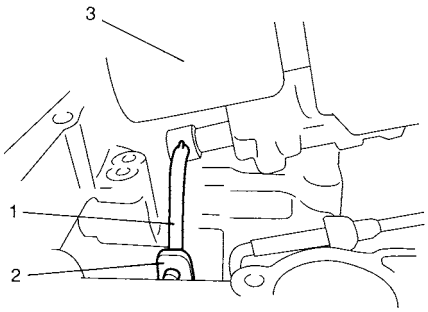
NOTE:

There are five kinds of bolts (bolts A (1), B (2), C (3), D (4) and E (5)) fixing valve body assembly.



I2RH0B510089-

14) Remove manual valve rod (1) from manual valve lever (2), then remove valve body assembly (3).

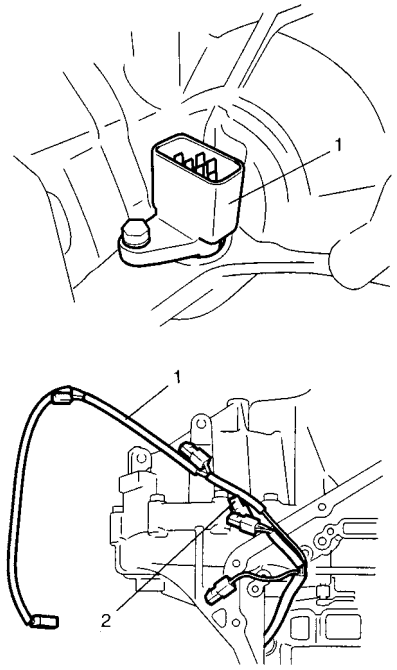


I2RH0B510090-

15) Remove valve body harness (1).

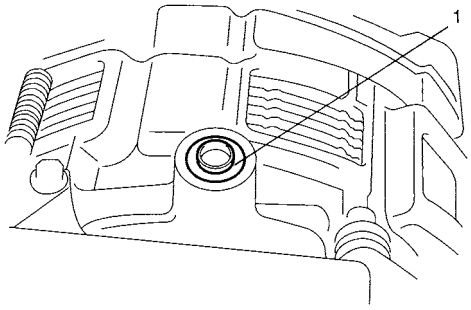
CAUTION:

When pulling valve body harness out of transaxle case, take care not to damage transmission fluid temperature sensor (2) at narrow exit of case.
Careless sensor treatment might cause sensor malfunction.



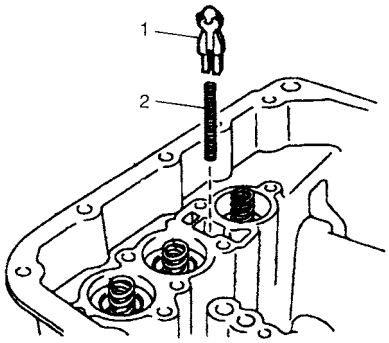
I2RH0B510091-

16) Remove governor apply No.1 gasket (1).



I2RH0B510092-

17) Remove cooler check valve (1) and spring (2).

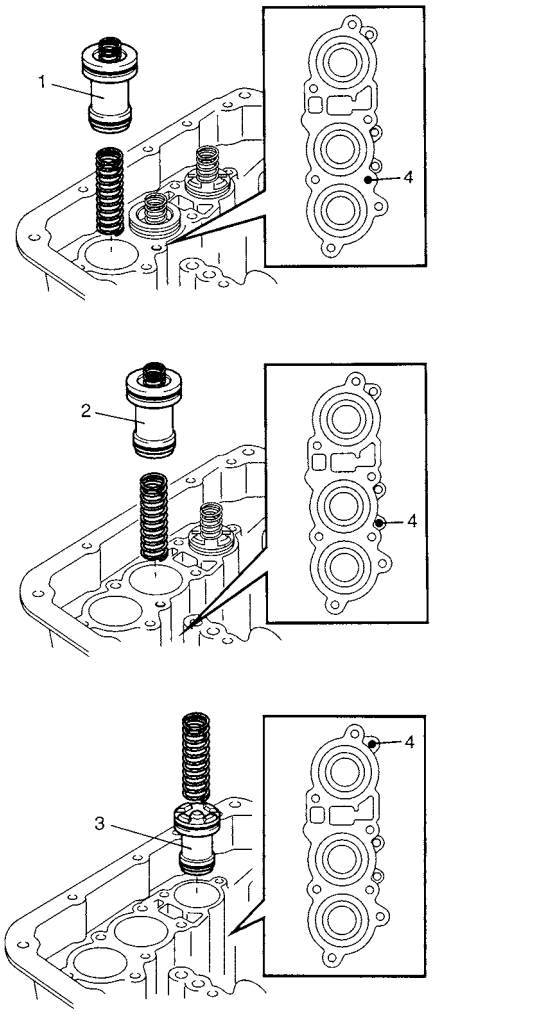


I2RH0B510093-

18) Remove accumulator pistons and springs.
To remove C2 (1), C1 (2) and B1 (3) accumulator pistons and springs, position rag on pistons to catch each piston. To remove pistons, force low-pressure compressed air (1 kg/cm^2, 15 psi, 100 kPa, max) into hole (4) as shown in figure, and pop each piston into rag.

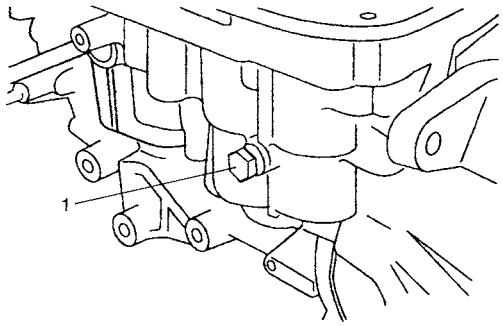
NOTE:

Do not push accumulator pistons with fingers or anything before removing them. Pushing them may cause compressed fluid in accumulator to spew out of hole and get to your face and clothes.



I2RH0B510094-

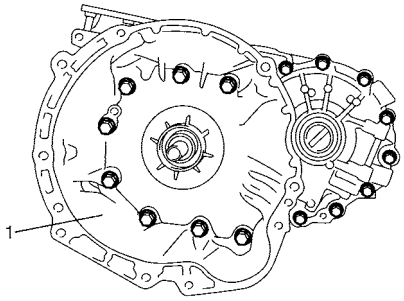
19) Remove transaxle case plug (1).



I2RH0B510095-

20) Remove torque converter housing bolts.

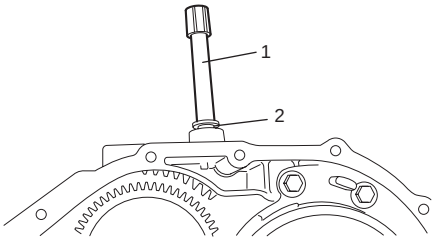
21) Remove torque converter housing (1) while tapping around it lightly with plastic hammer.



I3RM0B510060-

22) Remove breather hose (1).

23) Remove breather union (2).



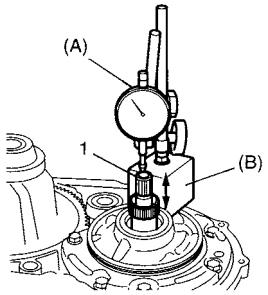
I2RH0B510097-

24) Measure input shaft thrust play.
Apply dial gauge onto input shaft end (1) and measure thrust play of input shaft.
When input shaft thrust play is out of specification, select input shaft front thrust bearing with proper thickness from among the list below and replace it.

Special tool
(A): 09900–20607
(B): 09900-20701

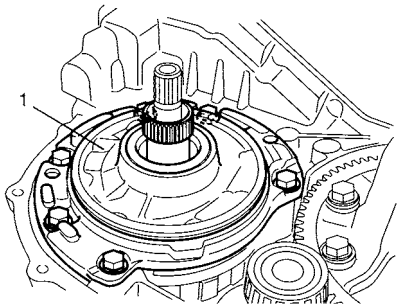
Input shaft thrust play
0.3 – 0.9 mm (0.012 – 0.035 in.)

Available input shaft front thrust bearing thickness
: 0.8, 1.4 mm (0.032, 0.055 in.)



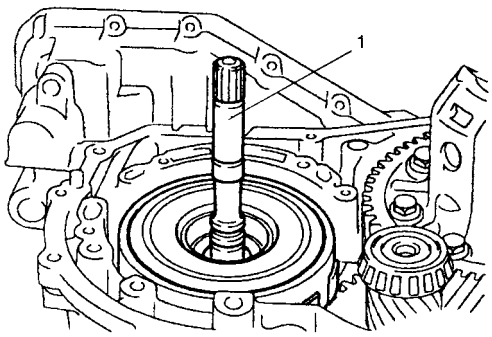
I2RH0B510098-

25) Remove oil pump assembly (1).



I2RH0B510099-

26) Remove direct clutch assembly (1).

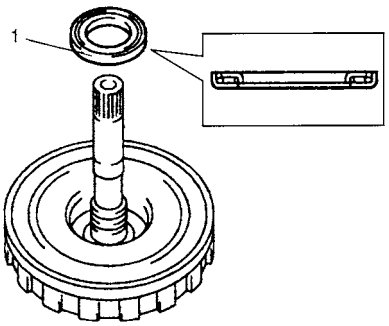


I2RH0B510100-

27) Remove input shaft front thrust bearing (1).

NOTE:

If input shaft front thrust bearing is not found, it may have been taken out with oil pump assembly.

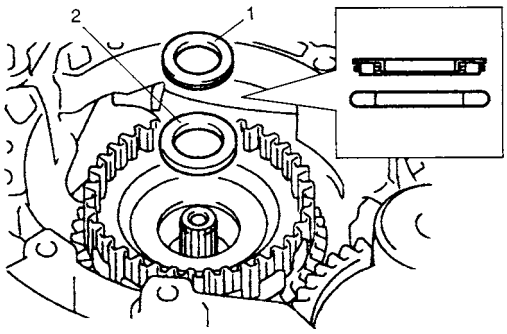


I2RH0B510101-

28) Remove input shaft rear thrust bearing (1) and thrust bearing race (2).

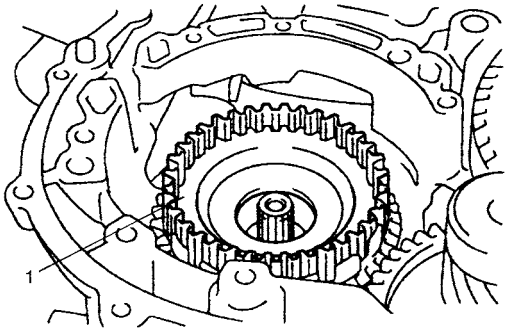
NOTE:

If input shaft rear thrust bearing is not found, it may have been taken out with direct clutch assembly.



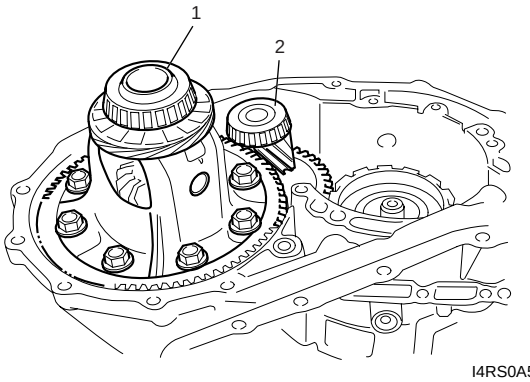
I2RH0B510102-

29) Remove direct clutch hub (1).



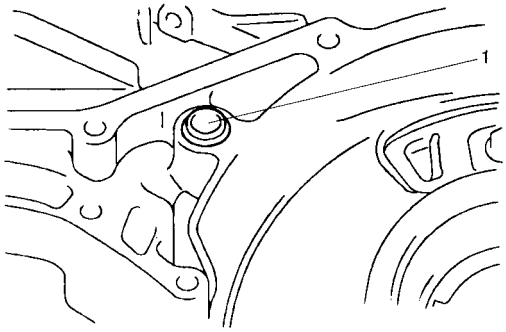
I2RH0B510103-

30) Remove differential assembly (1) and countershaft assembly (2).



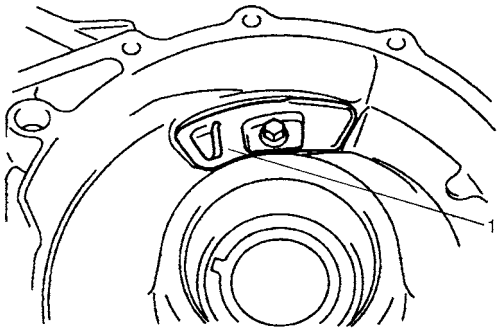
I4RS0A510036-

31) Remove governor apply No.2 gasket (1).



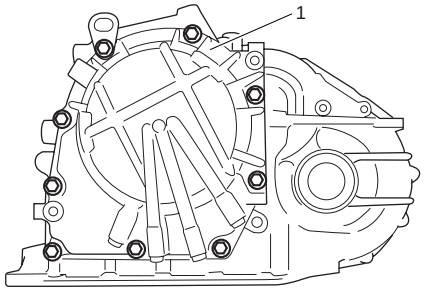
I2RH0B510105-

32) Remove fluid reservoir LH plate (1).



I2RH0B510106-

33) Turn over transaxle and remove rear cover assembly (1).

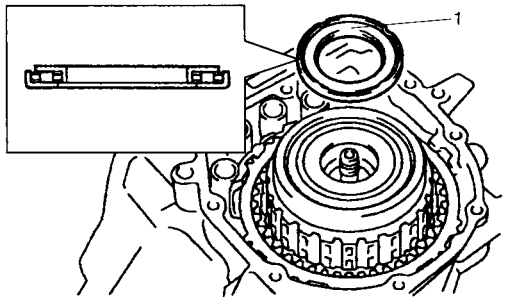


I4RS0A510037-

34) Remove reverse clutch drum thrust bearing (1).

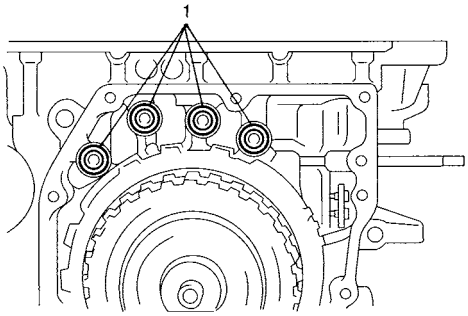
NOTE:

If reverse clutch drum thrust bearing is not found, it may have been taken out with rear cover assembly.



I2RH0B510108-

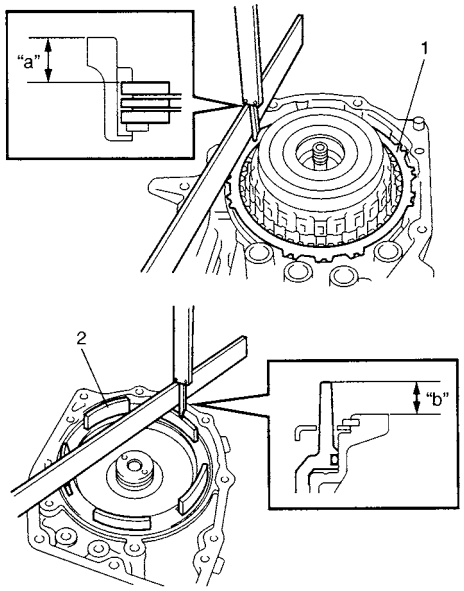
35) Remove 2nd brake gasket (1).



I2RH0B510109-

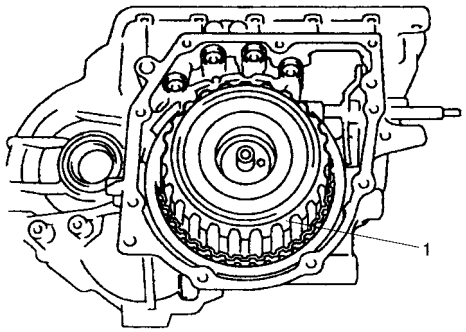
36) Measure O/D and 2nd coast brake piston stroke. If piston stroke exceeds specification, inspect and replace plates and discs.
- Measure dimension “a” from mating surface of transaxle case to O/D and 2nd coast brake rear plate (1) using straightedge and micrometer caliper.
- Measure dimension “b” from O/D and 2nd coast brake piston (2) to rear cover assembly mating surface using straightedge and micrometer caliper.
- Calculate piston stroke from measured value of dimensions “a” and “b”.
- Piston stroke = “a” – “b”

O/D and 2nd coast brake piston stroke
Standard: 0.65 – 1.05 mm (0.026 – 0.041 in.)



I2RH0B510110-

37) Remove forward and reverse clutch assembly (1).

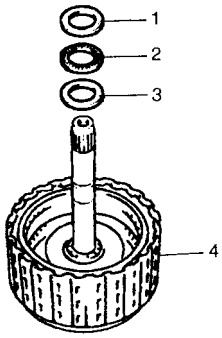


I2RH0B510111-

38) Remove intermediate shaft thrust bearing front race (1), thrust bearing (2) and rear race (3) from forward and reverse clutch assembly (4).

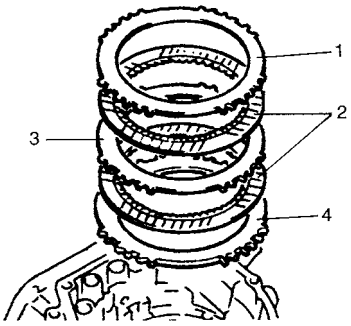
NOTE:

If intermediate shaft thrust bearing and/or races are not found on forward and reverse clutch assembly, they may have been left in transaxle.



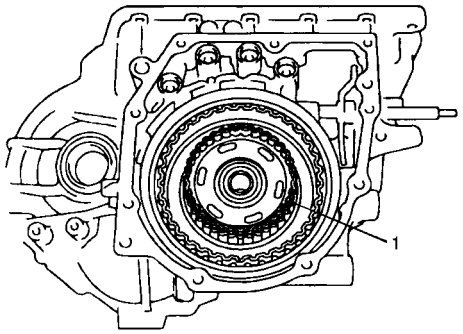
I2RH0B510112-

39) Remove O/D and 2nd coast brake rear plate (1), discs (2), separator plate (3) and retaining plate (4).



I2RH0B510113-

40) Remove forward clutch hub (1).

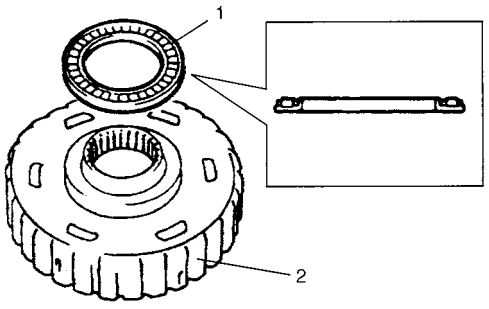


I2RH0B510114-

41) Remove rear sun gear thrust bearing (1) from forward clutch hub (2).

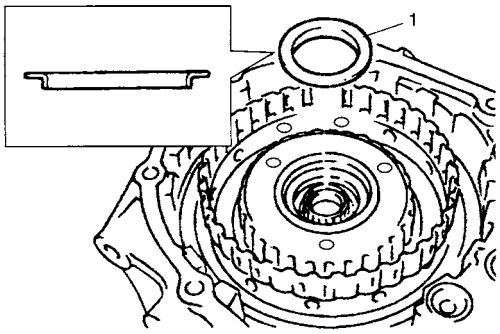
NOTE:

If rear sun gear thrust bearing is not found on forward clutch hub, it may have been left in transaxle.



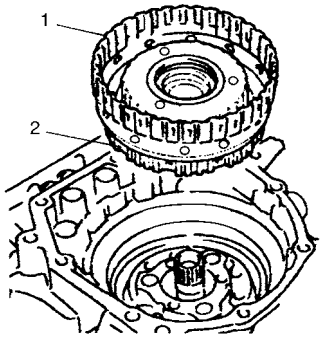
I2RH0B510115-

42) Remove rear sun gear thrust bearing race (1).



I2RH0B510116-

43) Remove rear planetary sun gear subassembly (1) and one-way clutch No.1 assembly (2).



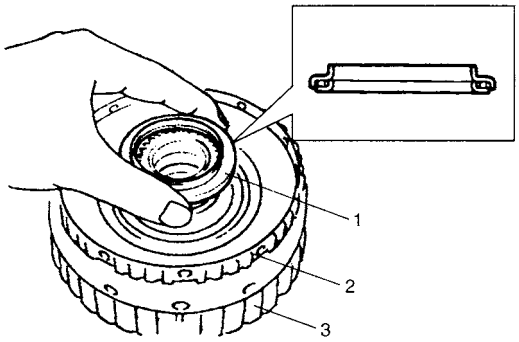
I2RH0B510117-

44) Remove planetary gear thrust bearing (1).

NOTE:

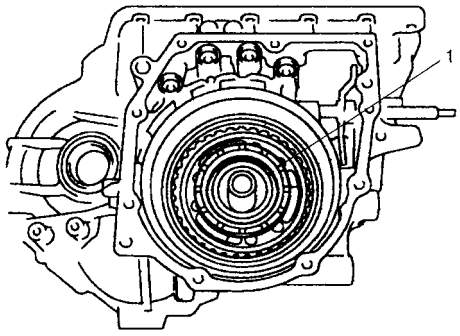
If planetary gear thrust bearing is not found on one-way clutch No.1 assembly, it may have been left in transaxle.

45) Remove one-way clutch No.1 assembly (2) from rear planetary sun gear subassembly (3).



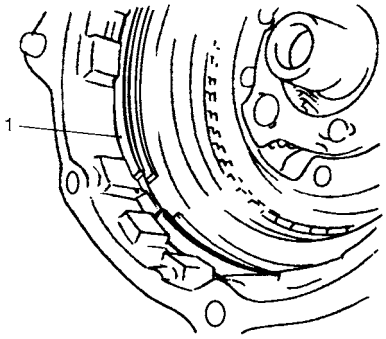
I2RH0B510118-

46) Remove planetary carrier thrust washer (1).



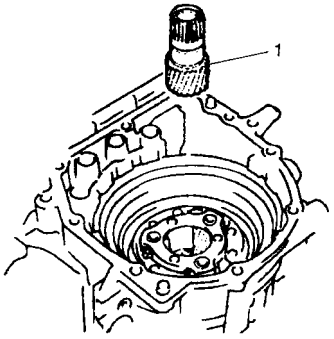
I2RH0B510119-

47) Remove O/D and 2nd coast brake retaining plate snap ring (1).



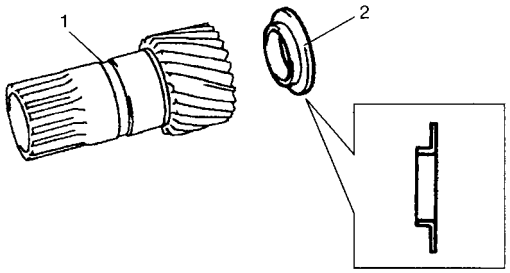
I2RH0B510120-

48) Remove front planetary sun gear (1).



I2RH0B510121-

49) Remove front sun gear thrust bearing race (2) from front planetary sun gear (1).



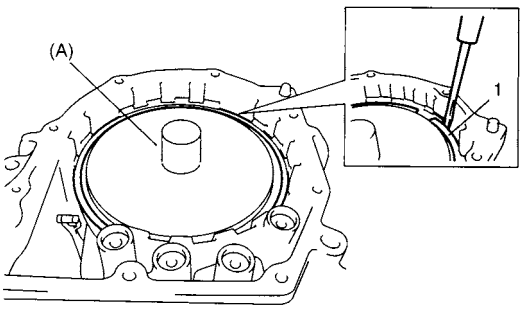
I2RH0B510122-

50) Using special tool and hydraulic press, remove 2nd brake piston snap ring (1).

CAUTION:

Do not press 2nd brake piston assembly in over 0.4 mm (0.016 in.).
Excessive compression may cause damage to piston assembly, return spring, plates and/ or discs.

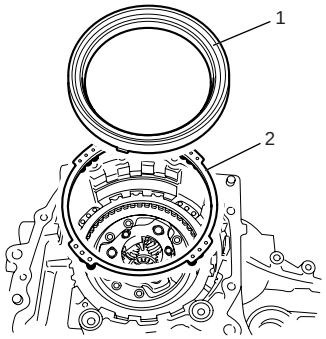
Special tool
(A): 09926–96050



I2RH0B510124-

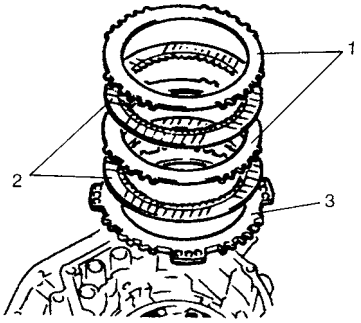
51) Remove 2nd brake piston assembly (1).

52) Remove 2nd brake return spring subassembly (2).



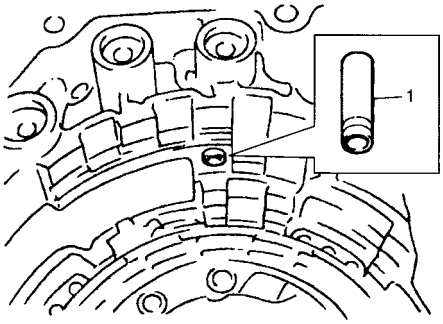
I4RS0A510038-

53) Remove 2nd brake separator plates (1), discs (2) and retaining plate (3).



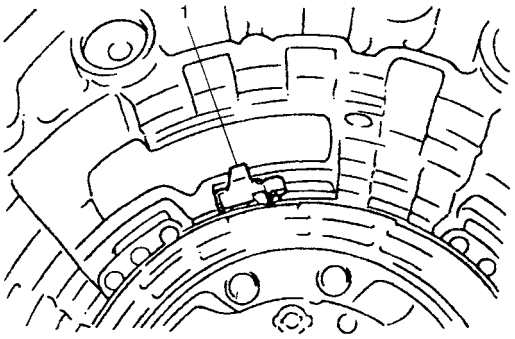
I2RH0B510127-

54) Remove brake drum gasket (1).



I2RH0B510128-

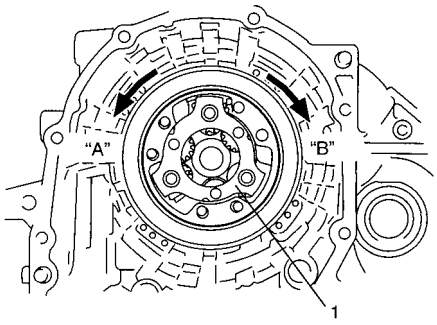
55) Remove one-way clutch outer race retainer (1).



I2RH0B510129-

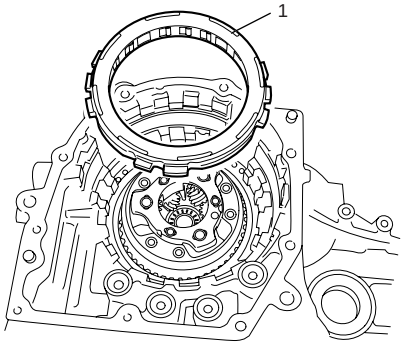
56) Check one-way clutch No.2 as follows.

- Ensure planetary carrier (1) rotates only in counterclockwise direction “A”, never in clockwise direction “B”.
- If the planetary carrier rotates both ways or does not rotate either way, one-way clutch No.2 assembly will need to be replaced with new one-way clutch No.2 assembly.



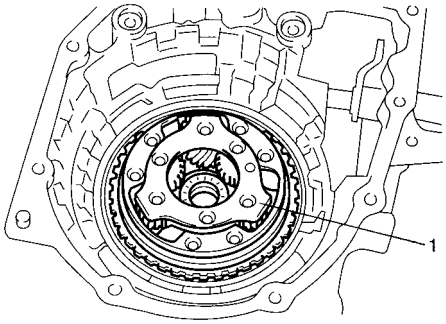
I2RH0B510130-

57) Remove one-way clutch No.2 assembly (1).



I4RS0A510039-

58) Remove planetary gear assembly (1).



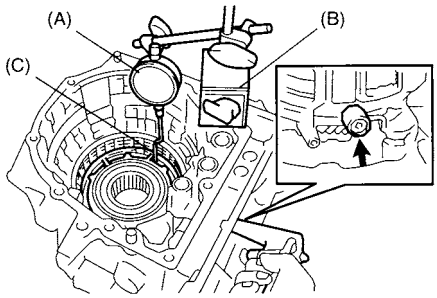
I2RH0B510132-

59) Measure 1st and reverse brake piston stroke. If piston stroke exceeds specified value, disassemble, inspect and replace discs and plates.

- Using special tool, measure 1st and reserve brake piston stroke when compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) is blown through oil hole.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

1st and reverse brake piston stroke
Standard: 0.79 – 1.49 mm (0.031 – 0.059 in.)



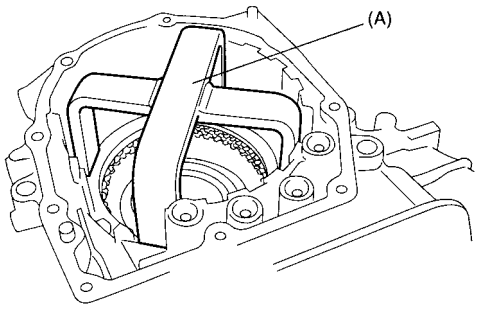
I2RH0B510133-

60) Remove snap ring while the 1st and reverse brake piston return springs are compressed using special tool and hydraulic press.

CAUTION:

Do not press 1st and reverse brake return spring subassembly in over 0.8 mm (0.031 in.).
Excessive compression may cause damage to return spring subassembly, discs, plates and/or piston.

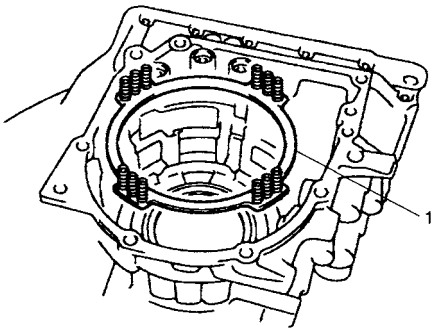
Special tool
(A): 09926–97620



I2RH0B510134-

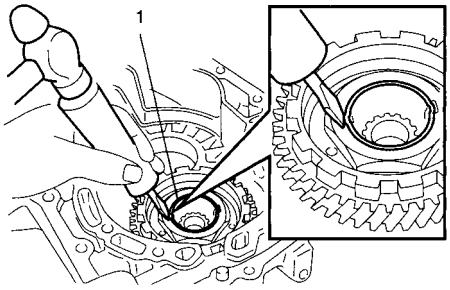
61) Remove 1st and reverse brake retaining plate, discs and separator plates.

62) Remove 1st and reverse brake return spring subassembly (1).



I2RH0B510135-

63) Turn over transaxle and uncaulk reduction drive gear nut (1).

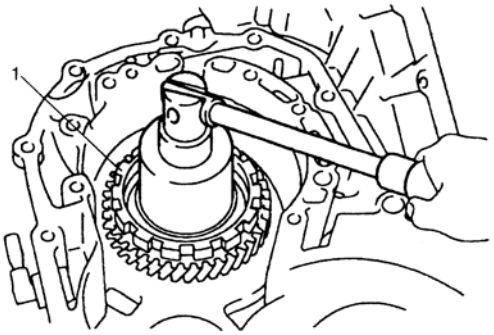


I2RH0B510136-

64) Secure reduction drive gear (1) with parking lock pawl, then remove reduction drive gear nut.

CAUTION:

- **It is recommended that this operation should be carried out on rubber mat to prevent damaging transaxle case.**
- **Never reuse removed nut.**



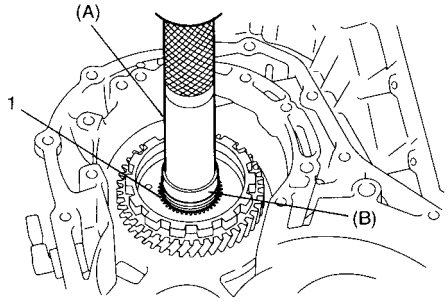
I2RH0B510137-

65) Using special tools and hydraulic press, remove planetary ring gear subassembly (1).

CAUTION:

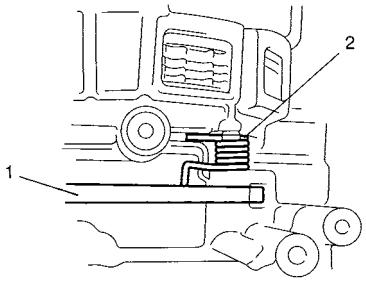
Do not reuse planetary ring gear subassembly. Otherwise it may cause damage to planetary gear unit and/or reduction gears.

Special tool
(A): 09913–84510
(B): 09923–78210



I2RH0B510138-

66) Remove parking lock pawl shaft, then spring (2) and parking lock pawl (1).



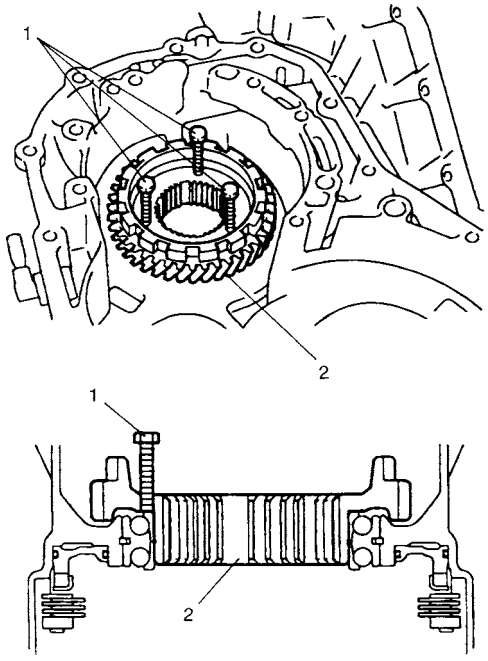
I2RH0B510139-

67) Screwing 3 bolts (1), remove reduction drive gear (2).

CAUTION:

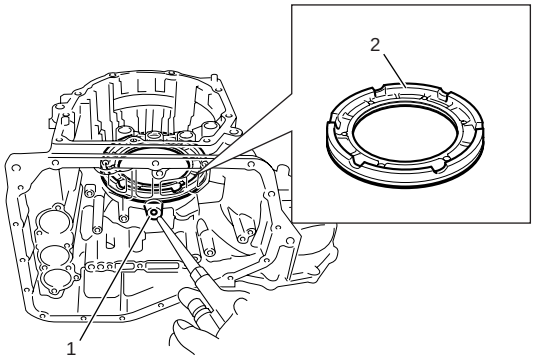
Screw 3 bolts into reduction drive gear uniformly, or reduction drive gear, bearing and transaxle case may be damaged.

Bolt length
30 mm (1.20 in.)



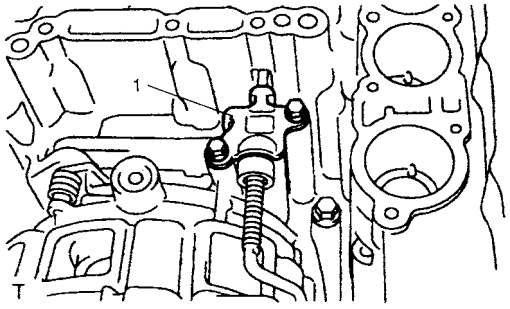
I2RH0B510140-

68) Blowing compressed air from oil hole (1) of oil pump, remove 1st and reverse brake piston (2).



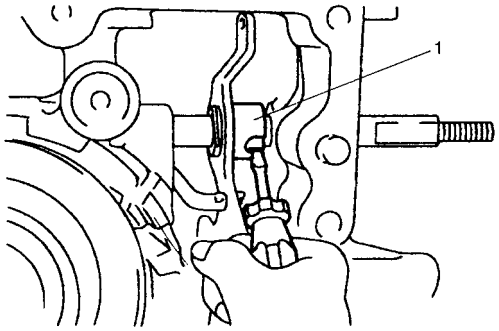
I4RS0A510040-

69) Remove parking lock pawl bracket (1).



I2RH0B510142-

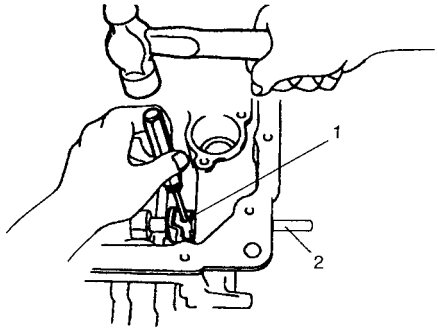
70) With slotted screwdriver, cut and unfold manual valve lever spacer (1) and proceed to remove manual valve lever spacer.



I2RH0B510143-

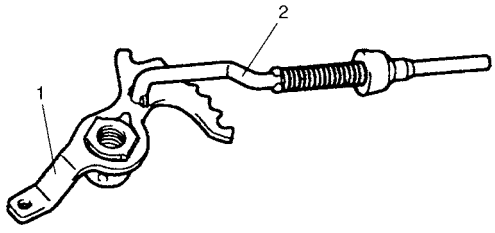
71) Using spring pin remover with 3 mm (0.12 in.) in diameter and hammer, drive out manual valve lever pin (1).

72) Remove manual shift shaft (2).



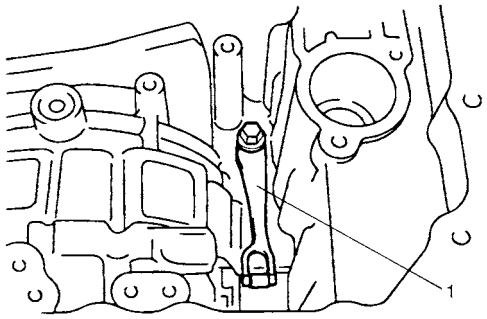
I2RH0B510144-

73) Remove parking lock pawl rod (2) from manual valve lever (1).

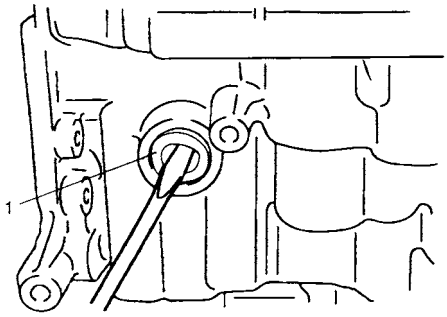


I2RH0B510145-

74) Remove manual detent spring (1).



I2RH0B510146-

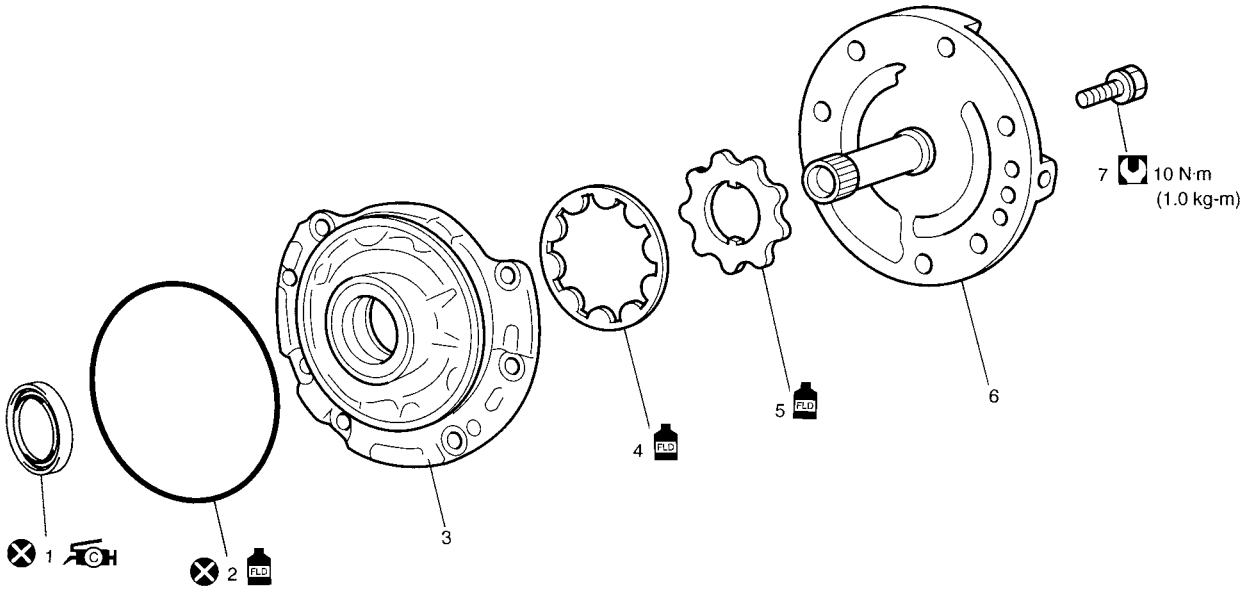


I2RH0B510147-

75) Remove manual shift shaft oil seal (1).

Oil Pump Assembly Components

S4RS0A5106027



I2RH0B510148-

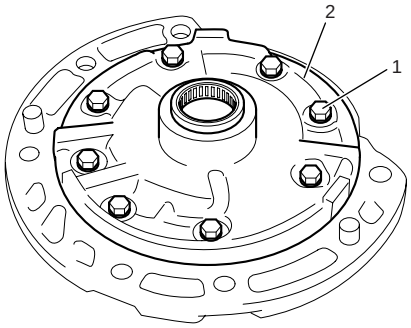
1. Oil seal : Apply grease 99000-25030 to oil seal lip.	5. Oil pump drive gear	: Apply automatic transaxle fluid.
2. O-ring	6. Stator shaft assembly	: Tightening torque
3. Oil pump body	7. Oil pump subassembly bolts	: Do not reuse.
4. Oil pump driven gear		

Oil Pump Assembly Disassembly and Reassembly

S4RS0A5106028

Disassembly

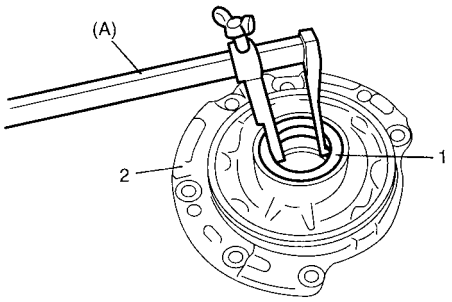
1) Remove O-ring from pump body.
2) Remove 8 oil pump subassembly bolts (1) and stator shaft assembly (2).



I4RS0A510041-

3) Remove oil seal (1) using special tool.

Special tool
(A): 09913–50121



I2RH0B510150-

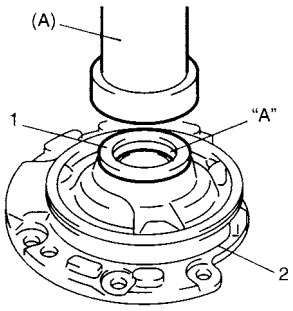
2. Oil pump body

Reassembly

1) Install new oil pump body oil seal (1).
Use special tool and hammer to install it, and then apply grease to its lip portion.

Special tool
(A): 09913–85210

"A": Grease 99000–25030

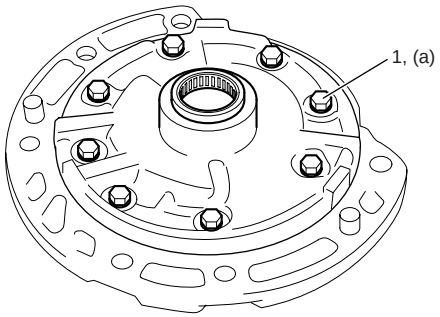


I2RH0B510151-

2. Oil pump body

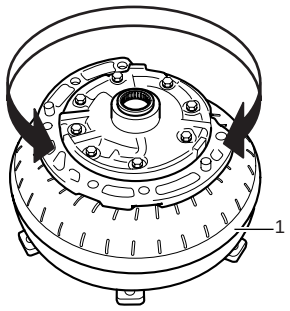
2) Install driven gear and drive gear to oil pump body after applying A/T fluid.
3) Install stator shaft assembly to oil pump body and tighten 8 pump subassembly bolts (1) to specification.

Tightening torque
Oil pump subassembly bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A510042-

4) After applying A/T fluid to new O-ring, install it to oil pump body.
5) Check drive gear for smooth rotation by using torque converter (1).



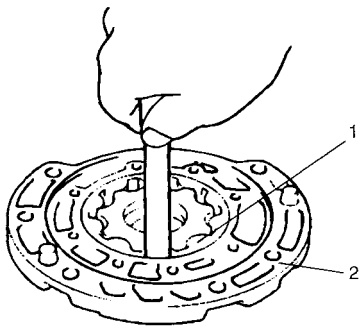
I4RS0A510043-

Oil Pump Assembly Inspection

S4RS0A5106029

1) Check body clearance of driven gear (1).
Push driven gear to one side of oil pump body (2). Using a feeler gauge, measure clearance between driven gear and body. If clearance exceeds its standard value, replace oil pump assembly.

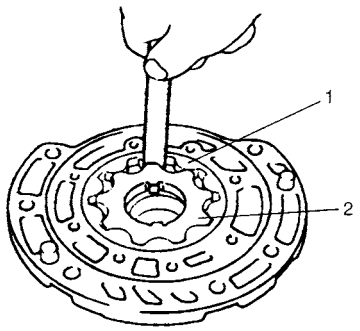
Clearance between oil pump driven gear and oil pump body
Standard: 0.10 – 0.17 mm (0.0039 – 0.0067 in.)



I2RH0B510154-

2) Check tip clearance of both drive and driven gears.
Using a feeler gauge, measure clearance between drive and driven gear tips. If clearance exceeds its standard value, replace oil pump assembly.

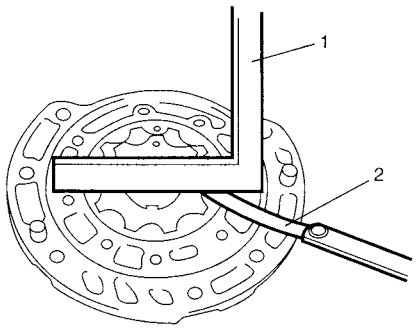
Tip clearance between oil pump drive gear and oil pump driven gear
Standard: 0.07 – 0.15 mm (0.0028 – 0.0059 in.)



I2RH0B510155-

3) Check side clearance of both gears.
Using a straightedge (1) and a feeler gauge (2), measure side clearance between gears and pump body.
If clearance exceeds its standard value, replace oil pump assembly.

Side clearance between gears and oil pump body
Standard: 0.02 – 0.05 mm (0.0008 – 0.0019 in.)

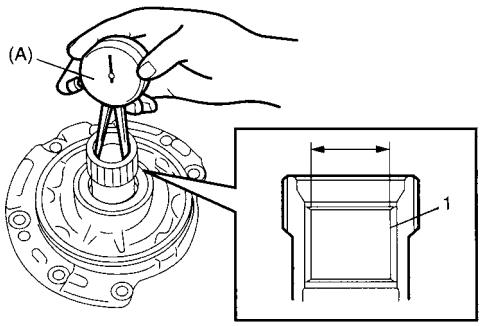


I2RH0B510156-

4) Using special tool, measure stator shaft bush (1) bore.
If measured stator shaft bush bore is out of specifications, replace oil pump assembly with new one.

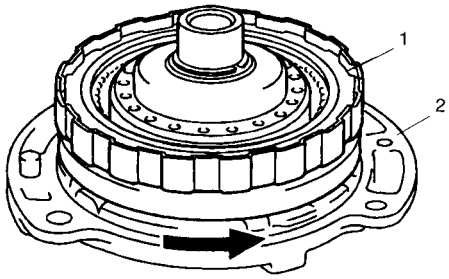
Special tool
(A): 09900–20605

Stator shaft bush bore
Standard: 18.424 – 18.450 mm (0.7254 – 0.7264 in.)



I2RH0B510157-

5) Install direct clutch assembly (1) to stator shaft assembly (2), then ensure that direct clutch assembly turns smoothly.
If unsmooth rotation or noise are found in oil pump assembly, replace oil pump assembly with new one. This check should also be done to input shaft assembly and replace input shaft assembly if necessary.

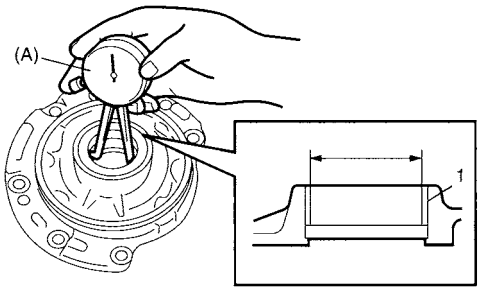


I2RH0B510158-

6) Using special tool, measure oil pump body bush bore.
If measured oil pump body bush (1) bore is out of specifications, replace oil pump assembly with new one. Torque converter also needs to be checked. Replace torque converter, if necessary.

Special tool
(A): 09900–20605

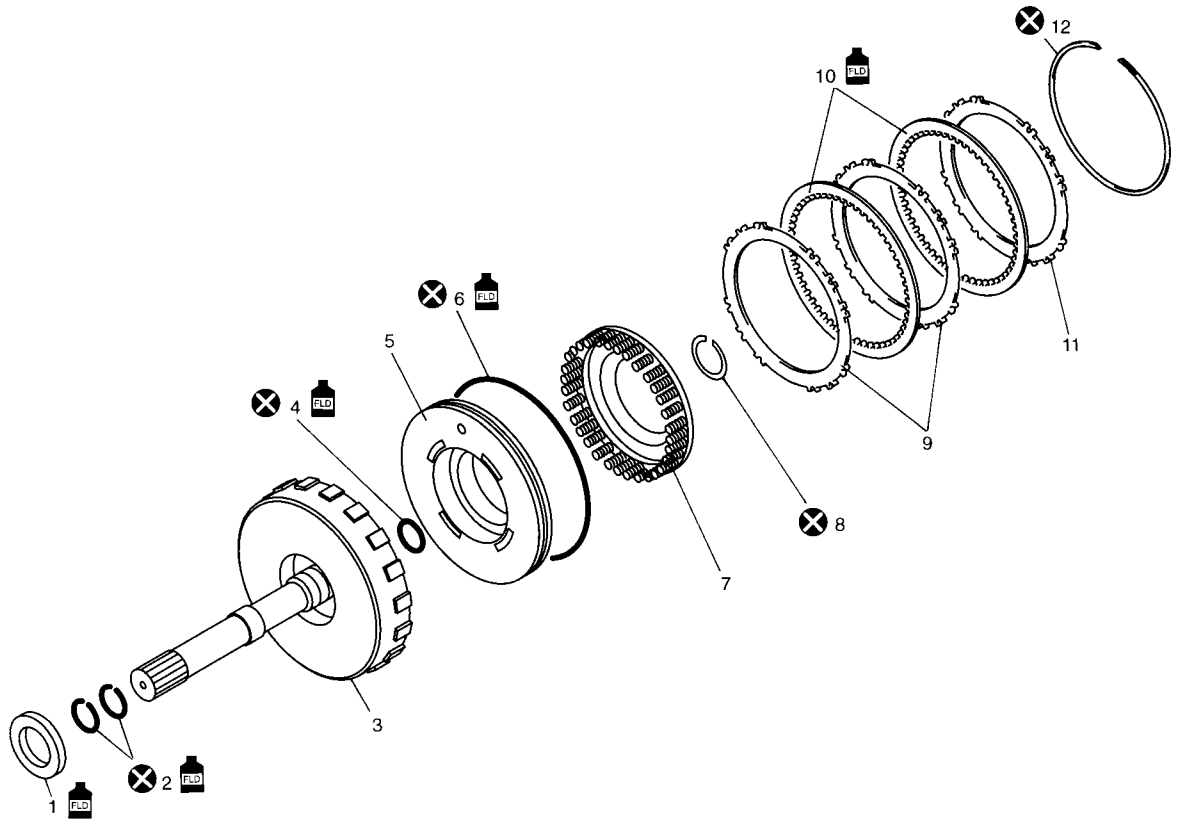
Oil pump body bush bore
Standard: 38.113 – 38.138 mm (1.5005 – 1.5015 in.)



I2RH0B510159-

Direct Clutch Assembly Components

S4RS0A5106030



I2RH0B510160-

1. Input shaft front thrust bearing	6. Outer O-ring	11. Direct clutch retaining plate
2. Input shaft seal ring	7. Direct clutch return spring subassembly	12. Plate snap ring
3. Input shaft subassembly	8. Shaft snap ring	FLD : Apply automatic transaxle fluid.
4. Inner O-ring	9. Direct clutch separator plate	⊗ : Do not reuse.
5. Direct clutch piston	10. Direct clutch disc	

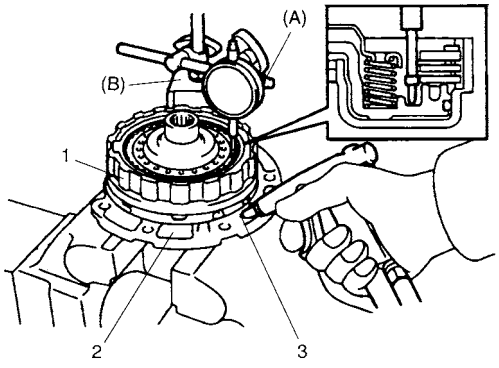
Direct Clutch Assembly Preliminary Check

S4RS0A5106031

Install direct clutch assembly (1) to oil pump assembly (2) blow in air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) through oil hole (3) of oil pump assembly with special tool attached on upper surface of direct clutch piston, and measure piston stroke of direct clutch.
If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool
(A): 09900–20607
(B): 09900–20701

Direct clutch piston stroke
0.4 – 0.7 mm (0.016 – 0.027 in.)



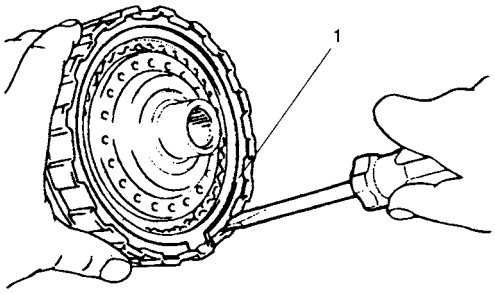
I2RH0B510161-

Direct Clutch Assembly Disassembly and Reassembly

S4RS0A5106032

Disassembly

1) Remove plate snap ring (1) then remove direct clutch retaining plate, discs and separator plates.



I2RH0B510162-

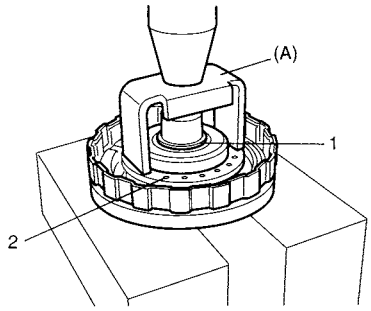
2) Using special tool and hydraulic press, remove shaft snap ring (1).

Special tool
(A): 09926–98310

CAUTION:

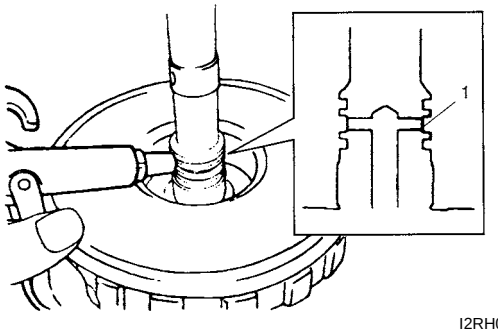
Do not press direct clutch return spring subassembly in over 0.7 mm (0.027 in.). Excessive compression may cause damage to direct clutch return spring subassembly and/or piston.

3) Remove direct clutch return spring assembly (2).



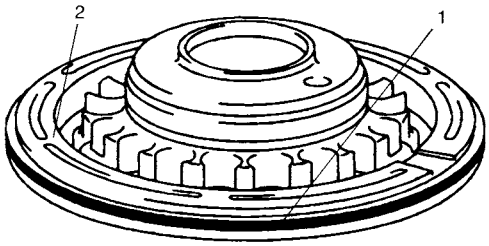
I2RH0B510163-

4) Using a finger to block oil hole (1), apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to opposite hole, which will assist in removal of the clutch piston.



I2RH0B510164-

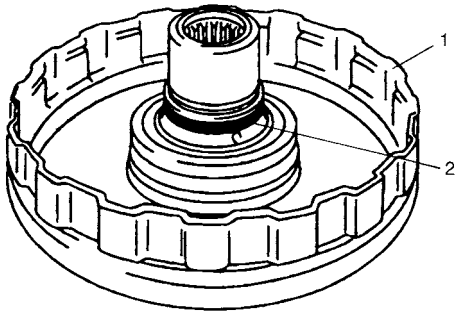
5) Remove outer O-ring (1).



I2RH0B510165-

2. Direct clutch piston

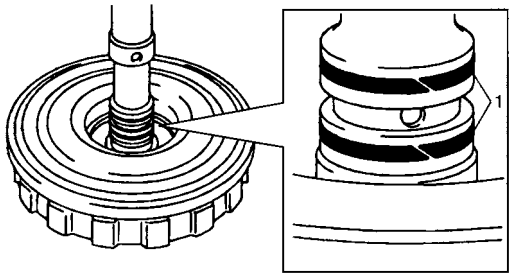
6) Remove inner O-ring (2).



I2RH0B510166-

1. Input shaft subassembly

7) Remove input shaft seal rings (1).



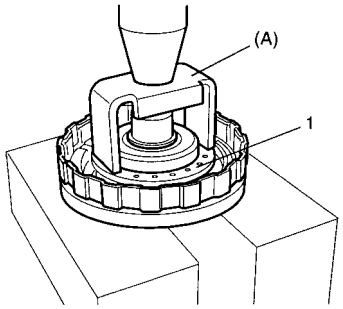
I2RH0B510167-

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

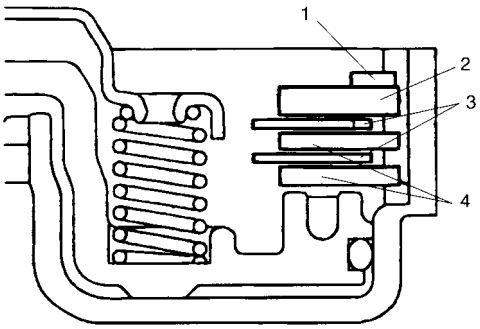
- Use new seal ring and O-ring. Apply A/T fluid before installation.
- Do not damage direct clutch return spring subassembly (1) and piston by pressing in direct clutch return spring subassembly passing through its original installing position over 0.7 mm (0.027 in.).

Special tool
(A): 09926–98310



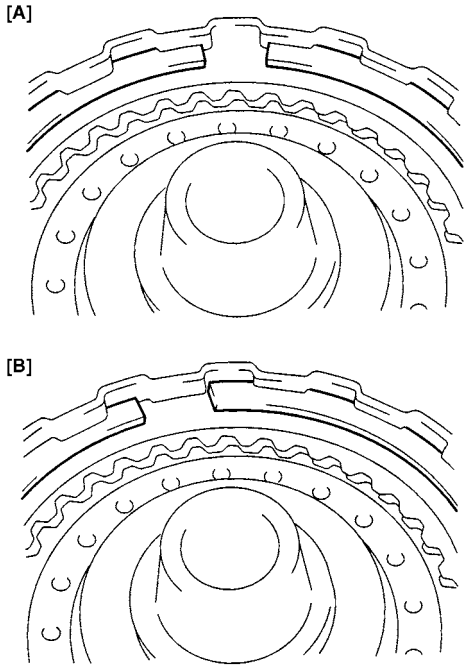
I2RH0B510168-

- Apply A/T fluid to direct clutch separator plates (4), discs (3) and retaining plate (2).
- Install direct clutch separator plates (4), discs (3), retaining plate (2) and snap ring (1) to input shaft subassembly.



I2RH0B510169-

- Install plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510170-

[A]: Correct	[B]: Incorrect

- After assembly, measure direct clutch piston stroke.

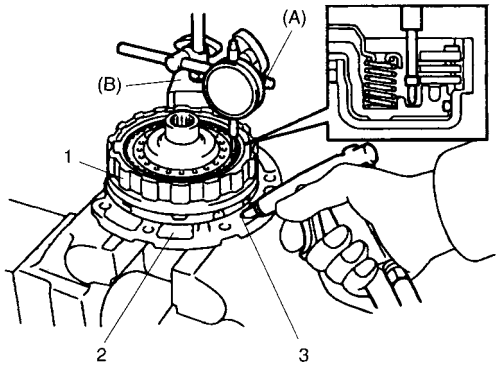
Special tool
(A): 09900–20607
(B): 09900–20701

Direct clutch piston stroke
0.4 – 0.7 mm (0.016 – 0.027 in.)

When piston stroke is out of specification, select direct clutch retaining plate with suitable thickness from among the following table and replace it.

Available direct clutch retaining plate thickness

Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.2 mm (0.126 in.)	2
3.4 mm (0.134 in.)	3
2.8 mm (0.110 in.)	4



I2RH0B510171-

1. Direct clutch assembly	3. Oil hole
2. Oil pump assembly	

Direct Clutch Assembly Inspection

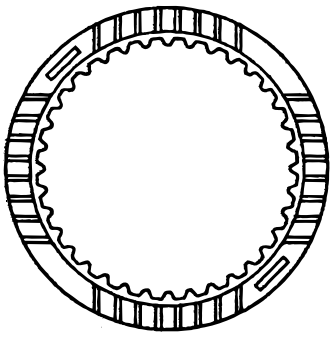
S4RS0A5106033

Clutch Discs, Plates and Retaining Plate

Check that sliding surfaces of discs, separator plates and retaining plate are not worn hard or burnt. If necessary, replace.

NOTE:

- **If disc lining is exfoliated, discolored, replace all discs.**
- **Before assembling new discs, soak them in A/T fluid for at least two hours.**



I2RH0B510172-

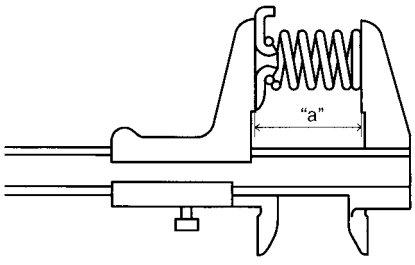
Direct Clutch Return Spring Subassembly

Measure free length of direct clutch return spring.

Direct clutch return spring free length
"a": 36.04 mm (1.419 in.)

NOTE:

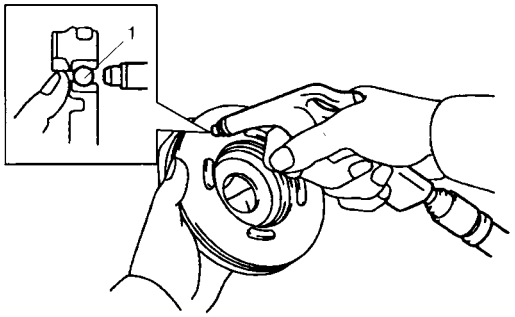
Do not apply excessive force when measuring spring free length. Perform measurement at several points.



I2RH0B510173-

Direct Clutch Piston

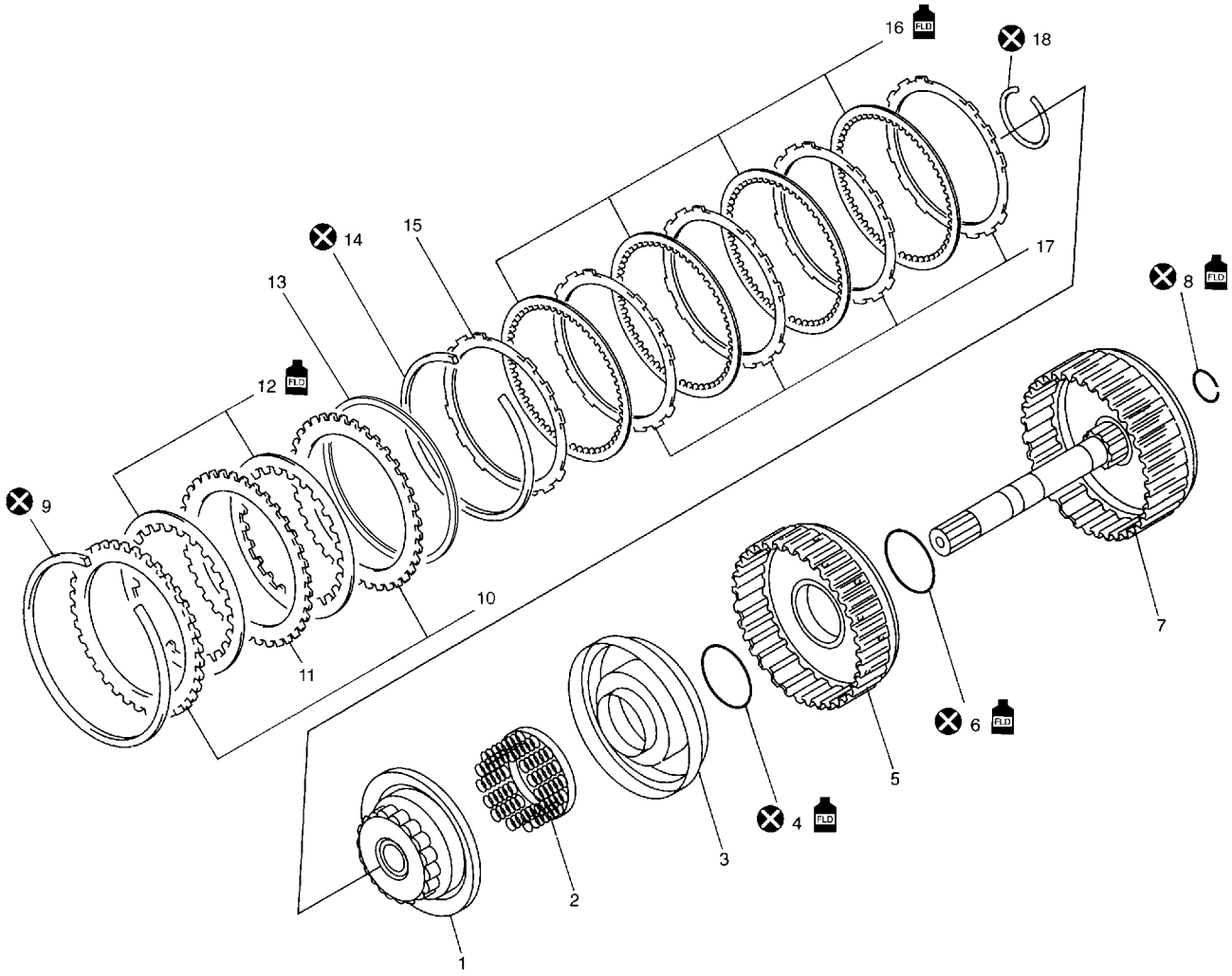
Shake direct clutch piston lightly and check that check ball (1) is not stuck.
Blow in low pressure air (Max. 100 kPa, 1 kg/cm^2, 15 psi) to check ball to check that there is no leakage.



I2RH0B510174-

Forward and Reverse Clutch Assembly Components

S4RS0A5106034



I3RM0B510061-

1. Forward clutch balancer	8. Intermediate shaft seal ring	15. Forward clutch retaining plate
2. Forward clutch return spring subassembly	9. Reverse clutch plate snap ring	16. Forward clutch disc
3. Forward clutch piston	10. Reverse clutch retaining plate	17. Forward clutch separator plate
4. Forward clutch piston O-ring	11. Reverse clutch separator plate	18. Balancer snap ring
5. Forward clutch drum	12. Reverse clutch disc	FLD : Apply automatic transaxle fluid.
6. Forward clutch drum O-ring	13. Reverse clutch cushion plate	: Do not reuse.
7. Intermediate shaft subassembly	14. Forward clutch plate snap ring	

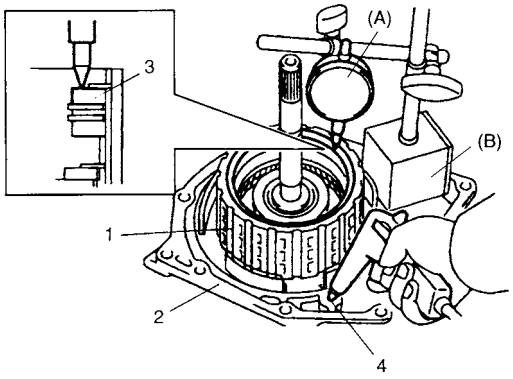
Forward and Reverse Clutch Assembly Preliminary Check

S4RS0A5106035

1) Install forward and reverse clutch assembly (1) to transaxle rear cover (2), blow in compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) through oil hole (4) of transaxle rear cover with the special tool attached on the upper surface of reverse clutch retaining plate (3), and measure reverse clutch piston stroke.
   If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool
(A): 09900–20607
(B): 09900–20701

Reverse clutch piston stroke
1.20 – 1.60 mm (0.047 – 0.063 in.)

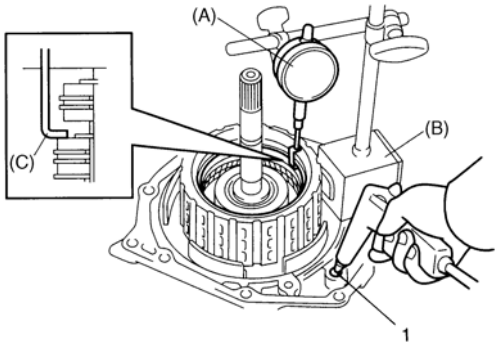


I2RH0B510176-

2) Blow compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) through oil hole (1) of transaxle rear cover with the special tool attached on the upper surface of forward clutch retaining plate, and measure forward clutch piston stroke.
If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

Forward clutch piston stroke
1.30 – 1.50 mm (0.051 – 0.059 in.)



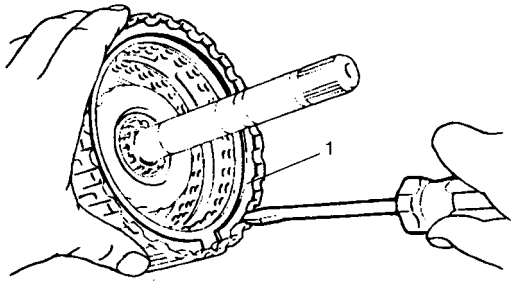
I2RH0B510177-

Forward and Reverse Clutch Assembly Disassembly and Reassembly

S4RS0A5106036

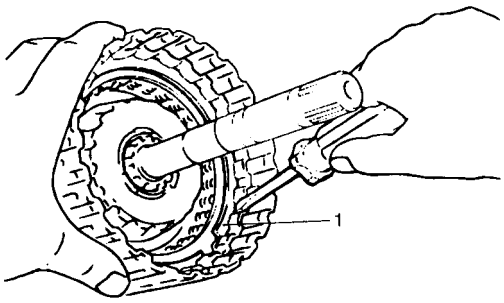
Disassembly

1) Remove reverse clutch plate snap ring (1) and take out reverse clutch retaining plate, discs, separator plates and clutch cushion plate from intermediate shaft subassembly.



I2RH0B510178-

2) Remove forward clutch plate snap ring (1) and take out forward clutch retaining plate, discs and separator plates from forward clutch drum.



I2RH0B510179-

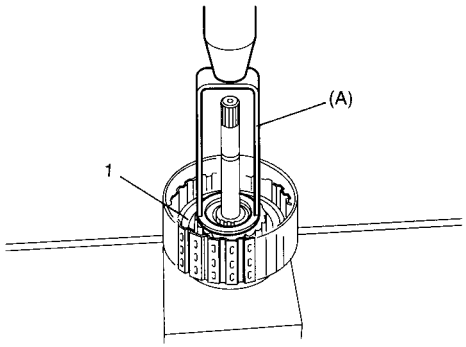
3) Remove balancer snap ring by using special tool and hydraulic press.

Special tool
(A): 09926–97610

CAUTION:

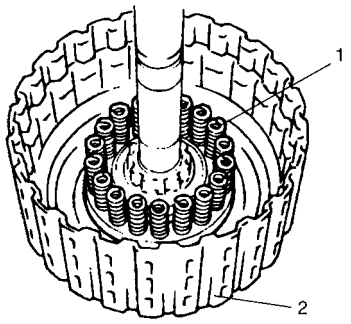
Do not press forward clutch return spring subassembly in over 1.5 mm (0.059 in.). Excessive compression may cause damage to return spring subassembly and/or balancer.

4) Remove forward clutch balancer (1).



I2RH0B510180-

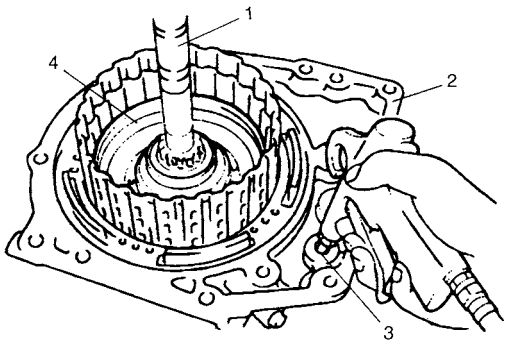
5) Remove forward clutch return spring subassembly (1).



I2RH0B510181-

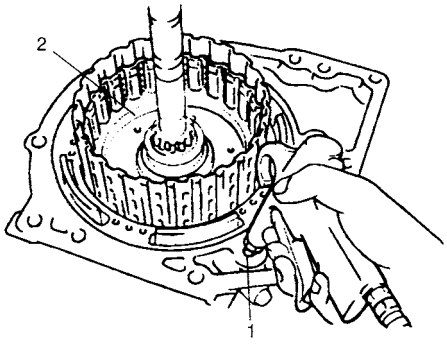
2. Intermediate shaft subassembly

6) Install intermediate shaft subassembly (1) to transaxle rear cover (2). Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (3) of transaxle rear cover to remove forward clutch piston (4).



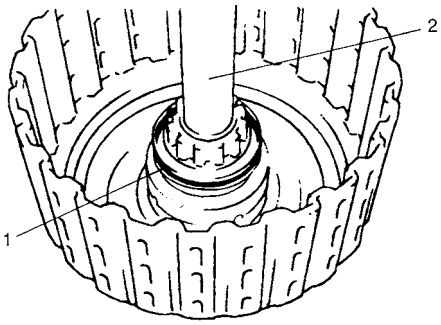
I2RH0B510182-

7) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (1) of transaxle rear cover to remove forward clutch drum (2).



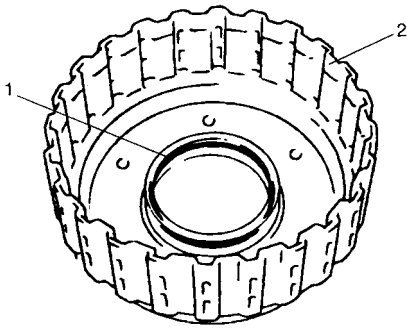
I2RH0B510183-

8) Remove forward clutch piston O-ring (1) from intermediate shaft subassembly (2).



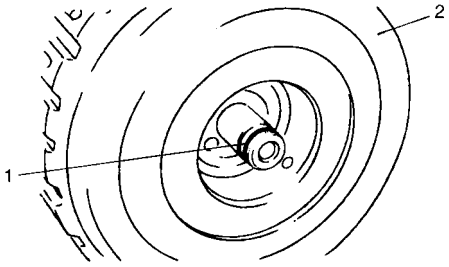
I2RH0B510184-

9) Remove forward clutch drum O-ring (1) from forward clutch drum (2).



I2RH0B510185-

10) Remove intermediate shaft seal ring (1) from intermediate shaft subassembly (2).



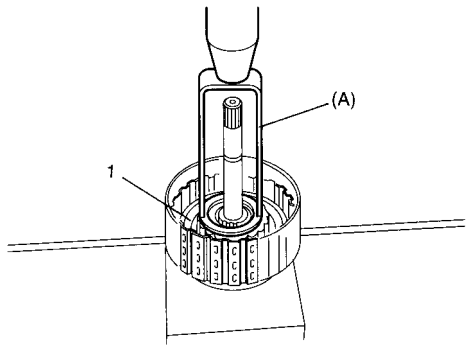
I2RH0B510186-

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

- Before assembling, apply automatic transaxle fluid to component parts.
- Replace O-rings and seal ring with new ones.
- Do not damage forward clutch return spring subassembly and balancer (1) by pressing forward clutch return spring subassembly passing through its original installing position over 1.5 mm (0.059 in.).

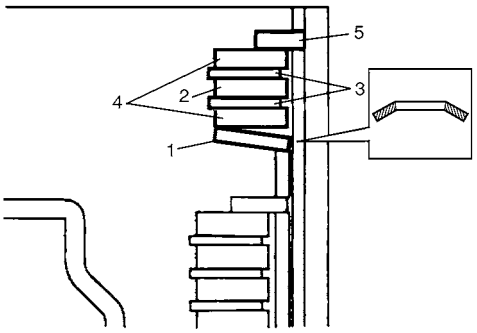
Special tool
(A): 09926–97610



I2RH0B510180-

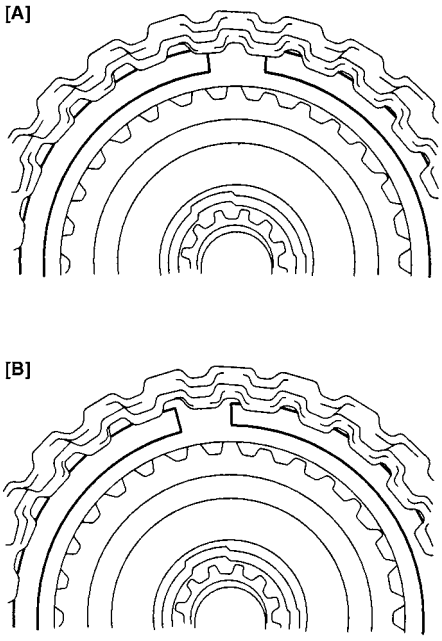
•

- Apply A/T fluid to forward clutch separator plates (1), discs (2) and retaining plate (3).
- Install forward clutch separator plates (1), discs (2) and retaining plate (3), then snap ring (4) to forward clutch drum.



I3RM0B510062-

- Install forward clutch plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510188-

[A]: Correct	[B]: Incorrect

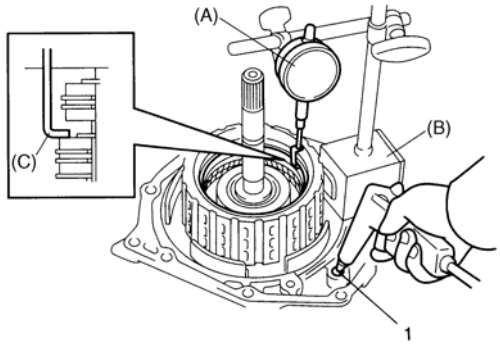
- Measure forward clutch piston stroke in the same manner as “Forward and Reverse Clutch Assembly Preliminary Check: ”.
  When piston stroke is out of specification, select forward clutch retaining plate with proper thickness from among the following table and replace it.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

Forward clutch piston stroke
1.30 – 1.50 mm (0.051 – 0.059 in.)

Available forward clutch retaining plate thickness

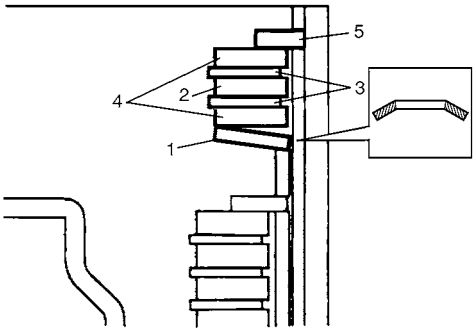
Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.1 mm (0.122 in.)	5
3.2 mm (0.126 in.)	2
3.3 mm (0.130 in.)	6
3.4 mm (0.134 in.)	3
3.5 mm (0.138 in.)	7
3.6 mm (0.142 in.)	4



I2RH0B510177-

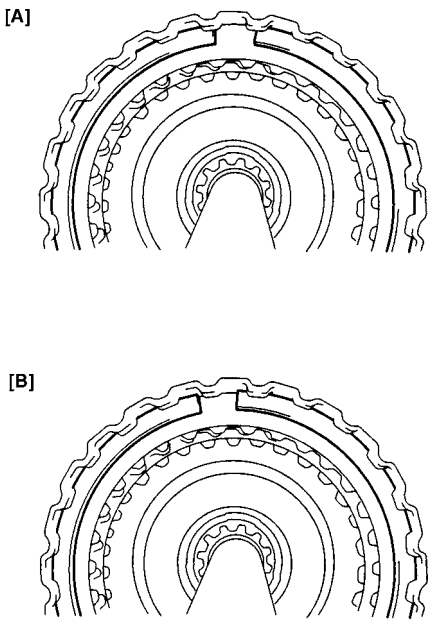
1. Oil hole

- Install reverse clutch cushion plate (1) in correct direction as shown in figure.
- Apply A/T fluid to reverse clutch cushion plate (1), reverse clutch separator plate (2), discs (3) and retaining plate (4).
- Install reverse clutch cushion plate (1), reverse clutch separator plate (2), discs (3), retaining plate (4) and then snap ring (5) to intermediate shaft subassembly.



I3RM0B510062-

- Install reverse clutch plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510190-

[A]: Correct	[B]: Incorrect

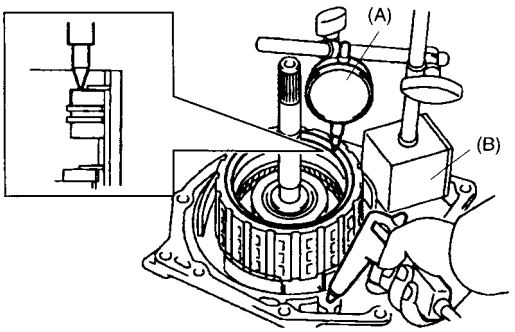
- Measure reverse clutch piston stroke in the same manner as “Forward and Reverse Clutch Assembly Preliminary Check: ”.
  When piston stroke is out of specification, select reverse clutch retaining plate with proper thickness from among the following table and replace it.

  Special tool
  (A): 09900–20607
  (B): 09900–20701

  Reverse clutch piston stroke
  1.20 – 1.60 mm (0.047 – 0.063 in.)

Available reverse clutch retaining plate thickness

Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.2 mm (0.126 in.)	2
3.4 mm (0.134 in.)	3
3.6 mm (0.142 in.)	4



I2RH0B510191-

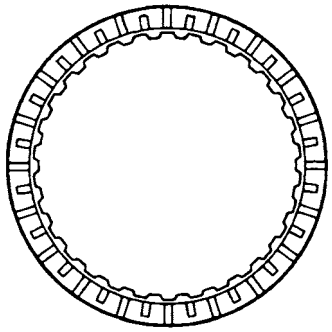
Forward and Reverse Clutch Assembly Inspection

S4RS0A5106037

Clutch, Discs, Separator Plates and Retaining Plate
Check that sliding surfaces of discs, separator plates and retaining plate are not worn hard or burnt. If necessary, replace.

NOTE:

- **If disc lining is exfoliated or discolored, replace all discs.**
- **Before assembling new discs, soak them in A/T fluid for at least two hours.**



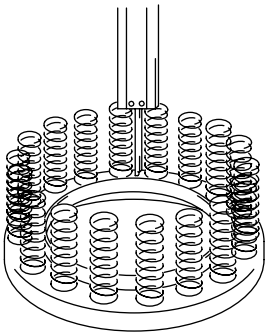
I2RH0B510192-

Forward Clutch Return Spring Subassembly
Measure free length of forward clutch return spring.

Forward clutch return spring free length
23.04 mm (0.907 in.)

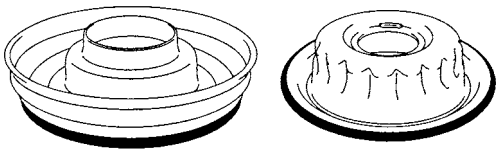
NOTE:

Do not apply excessive force when measuring spring free length. Perform measurement at several points.



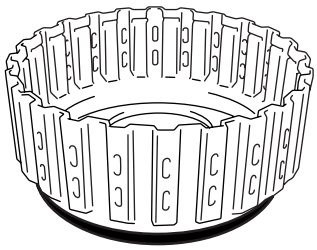
I2RH0B510193-

Forward Clutch Piston Lip and Forward Clutch Balancer Lip
Check each lip for wear, deformation, cut and/or hardening. If necessary, replace.



I2RH0B510194-

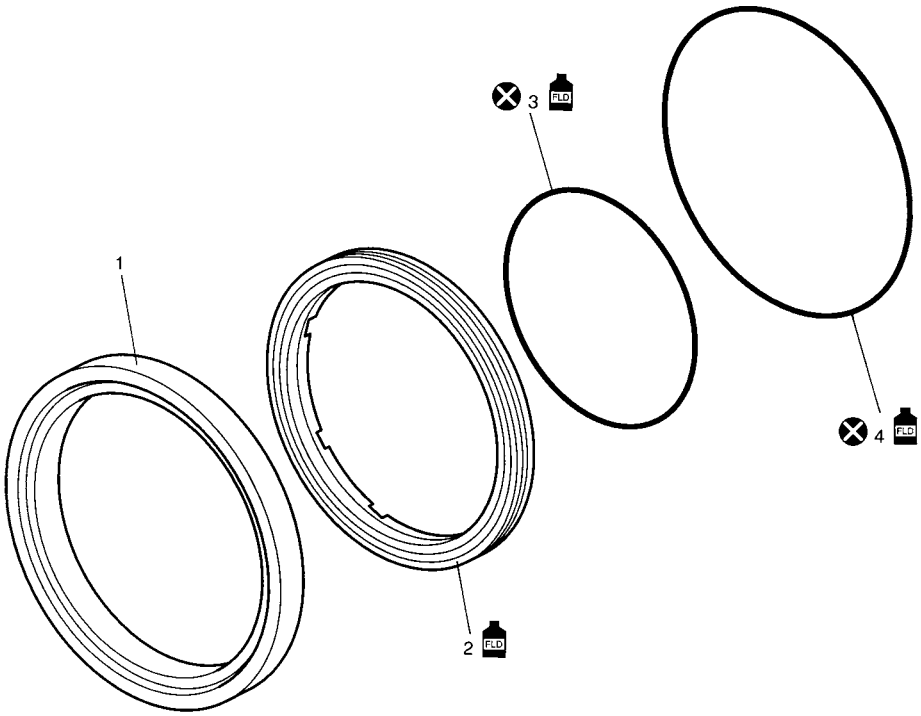
Forward Clutch Drum Lip
Check each lip for wear, deformation, cut and/or hardening. If necessary, replace.



I2RH0B510195-

2nd Brake Piston Assembly Components

S4RS0A5106038



I2RH0B510196-

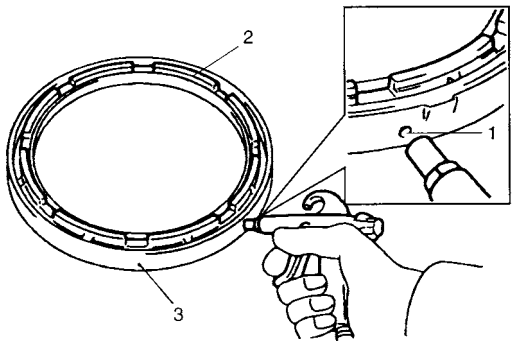
1. 2nd brake cylinder	4. Outer O-ring
2. 2nd brake piston	FLD : Apply automatic transaxle fluid.
3. Inner O-ring	⊗ : Do not reuse.

2nd Brake Piston Assembly Disassembly and Reassembly

S4RS0A5106040

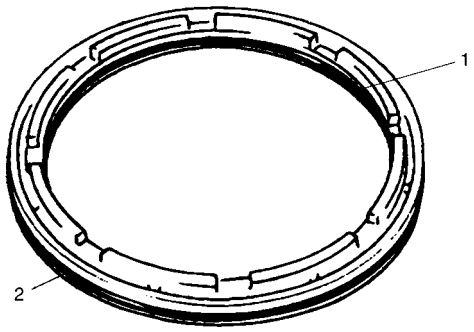
Disassembly

1) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (1) of 2nd brake cylinder (3) to remove 2nd brake piston (2).



I2RH0B510197-

2) Remove inner O-ring (1) and outer O-ring (2).

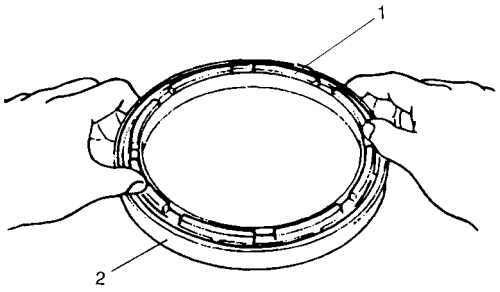


I2RH0B510198-

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

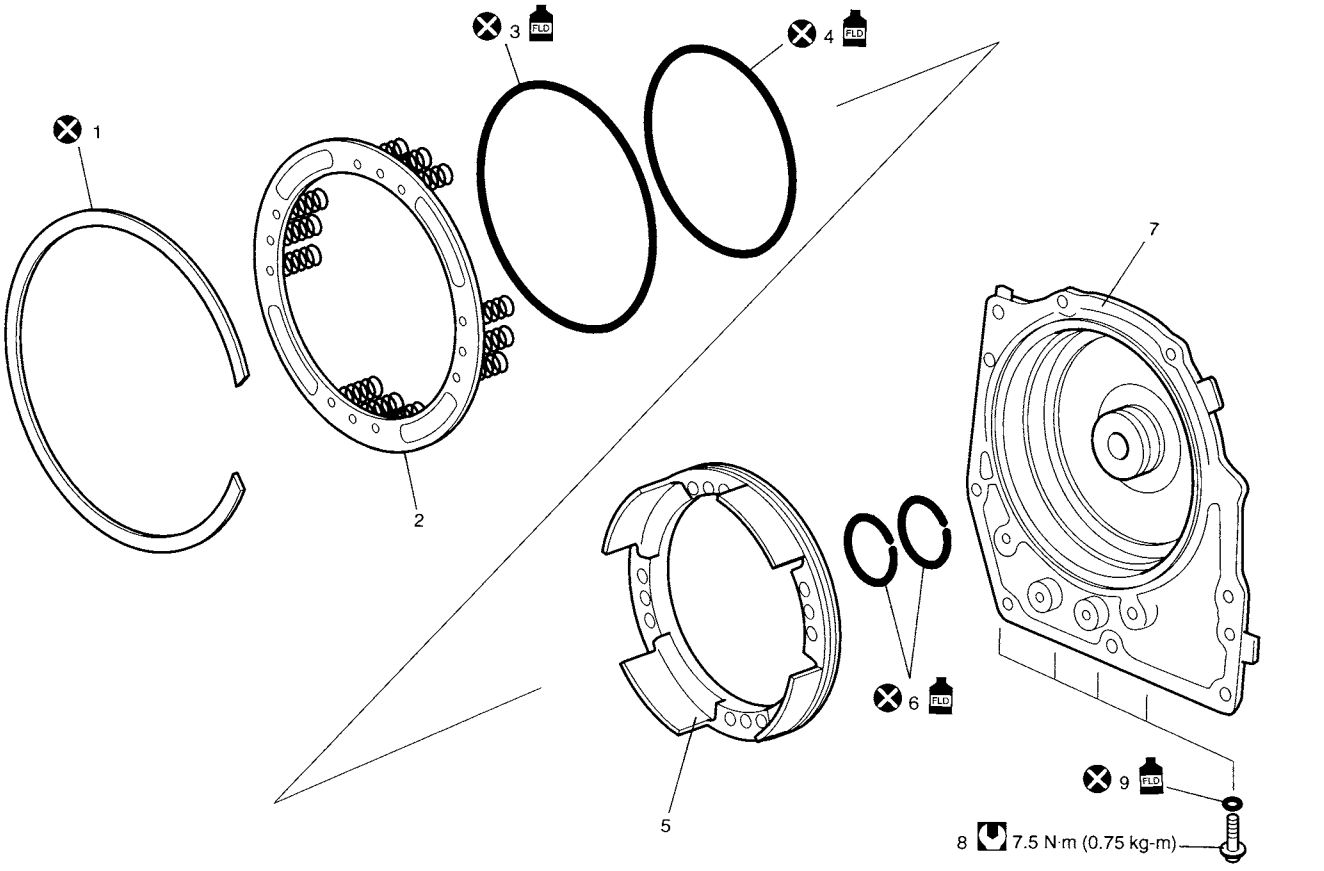
- Use new O-rings. Apply A/T fluid to the O-rings, before installation.
- Install 2nd brake piston (1) to which A/T fluid is applied to 2nd brake cylinder (2).
  Do not damage O-ring when installing 2nd brake piston.



I2RH0B510199-

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components

S4RS0A5106042



I2RH0B510200-

1. Snap ring	5. O/D and 2nd coast brake piston	9. Rear cover plug O-ring
2. O/D and 2nd coast brake return spring subassembly	6. Rear cover seal ring	FLD : Apply automatic transaxle fluid.
3. O/D and 2nd coast brake piston front O-ring	7. Transaxle rear cover	⊗ : Do not reuse.
4. O/D and 2nd coast brake piston rear O-ring	8. Rear cover plug	: Tightening torque

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Disassembly and Reassembly

S4RS0A5106044

Disassembly

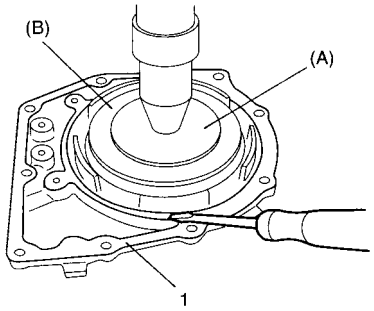
1) Remove snap ring by using special tools and hydraulic press.

Special tool
(A): 09926–96030
(B): 09946–06710

CAUTION:

Do not press O/D and 2nd coast brake return spring subassembly in over 1.0 mm (0.039 in.).
Excessive compression may cause damage to O/D and 2nd coast brake return spring subassembly and/or piston.

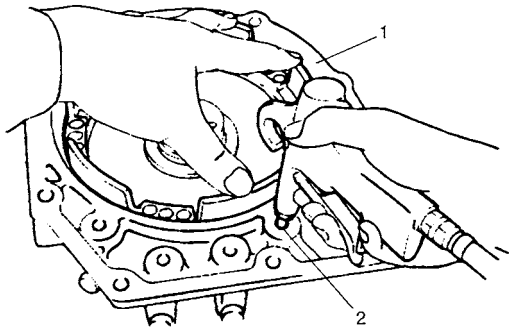
2) Remove O/D and 2nd coast brake return spring assembly.



I2RH0B510201-

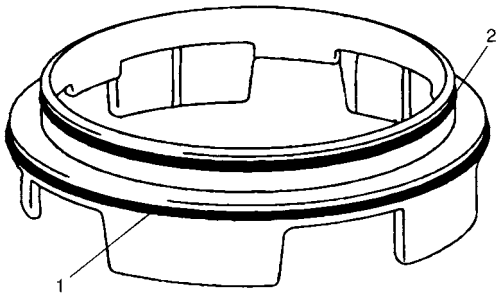
1. Transaxle rear cover

3) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (2) of transaxle rear cover (1) to remove O/D and 2nd coast brake piston.



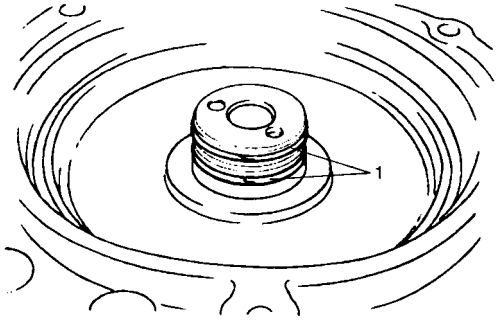
I2RH0B510202-

4) Remove O/D and 2nd coast brake piston front O-ring (1) and rear O-ring (2).



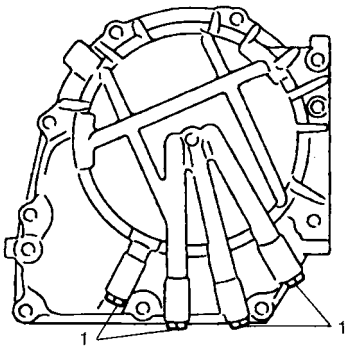
I2RH0B510203-

5) Remove rear cover seal rings (1).



I2RH0B510204-

6) Remove rear cover plugs (1).



I2RH0B510205-

Reassembly

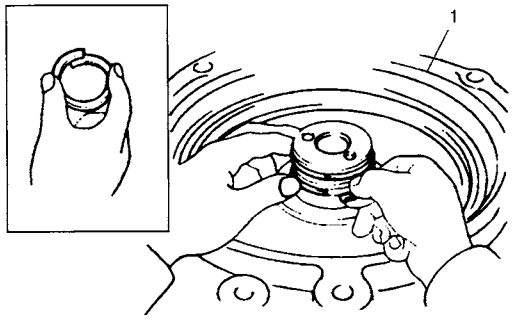
Reverse disassembly procedure for assembly, noting the following points.

- Use new seal rings and O-rings. Apply A/T fluid to seal rings and O-rings before installation.
- Tighten rear cover plugs to specified torque.

  Tightening torque
  Rear cover plug: 7.5 N·m (0.75 kg-m, 5.5 lb-ft)

- Before installing rear cover seal ring, apply A/T fluid to ring.
  First, tighten seal ring to 5 mm (0.197 in.), then install seal ring.

- Do not open rear cover seal ring too wide to attach.

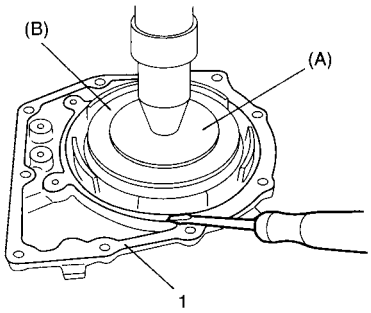


I2RH0B510206-

1. Transaxle rear cover

- Do not damage O/D and 2nd coast brake return spring subassembly and piston by pressing in O/D and 2nd coast brake return spring subassembly passing through its original installing position over 1.0 mm (0.039 in.).

Special tool
(A): 09926–96030
(B): 09946–06710



I2RH0B510201-

1. Transaxle rear cover

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Inspection

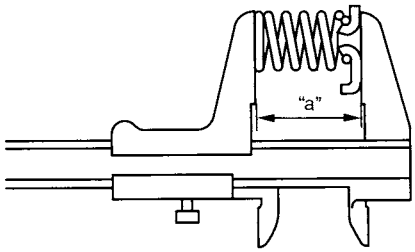
S4RS0A5106045

O/D and 2nd Coast Brake Return Spring Subassembly
Measure free length of O/D and 2nd coast brake return spring.

Free length of O/D and 2nd coast brake return spring "a": 18.99 mm (0.748 in.)

NOTE:

- **Do not apply excessive force when measuring spring free length.**
- **Perform measurement at several points.**

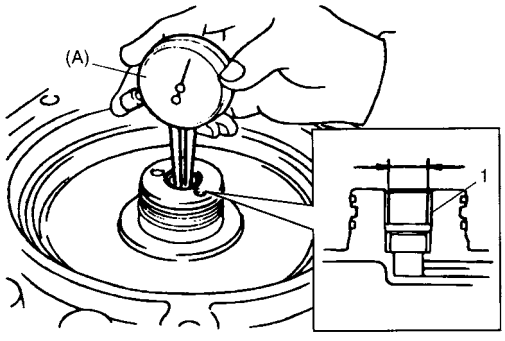


I2RH0B510207-

Transaxle Rear Cover Bush
Measure transaxle rear cover bush bore by using special tool.
If measured transaxle rear cover bush bore is out of specifications, replace transaxle rear cover with new one. In replacement, intermediate shaft subassembly also needs to be checked. Replace intermediate shaft subassembly, if necessary.

Special tool
(A): 09900–20605

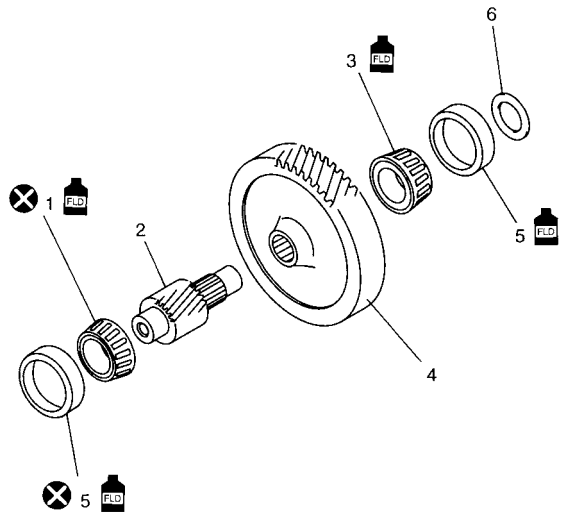
Transaxle rear cover bush bore
Standard: 13.94 – 13.96 mm (0.549 – 0.550 in.)



I2RH0B510208-

Countershaft Assembly Components

S4RS0A5106048



I2RH0B510209-

1. Countershaft RH bearing	5. Bearing cap
2. Countershaft	6. Countershaft bearing shim
3. Countershaft LH bearing	FLD : Apply automatic transaxle fluid.
4. Reduction driven gear	: Do not reuse.

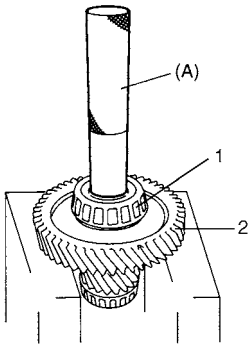
Countershaft Assembly Disassembly and Reassembly

S4RS0A5106049

Disassembly

1) Remove countershaft LH bearing (1) and reduction driven gear (2) at once by using special tool and hydraulic press.

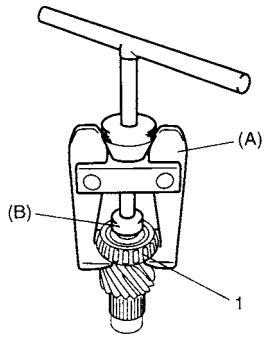
Special tool
(A): 09925–98221



I2RH0B510210-

2) Remove countershaft RH bearing (1) by using special tools.

Special tool
(A): 09913–61510
(B): 09926–58010



I2RH0B510211-

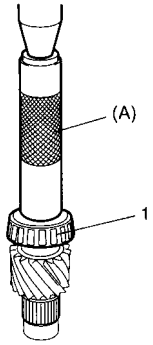
Reassembly

1) Install new countershaft RH bearing (1) by using special tool and hydraulic press.

Special tool
(A): 09913–84510

NOTE:

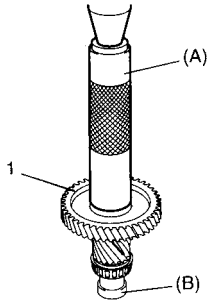
Replace countershaft RH bearing together with bearing cup as a set.



I2RH0B510212-

2) Install reduction driven gear (1) with special tools and hydraulic press.

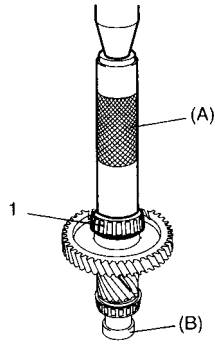
Special tool
(A): 09913–84510
(B): 09925–88210



I2RH0B510213-

3) Install countershaft LH bearing (1) with special tools and hydraulic press.

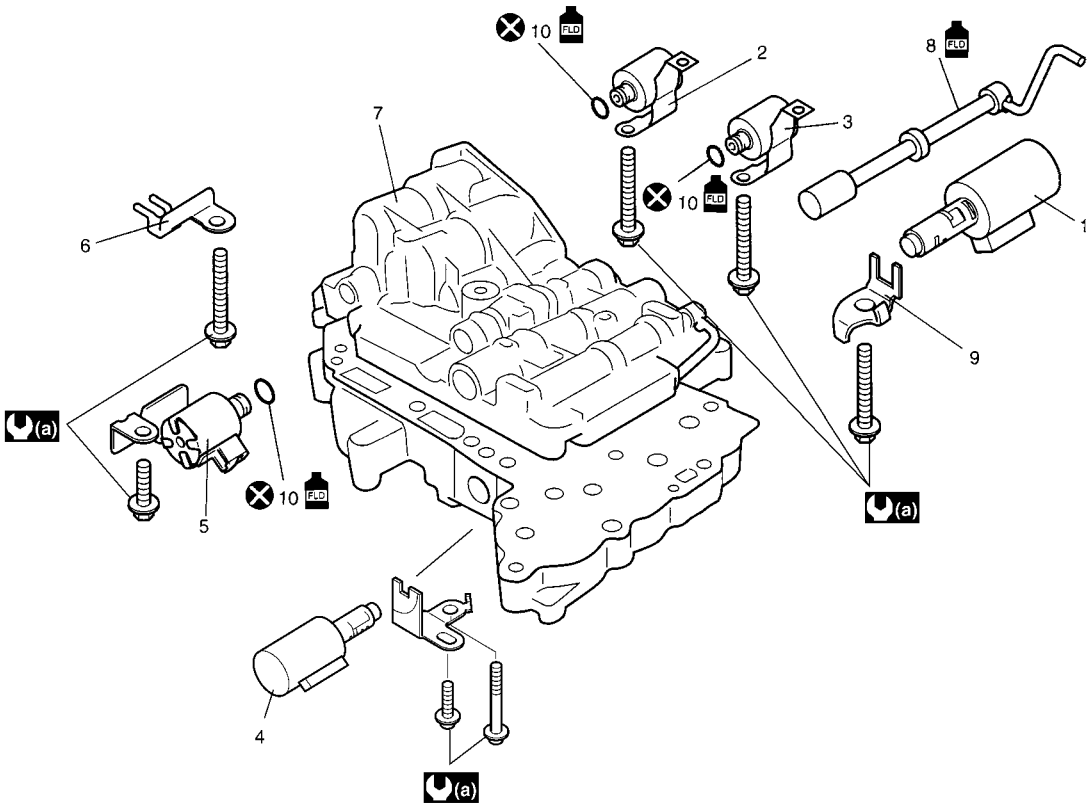
Special tool
(A): 09913–84510
(B): 09925–88210



I2RH0B510214-

Valve Body Assembly Components

S4RS0A5106050



I4RS0A510044-

1. Pressure control solenoid valve	6. Temperature sensor clamp	: Apply automatic transaxle fluid.
2. Shift solenoid valve-A (No.1)	7. Valve body assembly	: Tightening torque
3. Shift solenoid valve-B (No.2)	8. Manual valve	: Do not reuse.
4. TCC pressure control solenoid valve	9. Solenoid lock plate	
5. Timing solenoid valve	10. O-ring	

Valve Body Assembly Disassembly and Reassembly

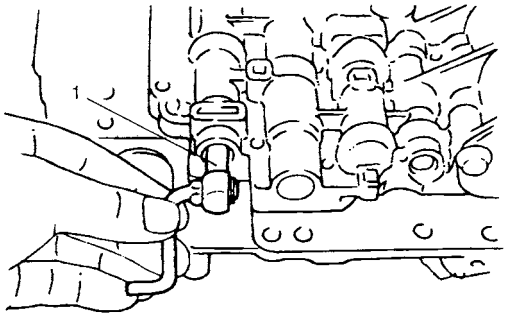
S4RS0A5106051

CAUTION:

When replacing pressure control solenoid valve and/or TCC pressure control solenoid valve, it is strictly required to replace it together with valve body assembly as a set. Replacing pressure control solenoid valve and/or TCC pressure control solenoid valve independently may cause excessive shift shock.

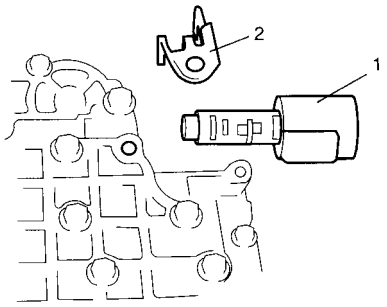
Disassembly

1) Pull out manual valve (1).



I2RH0B510216-

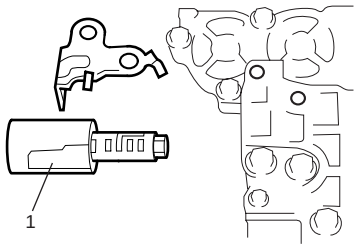
2) Remove pressure control solenoid valve (1).



I2RH0B510217-

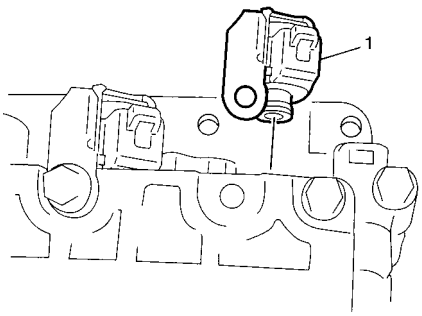
2. Solenoid lock plate

3) Remove TCC pressure control solenoid valve (1).



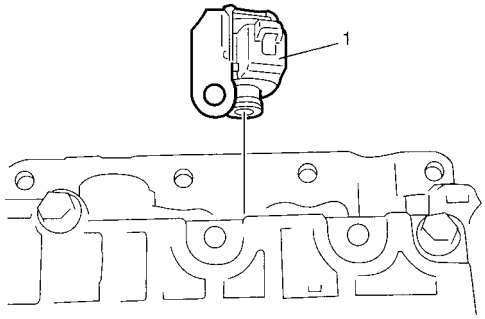
I4RS0A510045-

4) Remove shift solenoid valve-A (1).



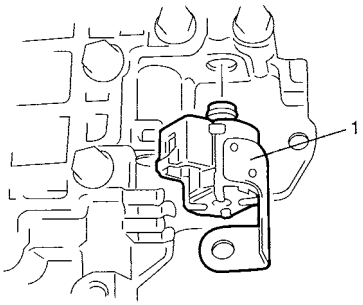
I2RH0B510219-

5) Remove shift solenoid valve-B (1).



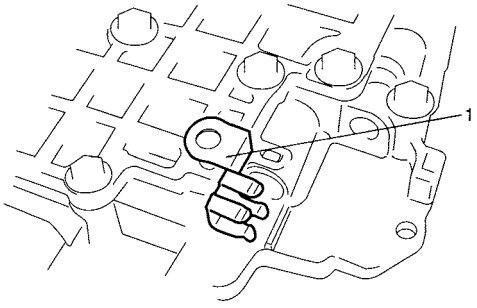
I2RH0B510220-

6) Remove timing solenoid valve (1).



I2RH0B510221-

7) Remove temperature sensor clamp (1).



I2RH0B510222-

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

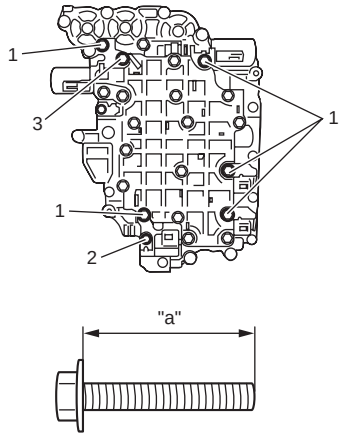
- Shift solenoid valve-A and -B are identical
- After applying A/T fluid to new O-rings, fit them to solenoid valves, then install solenoid valves to valve body.
- Tighten solenoid valve bolts to specified torque

Tightening torque

Solenoid valve bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

Solenoid valve bolt specification

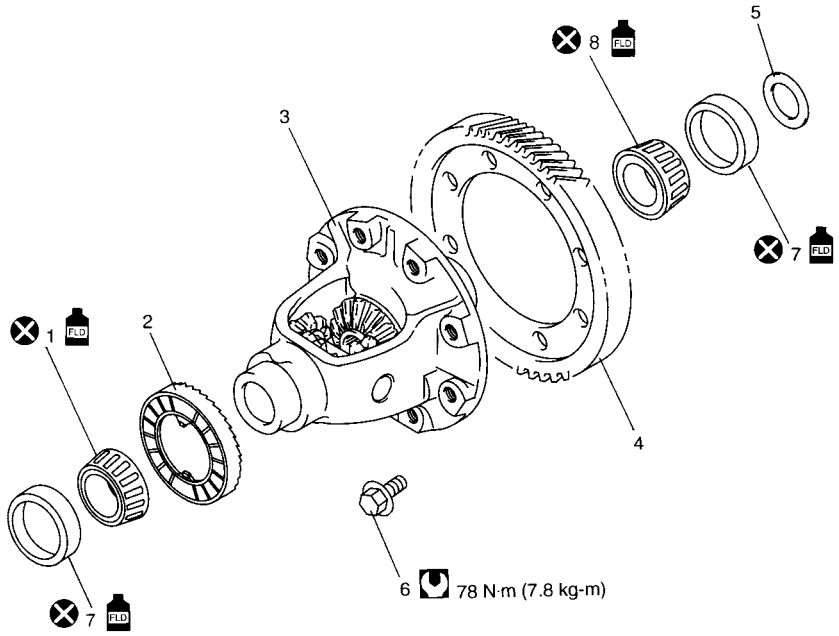
Bolt	Length “a”	Pieces
A (1)	49 mm (1.93 in.)	5
B (2)	20 mm (0.79 in.)	1
C (3)	60 mm (2.36 in.)	1



I4RS0A510046-

Differential Assembly Components

S4RS0A5106052



I2RH0B510224-

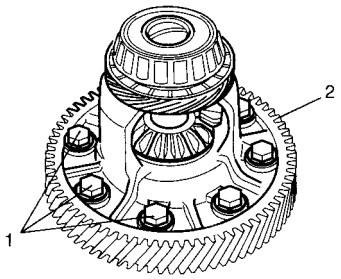
1. Differential side RH bearing	5. Side bearing shim	: Apply automatic transaxle fluid.
2. Output shaft speed sensor (VSS) drive gear	6. Final gear bolt	: Tightening torque
3. Differential case subassembly	7. Side bearing cup	: Do not reuse.
4. Final gear	8. Differential side LH bearing	

Differential Assembly Disassembly and Reassembly

S4RS0A5106053

Disassembly

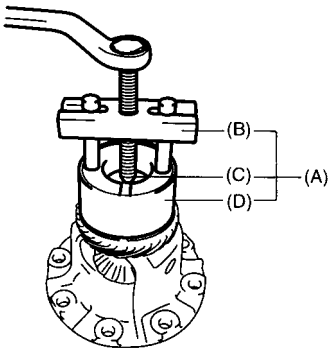
1) Remove final gear bolts (1), and then final gear (2).



I2RH0B510225-

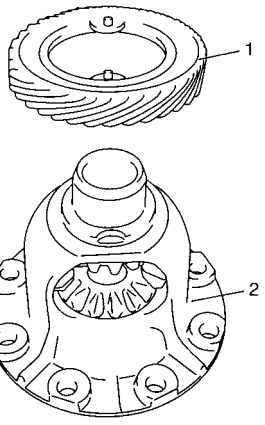
2) Remove differential side RH bearing by using special tools.

Special tool
(A): 09926–37610
(B): 09926–37610–001
(C): 09926–37610–003
(D): 09926–37610–002



I2RH0B510226-

3) Remove output shaft speed sensor (VSS) drive gear (1).

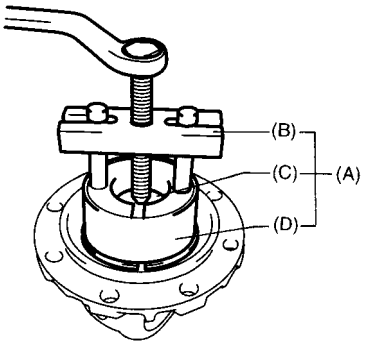


I2RH0B510227-

2. Differential case subassembly

4) Remove differential side LH bearing by using special tools.

Special tool
(A): 09926–37610
(B): 09926–37610–001
(C): 09926–37610–003
(D): 09926–37610–002



I2RH0B510228-

Reassembly

WARNING:

- **When taking warmed final driven gear out of vessel, use tongs or the like. Taking out it with bare hand will cause severe burn.**
- **While installing warmed final driven gear, use oven glove such as leather glove. Picking up it with bare hand may cause burn.**

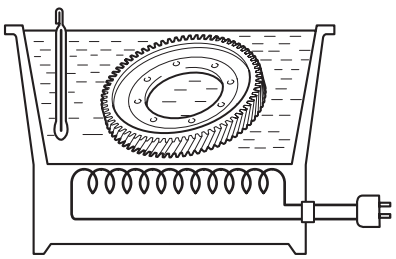
CAUTION:

Do not leave final driven gear in boiling water for longer than 5 min. Overheating the gear may cause strength reduction of gear.

1) Put final driven gear in water vessel, heat and remove when it boils, then remove moisture.

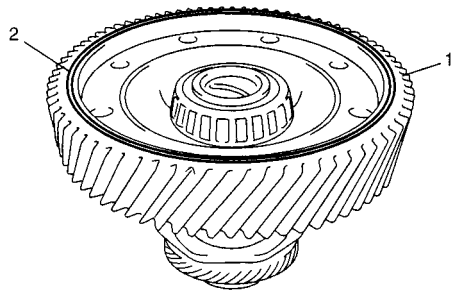
NOTE:

After removing moisture on final driven gear, install final driven gear to differential case as quickly as possible.



I2RH0B510229-

2) As shown in figure, facing groove (2) side upward, install final driven gear (1) to differential case.



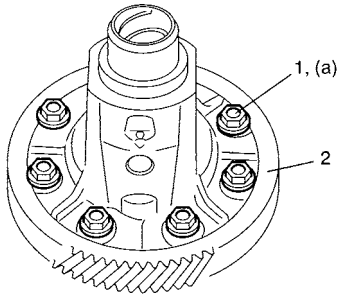
I2RH0B510230-

3) Tighten final gear bolts (1) to specified torque.

NOTE:

To avoid rust, apply A/T fluid to final driven gear after installation.

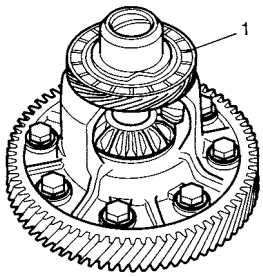
Tightening torque
Final gear bolt (a): 78 N·m (7.8 kg-m, 56.5 lb-ft)



I2RH0B510231-

2. Final driven gear

4) After applying A/T fluid to output shaft speed sensor (VSS) drive gear (1), install output shaft speed sensor drive gear.



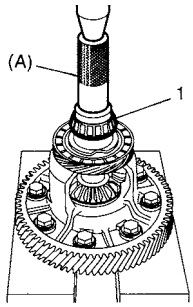
I2RH0B510232-

5) Install new differential side RH bearing (1) by using special tool and hydraulic press.

NOTE:

Replace differential side RH bearing together with bearing cup as a set.

Special tool
(A): 09913–70123



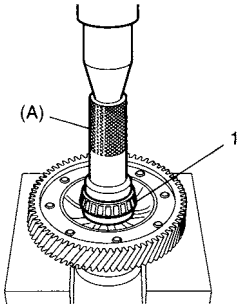
I2RH0B510233-

6) Install new differential side LH bearing (1) by using special tool and hydraulic press.

NOTE:

Replace differential side LH bearing together with bearing cup as a set.

Special tool
(A): 09913–70123



I2RH0B510234-

Differential Assembly Inspection

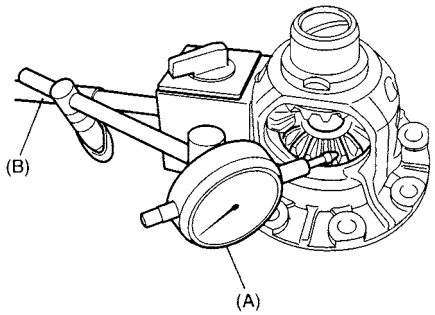
S4RS0A5106054

1) Hold differential case subassembly with soft jawed vice and set special tools as shown.

Special tool
(A): 09900–20607
(B): 09900–20701

2) Measure differential gear thrust play.

Differential gear thrust play
Standard: 0.06 – 0.22 mm (0.002 – 0.009 in.)



I2RH0B510235-

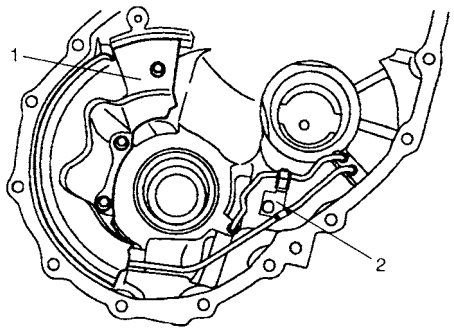
3) If thrust play is out of specification, replace differential case subassembly.

Torque Converter Housing Disassembly and Reassembly

S4RS0A5106055

Disassembly

1) Remove fluid reservoir RH plate (1) and lubrication tube clamp (2).

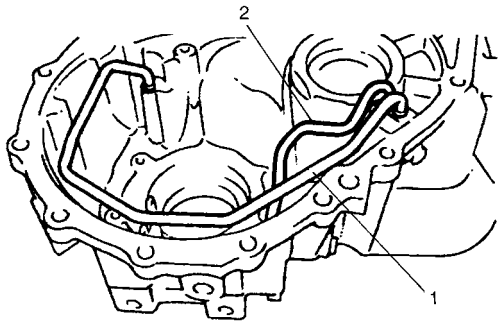


I2RH0B510236-

2) Remove lubrication LH tube (1) and RH tube (2).

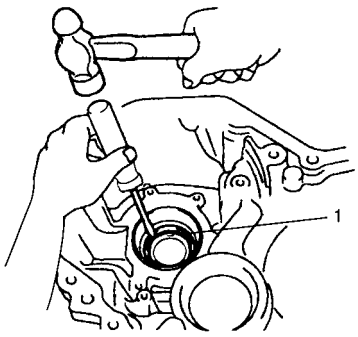
NOTE:

Do not bend lubrication tube with excessive force.



I2RH0B510237-

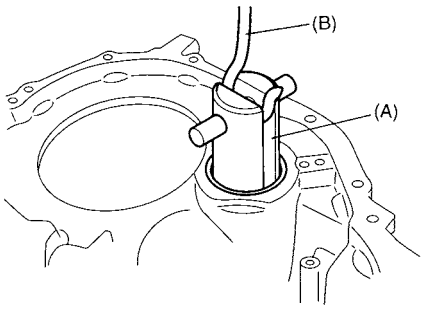
3) Remove differential side oil seal (1).



I2RH0B510238-

4) Remove countershaft RH bearing cup by using special tools.

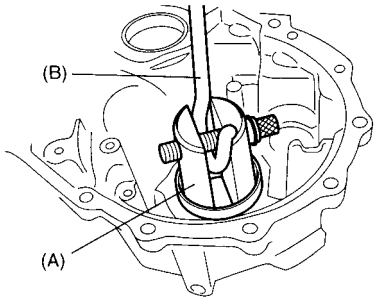
Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510239-

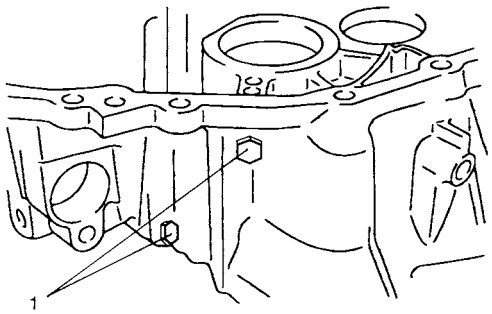
5) Remove differential side RH bearing cup by using special tools.

Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510240-

6) Remove torque converter case plugs (1).

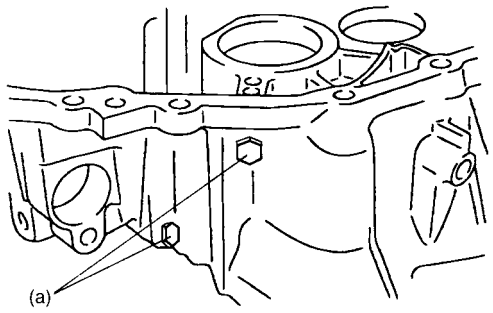


I2RH0B510241-

Reassembly

1) After applying A/T fluid to new O-rings, fit them to housing plugs. Finally install plugs to torque converter housing.

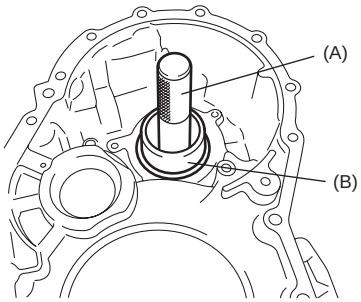
Tightening torque
Torque converter housing plug (a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



I2RH0B510242-

2) Using special tools, assemble differential side RH bearing cup.

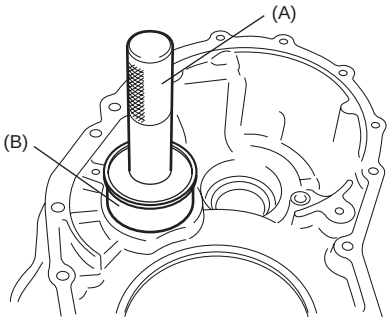
Special tool
(A): 09924–74510
(B): 09944–88220



I3RM0B510063-

3) Using special tool, install countershaft RH bearing cup.

Special tool
(A): 09924–74510
(B): 09944–88220



I3RM0B510064-

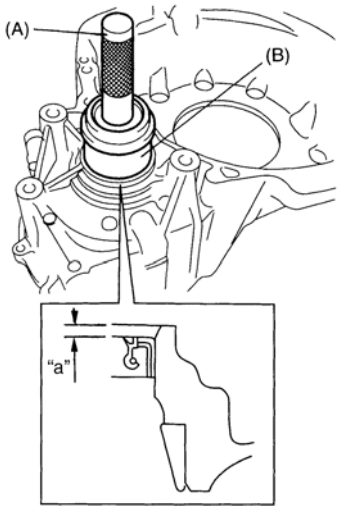
4) Using special tools, install new differential side oil seal to torque converter housing.

Special tool
(A): 09924–74510
(B): 09944–88220

Differential side oil seal installing depth "a": 2.6 – 3.6 mm (0.10 – 0.14 in.)

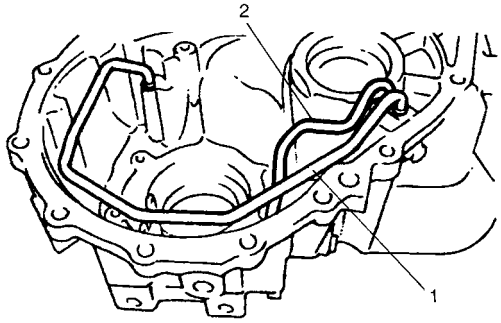
5) Apply grease to oil seal lip.

: Grease 99000–25030



I2RH0B510245-

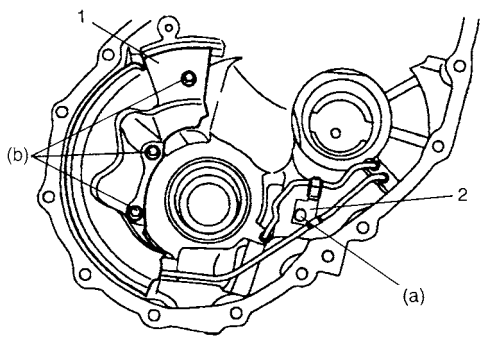
6) Install lubrication LH tube (1) and RH tube (2).



I2RH0B510237-

7) Install fluid reservoir RH plate (1) and lubrication tube clamp (2).

Tightening torque
Lubrication tube clamp bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)
Fluid reservoir RH plate bolt (b): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



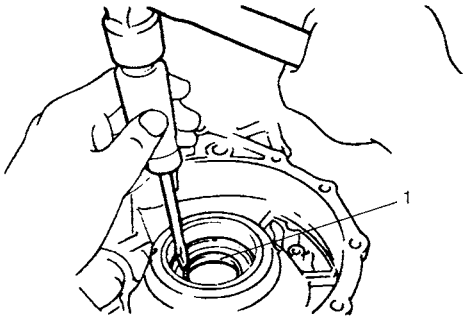
I2RH0B510246-

Transaxle Case Disassembly and Reassembly

S4RS0A5106057

Disassembly

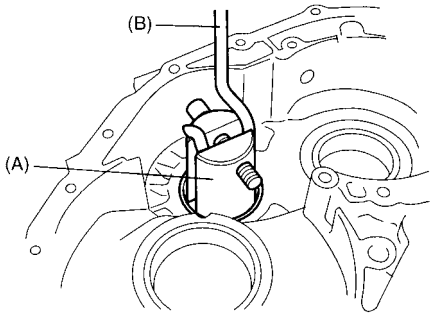
1) Remove differential side oil seal (1).



I2RH0B510247-

2) Remove countershaft LH bearing cup and shim with special tools.

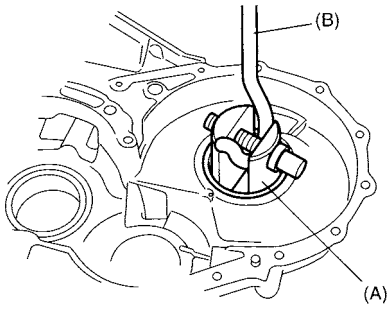
Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510248-

3) Remove differential side LH bearing cup and shim with special tools.

Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510249-

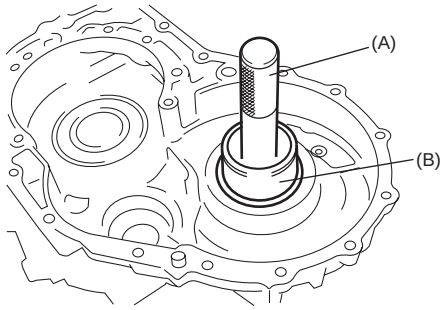
Reassembly

1) Using special tools, assemble shim and differential side LH bearing cup.

NOTE:

Use shim with same thickness as the removed one.

Special tool
(A): 09924–74510
(B): 09944–88220



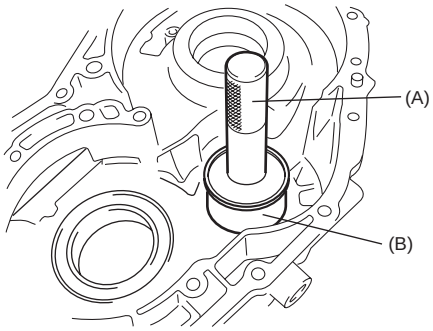
I3RM0B510065-

2) Using special tools, assemble shim and countershaft LH bearing cup.

NOTE:

Use shim with same thickness as the removed one.

Special tool
(A): 09924–74510
(B): 09944–88220



I3RM0B510066-

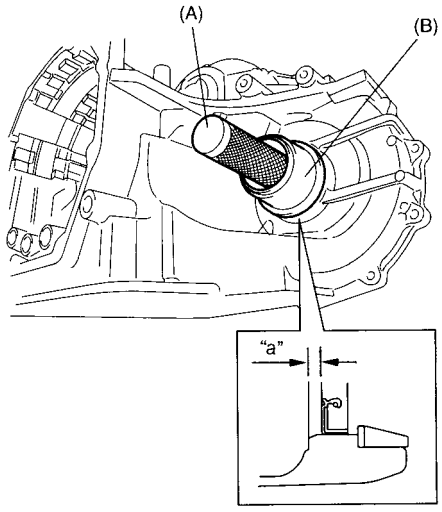
3) Install new differential side oil seal to transaxle case by using special tools.

Special tool
(A): 09924–74510
(B): 09944–88220

Differential side oil seal installing depth
"a": 3.8 – 4.8 mm (0.15 – 0.19 in.)

4) Apply grease to oil seal lip.

: Grease 99000–25030



I2RH0B510252-

Automatic Transaxle Unit Inspection and Adjustment

S4RS0A5106063

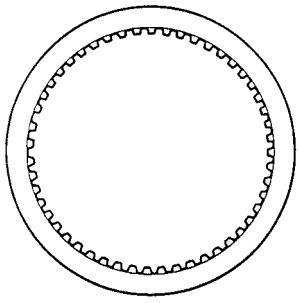
Inspection

Brake discs

Dry and inspect them for pitting, burn flaking, significant wear, glazing, cracking, charring and chips or metal particles imbedded in lining.
If discs show any of the above conditions, replacement is required.

NOTE:

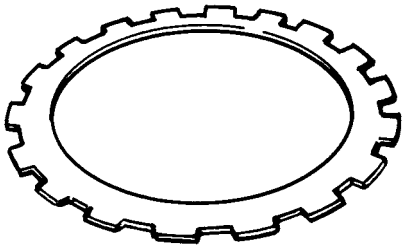
- **If disc lining is exfoliated or discolored, replace all discs.**
- **Before assembling new discs, soak them in A/T fluid for at least two hours.**



I2RH01510147-

Brake separator plates and retaining plates

Dry plates and check for discoloration. If plate surface is smooth and even color smear is indicated, plate should be reused. If severe heat spot discoloration or surface scuffing is indicated, plate must be replaced.



I2RH0B510253-

Brake return spring subassembly

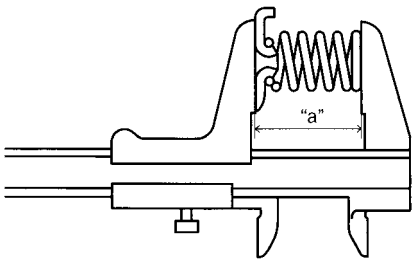
Measure brake return springs.
Evidence of extreme heat or burning in the area of clutch may have caused springs to take heat set and would require their replacement.

Free length of 1st & reverse brake return spring
"a": 21.71 mm (0.855 in.)

Free length of 2nd brake return spring
"a": 15.85 mm (0.624 in.)

NOTE:

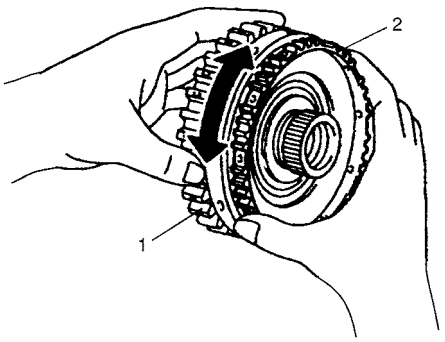
- **Do not apply excessive force when measuring spring free length.**
- **Perform measurement at several points.**



I2RH0B510173-

One-way clutch No.1 assembly

1) Install one-way clutch No.1 assembly (2) to rear planetary sun gear subassembly (1).
2) Securing rear planetary sun gear subassembly, ensure that one-way clutch No.1 assembly rotates only in one direction.
   If the one-way clutch rotates in both directions or it does not rotate in either direction, replace it with new one.



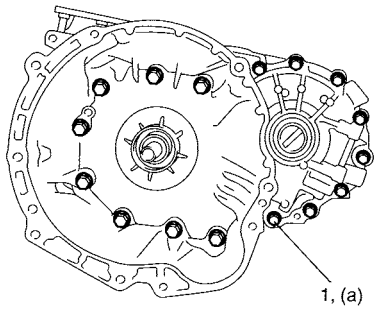
I2RH0B510254-

Adjustment

Differential side bearing preload

1) After applying A/T fluid to differential assembly, fit it to transaxle case.
2) Install torque converter housing to transaxle case, then tighten bolts (1) to specified torque.

Tightening torque
Torque converter housing bolt (a): 33 N·m (3.3 kg-m, 24.0 lb-ft)

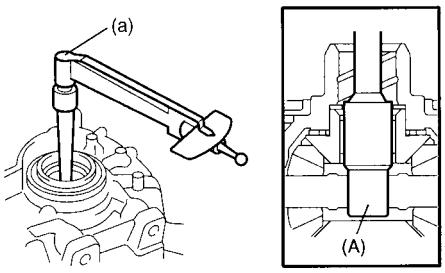


I2RH0B510255-

3) Measure bearing preload (a) by using a special tool.

Special tool
(A): 09928–06050

Differential side bearing preload (a) measured as starting torque
In the case of new bearing: 0.78 – 1.37 N·m (7.9 – 13.9 kg-cm, 0.58 – 1.01 lb-ft)
In the case of reused bearing: 0.39 – 0.69 N·m (3.9 – 6.9 kg-cm, 0.29 – 0.51 lb-ft)



I2RH0B510256-

4) If bearing preload is out of specification, select shim with suitable thickness from among the list below and replace it. Then adjust differential side bearing preload within specification.

Available shim thickness

Thickness	Identification mark
1.80 mm (0.070 in.)	A
1.85 mm (0.072 in.)	B
1.90 mm (0.074 in.)	C
1.95 mm (0.076 in.)	D
2.00 mm (0.078 in.)	E
2.05 mm (0.080 in.)	F
2.08 mm (0.081 in.)	G
2.11 mm (0.083 in.)	H
2.14 mm (0.084 in.)	J
2.17 mm (0.085 in.)	K
2.20 mm (0.087 in.)	L
2.23 mm (0.088 in.)	M
2.26 mm (0.089 in.)	N
2.29 mm (0.090 in.)	P
2.32 mm (0.091 in.)	Q
2.35 mm (0.092 in.)	R
2.40 mm (0.094 in.)	S
2.45 mm (0.096 in.)	T
2.50 mm (0.098 in.)	U
2.55 mm (0.100 in.)	V
2.60 mm (0.102 in.)	W
2.65 mm (0.104 in.)	X
2.70 mm (0.106 in.)	Y

NOTE:

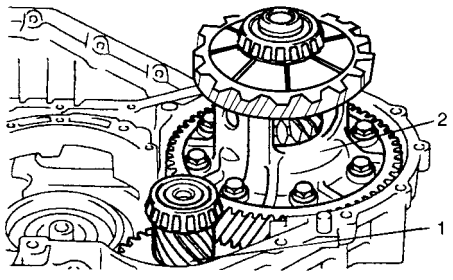
Record measured differential side bearing, because it is necessary to adjust countershaft bearing preload.

5) Remove differential assembly.

Countershaft bearing preload

1) After applying A/T fluid to countershaft assembly (1) and differential assembly (2), fit them.
2) Install torque converter housing to transaxle case, then tighten bolts to specified torque.

Tightening torque
Torque converter housing bolt: 33 N·m (3.3 kg-m, 24.0 lb-ft)



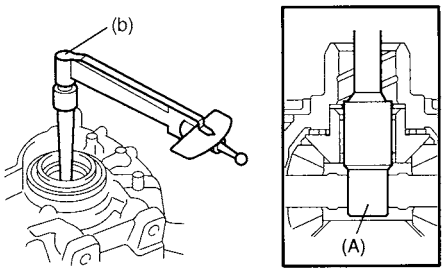
I2RH0B510257-

3) Measure bearing preload (b) by using special tool.

Special tool
(A): 09928–06050

Countershaft bearing preload	=	(b) – Differential side bearing preload (a)

Countershaft bearing preload (b) measured as starting torque
In the case of new bearing: 0.33 – 0.76 N·m (3.3 – 7.6 kg-cm, 0.24 – 0.55 lb-ft)
In the case of reused bearing: 0.17 – 0.38 N·m (1.7 – 3.8 kg-cm, 0.12 – 0.28 lb-ft)



I3RM0B510067-

4) If bearing preload is out of specification, select shim with suitable thickness from among the list below and replace it. Then adjust countershaft bearing preload within specification.

Available shim thickness

Thickness	Identification mark
1.70 (0.066 in.)	1
1.75 (0.068 in.)	2
1.80 (0.070 in.)	3
1.85 (0.072 in.)	4
1.90 (0.074 in.)	5
1.93 (0.075 in.)	6
1.96 (0.077 in.)	7
1.99 (0.078 in.)	A
2.02 (0.079 in.)	B
2.05 (0.080 in.)	C
2.08 (0.081 in.)	D
2.11 (0.083 in.)	E
2.14 (0.084 in.)	F
2.17 (0.085 in.)	G
2.20 (0.086 in.)	H
2.25 (0.088 in.)	K
2.30 (0.090 in.)	L
2.35 (0.092 in.)	M
2.40 (0.094 in.)	N
2.45 (0.096 in.)	P
2.50 (0.098 in.)	Q
2.55 (0.100 in.)	R
2.60 (0.102 in.)	S
2.65 (0.104 in.)	U
2.70 (0.106 in.)	W

5) Remove differential assembly and countershaft assembly.

Automatic Transaxle Unit Assembly

S4RS0A5106058

CAUTION:

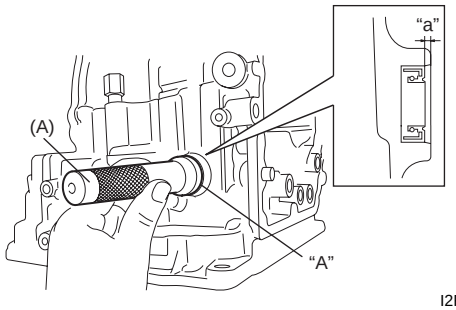
- **Automatic transaxle consists of highly precise parts. As even flaw in small part may cause oil leakage or decrease in function, check each part carefully before installation.**
- **Clean all parts with compressed air. Never use wiping cloths or rags.**
- **Before assembling new clutch or brake discs, soak them in automatic transaxle fluid for at least 2 hours.**
- **Be sure to use new gaskets and O-rings.**
- **Lubricate O-rings with automatic transaxle fluid.**
- **Apply automatic transaxle fluid on sliding or rotating surfaces of the parts before assembly.**
- **Use Suzuki Super Grease "C" to retain parts in place.**
- **Be sure to install thrust bearings and races in correct direction and position.**
- **Make sure that snap ring ends are not aligned with one of cutouts and are installed in groove correctly.**
- **Do not use adhesive cements on gaskets and similar parts.**
- **Be sure to torque each bolt and nut to specification.**

1) Install new manual shift shaft oil seal to transaxle case.
Use special tool and hammer to install it, and then apply grease to its lip.

Special tool
(A): 09925–98210

"A": Grease 99000–25030

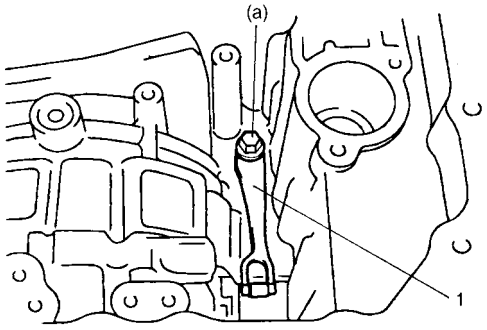
Manual shift shaft oil seal installing depth
"a": 0.75 – 1.25 mm (0.03 – 0.05 in.)



I2RH0B510258-

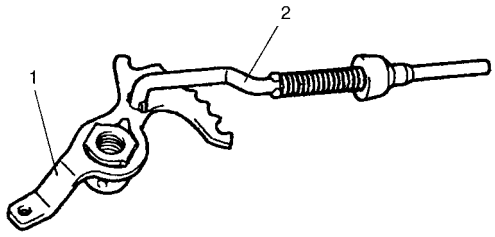
2) Install manual detent spring (1) to transaxle case and tighten manual detent spring bolt to specified torque.

Tightening torque
Manual detent spring bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



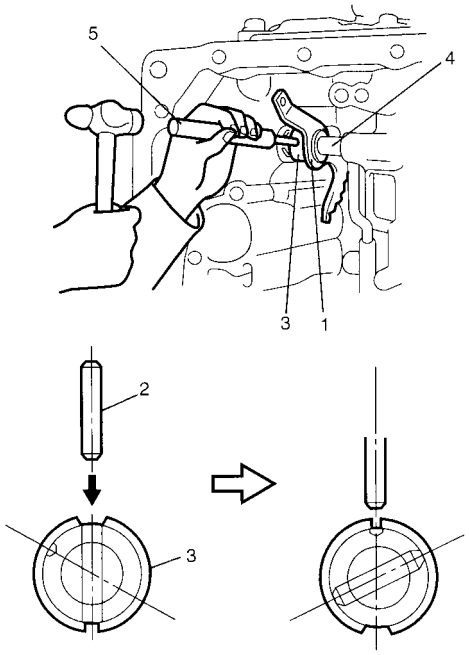
I2RH0B510259-

3) Install parking lock pawl rod (2) to manual valve lever (1).



I2RH0B510260-

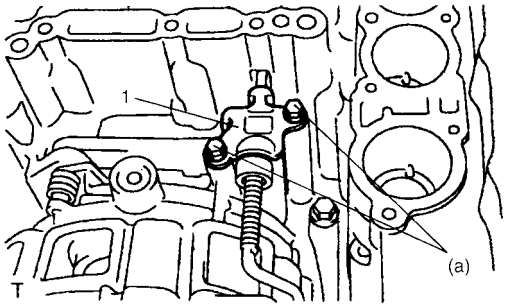
4) After applying A/T fluid to new manual valve lever (1), install new manual shift shaft (4), new spacer (3) and manual valve lever to transaxle case.
5) After installing manual valve lever pin (2) by using spring pin remover with 3 mm (0.12 in.) in diameter (5) and hammer, turn spacer to set the position as shown in figure. Then caulk spacer with a punch.



I2RH0B510261-

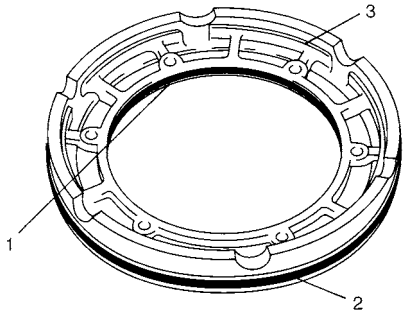
6) Install parking lock pawl bracket (1) to transaxle case.

Tightening torque
Parking lock pawl bracket bolt (a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



I2RH0B510262-

7) After applying A/T fluid to new O-rings, install them to 1st and reverse brake piston (3).



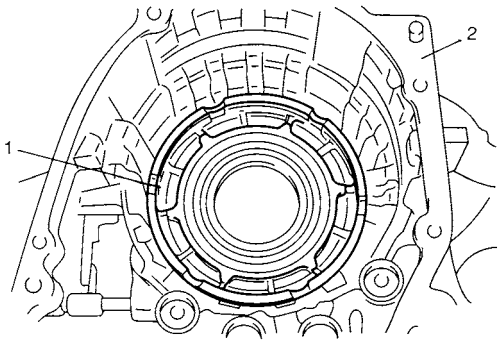
I2RH0B510263-

1. Inner O-ring	2. Outer O-ring

8) Install 1st and reverse brake piston (1) to transaxle case (2).

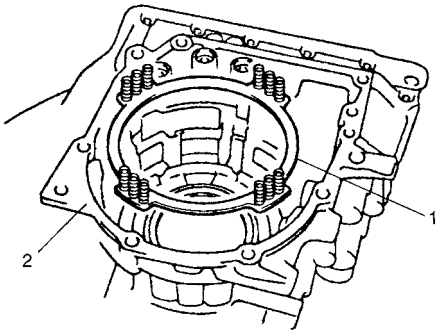
NOTE:

Be careful not to damage O-ring when installing 1st and reverse brake piston.



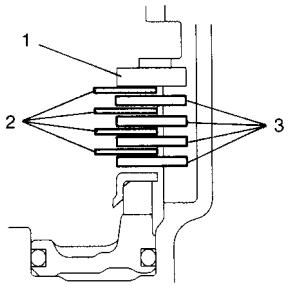
I2RH0B510264-

9) Install 1st and reverse brake return spring subassembly (1) to transaxle case (2).



I2RH0B510265-

10) Apply A/T fluid to 1st and reverse brake discs (2), separator plates (3) and retaining plate (1), then install them to transaxle case.



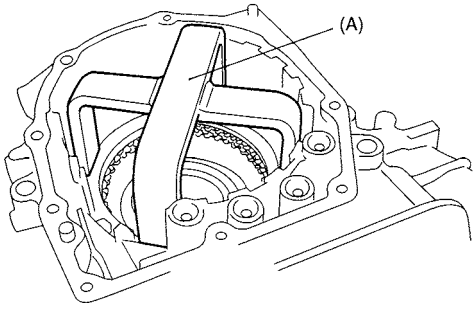
I2RH0B510266-

11) Compress 1st and reverse brake return spring using special tool and hydraulic press, then attach snap ring.

CAUTION:

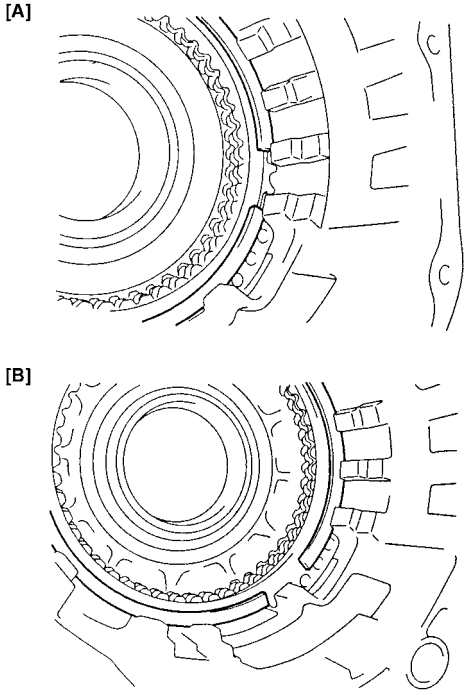
Do not damage 1st and reverse brake return spring subassembly discs, plates and piston by pressing in 1st and reverse brake return spring subassembly passing through its original installing position over 0.8 mm (0.031 in.).

Special tool
(A): 09926–97620



I2RH0B510267-

12) Install 1st and reverse brake plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



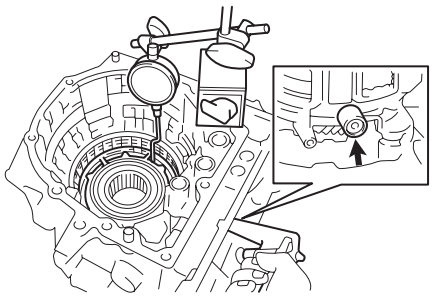
I2RH0B510268-

[A]: Correct	[B]: Incorrect

13) Using special tools, measure 1st and reverse brake piston stroke when compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) is brown through oil hole.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

1st and reverse brake piston stroke
Standard: 0.791 – 1.489 mm (0.0311 – 0.0586 in.)



I2RH0B510269-

14) Install reduction drive gear (1) to transaxle case (3) by using special tools and hydraulic press.

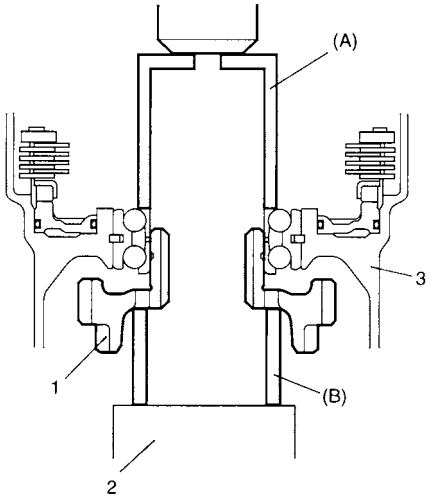
CAUTION:

- **Do not use transaxle case as groundwork to press fit reduction drive gear.**
- **Do not give load more than 20 kN (2000 kg, 4410 lb) with hydraulic press. Otherwise, it may result in damaging reduction drive gear bearing.**

NOTE:

When replacing reduction drive gear, replace it together with reduction driven gear as a set.

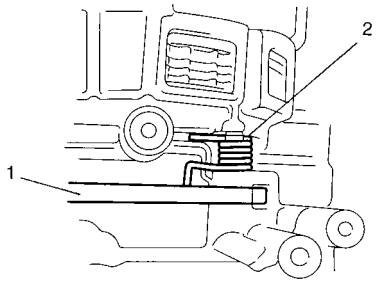
Special tool
(A): 09951–18210
(B): 09944–78210



I2RH0B510270-

2. Stand that can slightly lift transaxle case.

15) Install parking lock pawl (1) and spring (2). Apply A/T fluid to parking lock pawl shaft, then insert it into transaxle case.



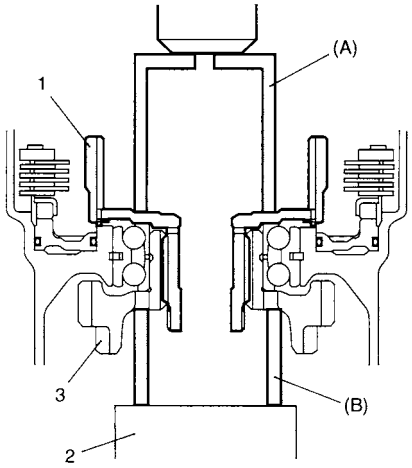
I2RH0B510271-

16) Install new planetary ring gear subassembly (1) to reduction drive gear (3) by using special tools and hydraulic press.

CAUTION:

- **Do not reuse planetary ring gear subassembly. Otherwise it may cause damage to planetary gear unit and/or reduction gears.**
- **Do not use transaxle case as groundwork to press fit planetary ring gear subassembly.**
- **Do not give load more than 20 kN (2000 kg, 4410 lb) with hydraulic press. Otherwise, it may result in damaging reduction drive gear bearing.**

Special tool
(A): 09951–18210
(B): 09944–78210



I2RH0B510272-

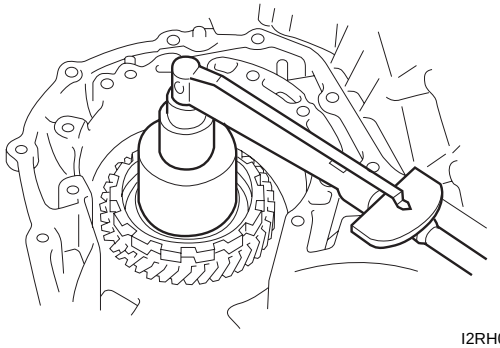
2. Stand that can slightly lift transaxle case.

17) Using a small torque wrench, while turning to counter drive gear 100 rpm and measure the preload.

CAUTION:

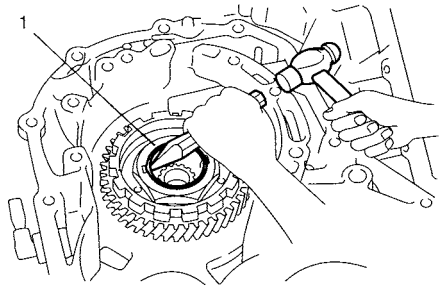
- **Do not tighten nut over the specifications so that reduction drive gear nut would not be broken.**
- **Carry out this procedure on rubber mat in order not to damage transaxle case.**

Reduction drive gear bearing preload measured as starting torque
Standard: 0.05 – 0.35 N·m (0.5 – 3.5 kg-cm, 0.036 – 0.253 lb-ft)



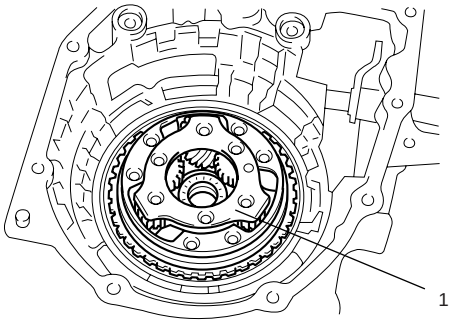
I2RH0B510273-

18) Caulk reduction drive gear nut (1).



I2RH0B510274-

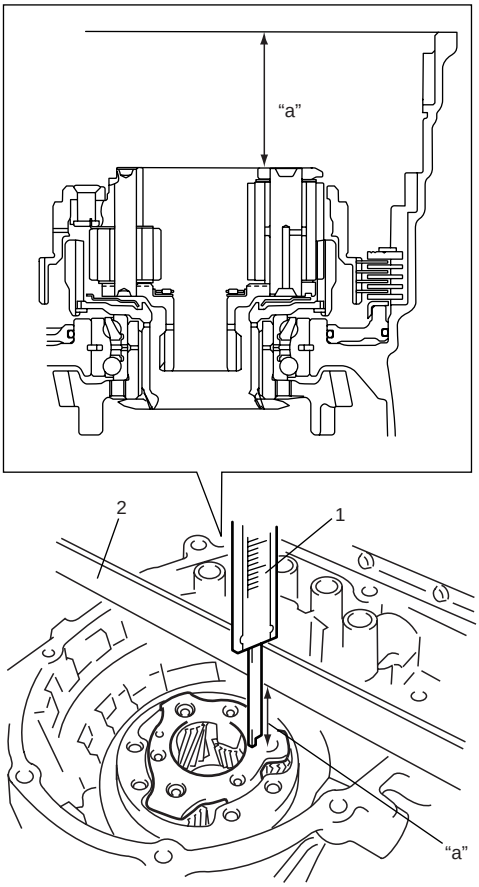
19) Apply A/T fluid to planetary gear assembly (1), then fit it to planetary ring gear assembly.



I2RH0B510275-

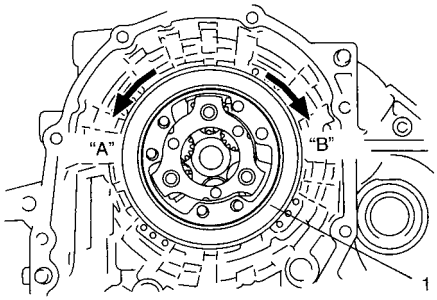
20) Check for correct installation of planetary gear assembly as follows.
Measure the distance “a” by using micrometer caliper (1) and straightedge (2). If measured value is out of specification, remove planetary gear assembly and reinstall it properly.

Distance between planetary gear assembly and mating surface of transaxle case
“a”: More than 49.9 m (1.965 in.)



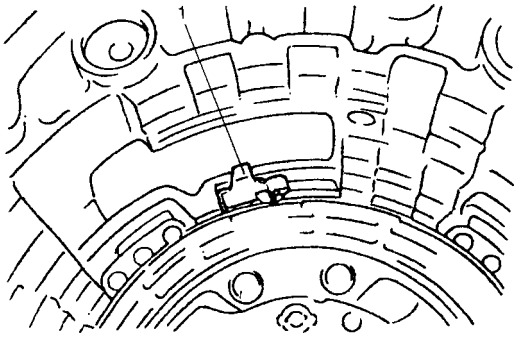
I2RH0B510276-

21) Apply A/T fluid to one-way clutch No.2 assembly (1), then install it to planetary gear assembly. After that, ensure that planetary carrier rotates only in counterclockwise direction “A”, not in clockwise direction “B”.



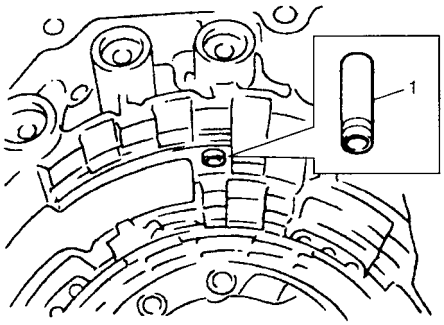
I2RH0B510277-

22) Install one-way clutch outer race retainer (1).



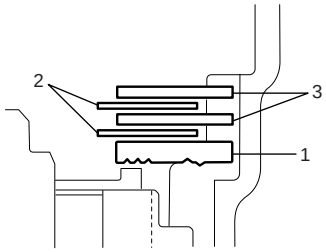
I2RH0B510278-

23) Apply A/T fluid to new brake drum gasket (1), then install it to transaxle case.



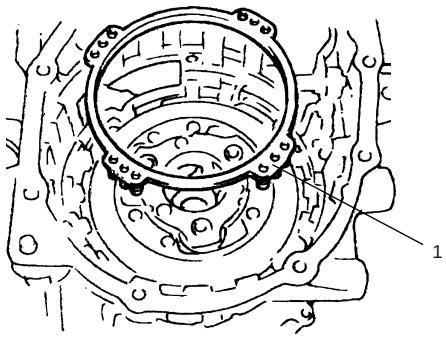
I2RH0B510279-

24) Apply A/T fluid to 2nd brake retaining plate (1), discs (2) and separator plates (3), then install them to transaxle case.



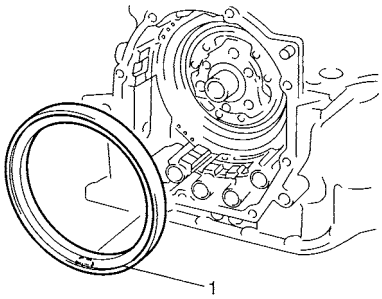
I2RH0B510280-

25) Install 2nd brake return spring subassembly (1) to transaxle case.



I2RH0B510281-

26) Apply A/T fluid to 2nd brake piston assembly (1), and align the projection of 2nd brake piston assembly with the groove of transaxle case, then put together.



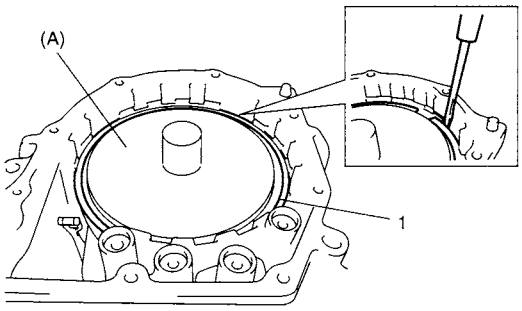
I2RH0B510282-

27) Install 2nd brake piston snap ring (1) by using special tool and hydraulic press.

CAUTION:

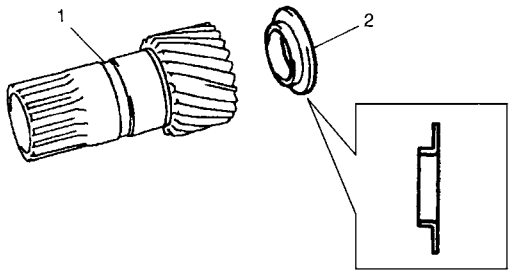
Do not damage 2nd brake piston assembly, return spring subassembly, plates and discs by pressing in 2nd brake assembly passing through its original installing position over 0.4 mm (0.016 in.).

Special tool
(A): 09926–96050



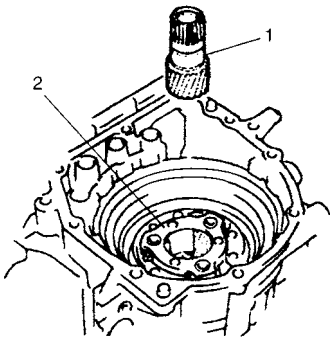
I2RH0B510283-

28) After applying A/T fluid to front sun gear thrust bearing race (2), install it to front planetary sun gear (1).



I2RH0B510285-

29) Apply A/T fluid to front planetary sun gear (1) and install it to planetary gear assembly (2).

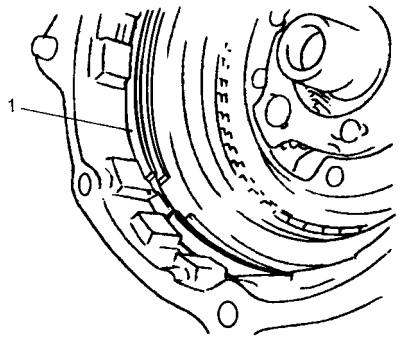


I2RH0B510286-

30) Install O/D and 2nd coast brake retaining plate snap ring (1).

CAUTION:

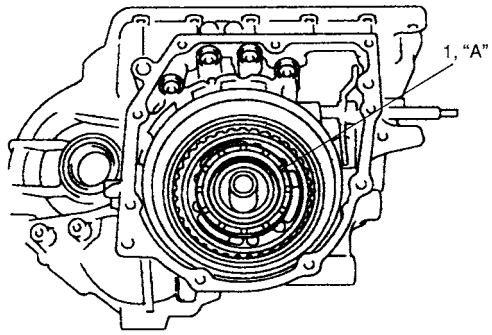
Be sure to install O/D and 2nd coast brake retaining plate snap ring correctly in groove of transaxle case.



I2RH0B510287-

31) After applying grease to slide contact face of planetary carrier thrust washer (1), install it to planetary gear assembly.

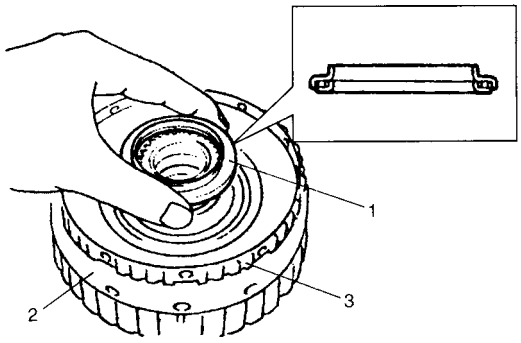
"A": Grease 99000–25030



I2RH0B510288-

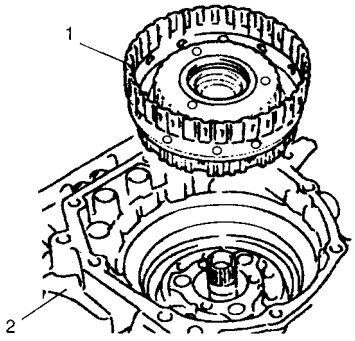
32) Apply A/T fluid to one-way clutch No.1 assembly (3) and install one-way clutch No.1 assembly (3) to rear planetary sun gear subassembly (2).

33) Apply A/T fluid to planetary gear thrust bearing (1), then install it to one-way clutch No.1 assembly (3).



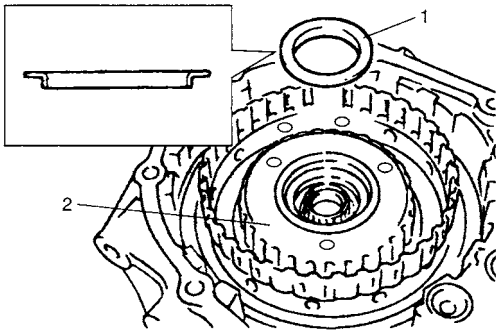
I2RH0B510289-

34) After applying A/T fluid to rear planetary sun gear subassembly and one-way clutch No.1 assembly (1), install them in transaxle case (2).



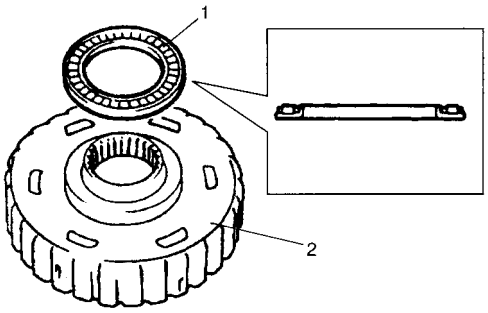
I2RH0B510290-

35) After applying A/T fluid to rear sun gear thrust bearing race (1), install it to rear planetary sun gear (2).



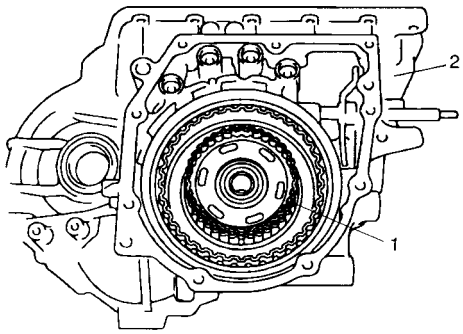
I2RH0B510291-

36) After applying A/T fluid to rear sun gear thrust bearing (1), install it to forward clutch hub (2).



I2RH0B510292-

37) After applying A/T fluid to forward clutch hub (1), install it in transaxle case (2).

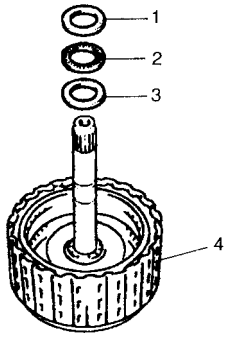


I2RH0B510293-

38) After applying A/T fluid to intermediate shaft thrust bearing rear race (3), thrust bearing (2) and front race (1), install them to forward and reverse clutch assembly (4).

Bearing race dimension

	Front race	Rear race
Outside diameter	30.6 mm (1.20 in.)	28.2 mm (1.11 in.)
Thickness	2.0 mm (0.08 in.)	2.0 mm (0.08 in.)

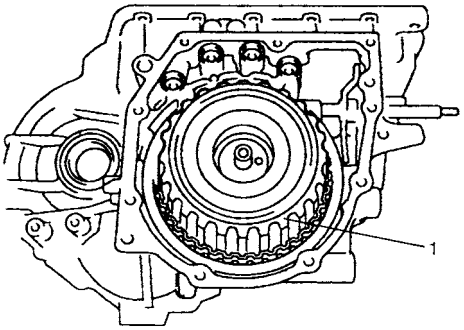


I2RH0B510294-

39) Apply A/T fluid to forward and reverse clutch assembly (1).
Install forward and reverse clutch assembly while rotating clockwise and counterclockwise frequently to fit clutch discs to mating hubs.

NOTE:

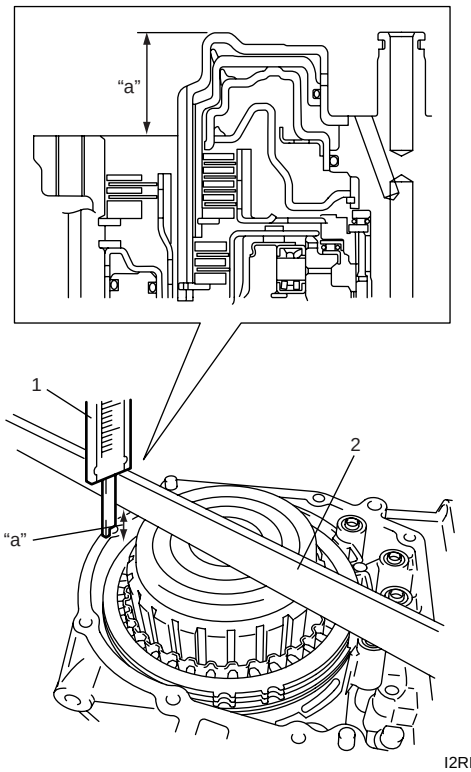
Before installation, align teeth of forward and reverse clutch discs to facilitate installation.



I2RH0B510295-

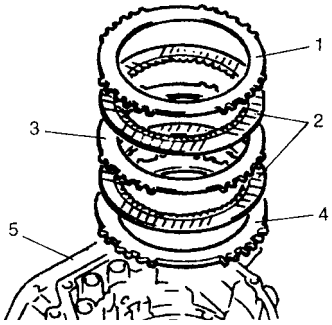
40) Check for correct installation of forward and reverse clutch assembly as follows.
Measure distance “a” by using micrometer caliper (1) and straightedge (2). If out of specification, remove forward and reverse clutch assembly, forward clutch hub, rear planetary sun gear subassembly and one-way clutch No.1 assembly, and reinstall them properly.

Distance between forward and reverse clutch assembly and mating surface of transaxle case
“a”: 27.1 – 29.4 mm (1.067 – 1.157 in.)



I2RH0B510296-

41) After applying A/T fluid to O/D and 2nd coast brake retaining plate (4), separator plate (3), discs (2) and rear plate (1), install them to transaxle case (5).



I2RH0B510297-

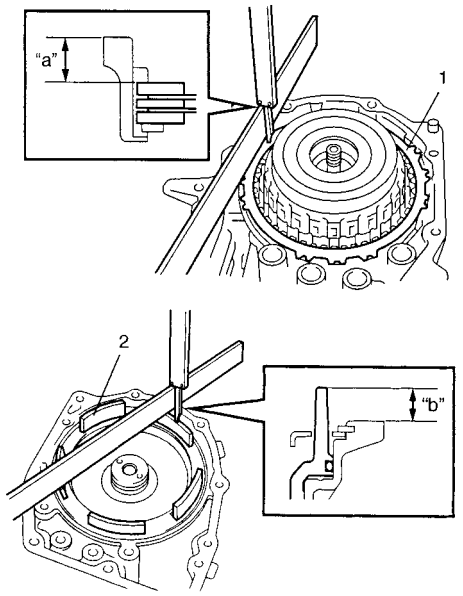
42) Measure O/D and 2nd coast brake piston stroke.
- Measure dimension “a” from end face of transaxle case to O/D and 2nd coast brake rear plate (1) using straightedge and micrometer caliper.
- Measure dimension “b” from O/D and 2nd coast brake piston (2) to rear cover assembly mating surface using straightedge and micrometer caliper.
- Calculate piston stroke from measured value of dimensions “a” and “b”.
- Piston stroke = “a” – “b”

O/D and 2nd coast brake piston stroke
Standard: 0.65 – 1.05 mm (0.026 – 0.041 in.)

When piston stroke is out of specification, select O/D and 2nd coast brake rear plate with proper thickness from among the following table and replace it.

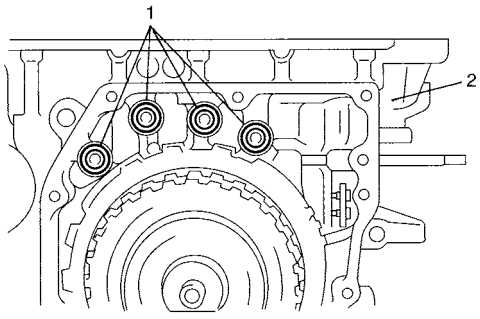
Available O/D and 2nd coast brake rear plate thickness

Thickness	Identification mark
1.8 mm (0.071 in.)	1
2.0 mm (0.079 in.)	2
2.2 mm (0.087 in.)	3
2.4 mm (0.094 in.)	4
2.6 mm (0.102 in.)	5



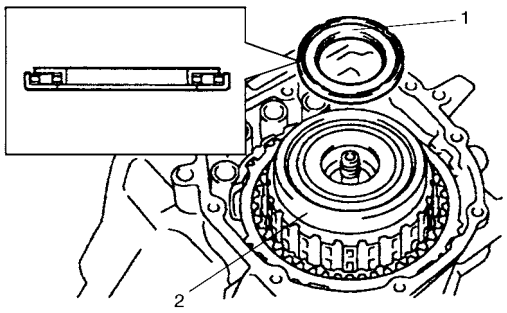
I2RH0B510298-

43) After applying A/T fluid to new 2nd brake gaskets (1), install them to transaxle case (2).



I2RH0B510299-

44) After applying A/T fluid to reverse clutch drum thrust bearing (1), install it to forward and reverse clutch assembly (2).

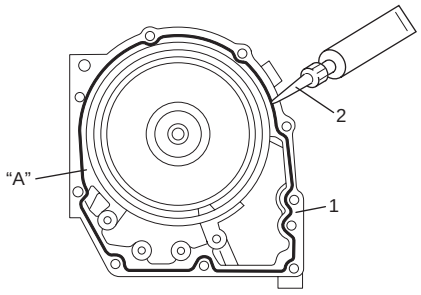


I2RH0B510300-

45) Remove sealant attached to mating surface of transaxle rear cover (1) completely.

46) Apply sealant to mating surface of transaxle rear cover (1) by using a nozzle (2) as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter.

"A": Sealant 99000–31230



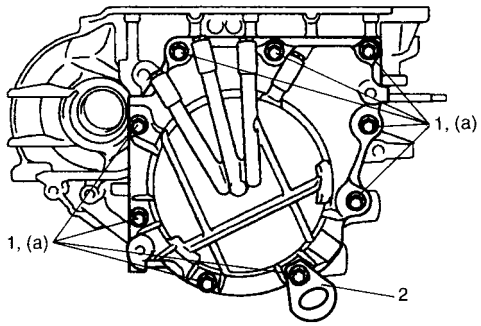
I2RH0B510301-

47) Install transaxle rear cover assembly on transaxle case.

48) Install hook (2) to location shown in figure.

49) Tighten rear cover bolts (1).

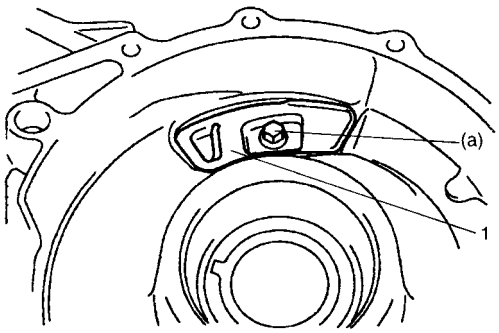
Tightening torque
Rear cover bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I3RM0B510068-

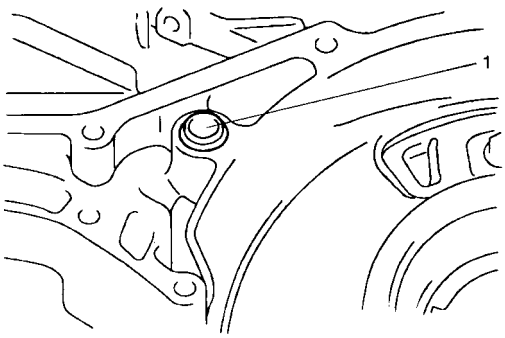
50) Install fluid reservoir LH plate (1).

Tightening torque
Fluid reservoir LH plate bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



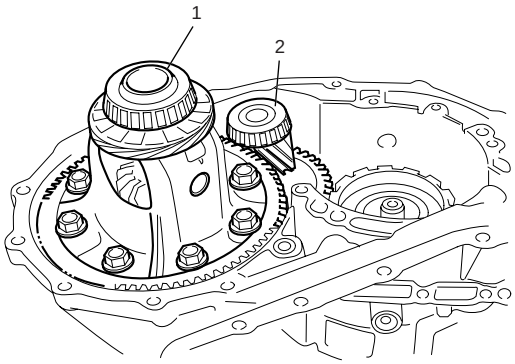
I2RH0B510303-

51) After applying A/T fluid to new governor apply No.2 gasket (1), install it to transaxle case.



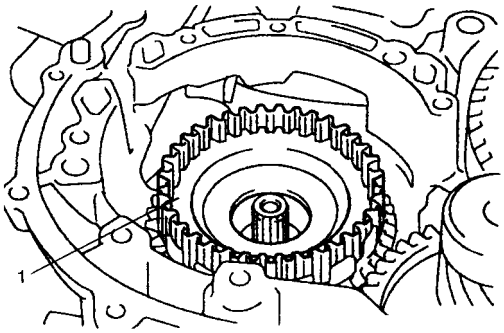
I2RH0B510304-

52) After applying A/T fluid to differential assembly (1) and countershaft assembly (2), install them to transaxle case.



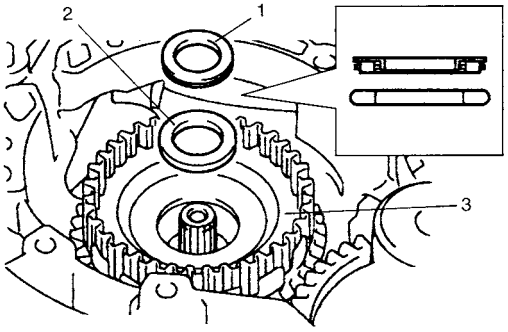
I4RS0A510036-

53) After applying A/T fluid to direct clutch hub (1), install it to planetary gear assembly.



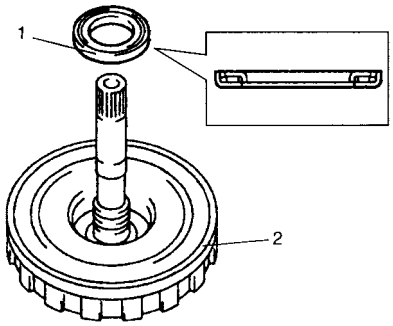
I2RH0B510306-

54) After applying A/T fluid to input shaft rear thrust bearing (1) and thrust bearing race (2), install them into direct clutch hub (3).



I2RH0B510307-

55) After applying A/T fluid to input shaft front thrust bearing (1), install it to direct clutch assembly (2).

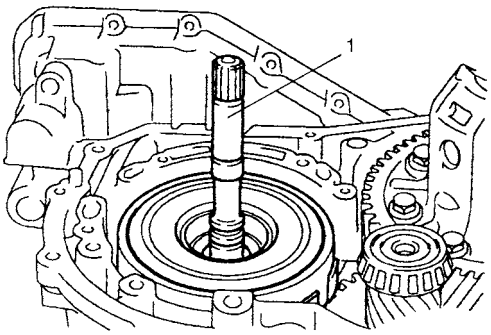


I2RH0B510308-

56) Apply A/T fluid to direct clutch assembly (1). Install direct clutch assembly while rotating clockwise and counterclockwise frequently to fit clutch discs to mating hub.

NOTE:

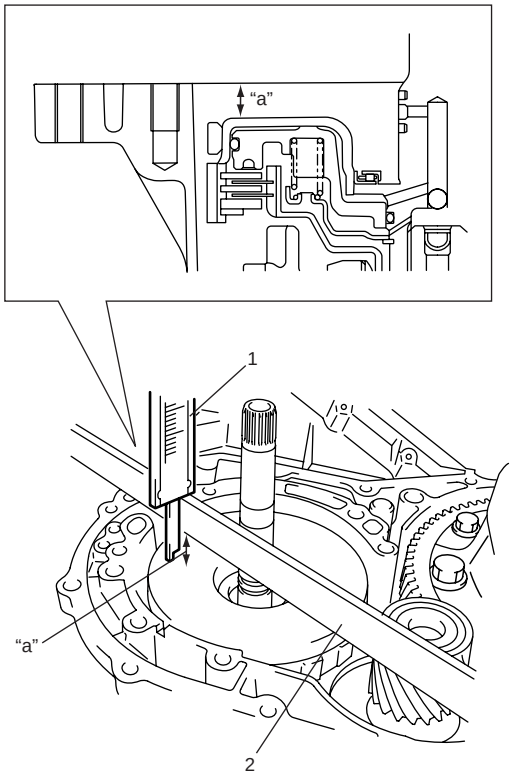
Before installation, align teeth of direct clutch discs to facilitate installation.



I2RH0B510309-

57) Check for correct installation of direct clutch assembly as follows.
Measure distance “a” by using micrometer caliper (1) and straightedge (2). If out of specification, remove direct clutch assembly, direct clutch hub and reinstall them properly.

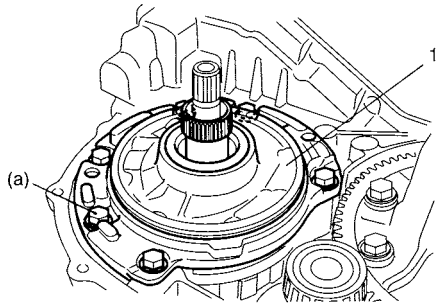
Distance between direct clutch assembly and mating surface of transaxle case
“a”: 10.5 – 11.3 mm (0.413 – 0.445 in.)



I2RH0B510310-

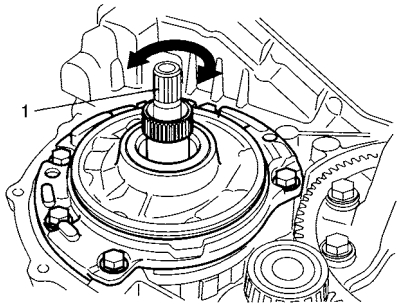
58) Install oil pump assembly (1) to transaxle case.

Tightening torque
Oil pump assembly bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



I2RH0B510311-

59) Make sure that input shaft (1) turns smoothly.



I2RH0B510312-

60) Measure input shaft thrust play.
Apply dial gauge onto input shaft end (1) and measure thrust play of input shaft.

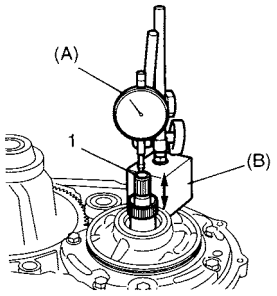
Special tool
(A): 09900–20607
(B): 09900–20701

Input shaft thrust play
0.3 – 0.9 mm (0.012 – 0.035 in.)

When input shaft thrust play is out of specification, select input shaft front thrust bearing with proper thickness from among the following table and replace it.

Available input shaft front thrust bearing thickness

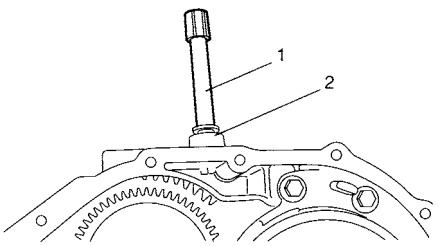
Thickness	Outside diameter	Inside diameter
3.45 mm (0.14 in.)	48.5 mm (1.90 in.)	32.9 mm (1.30 in.)
4.05 mm (0.16 in.)	48.5 mm (1.90 in.)	32.5 mm (1.28 in.)



I2RH0B510313-

61) After applying A/T fluid to new O-ring, fit it to breather union (2). Then install breather union to transaxle case.

62) Install breather hose (1).

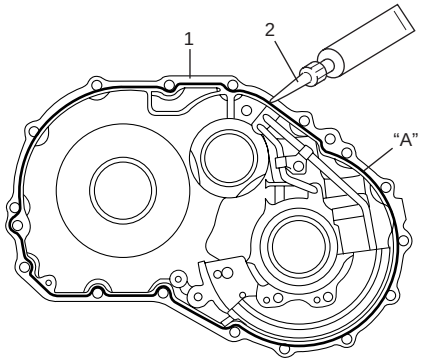


I2RH0B510314-

63) Wipe off and clean mating surface between transaxle case (1) and torque converter housing.

64) Apply sealant to torque converter housing by using a nozzle (2) as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter.

"A": Sealant 99000–31230



I2RH0B510315-

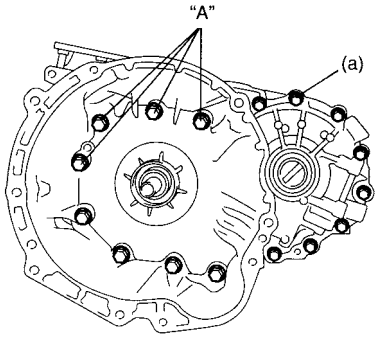
65) Install torque converter housing to transaxle case, tighten bolts to specified torque.

CAUTION:

Apply sealant to threads of four bolts shown in figure before tightening.

"A": Sealant 99000–31230

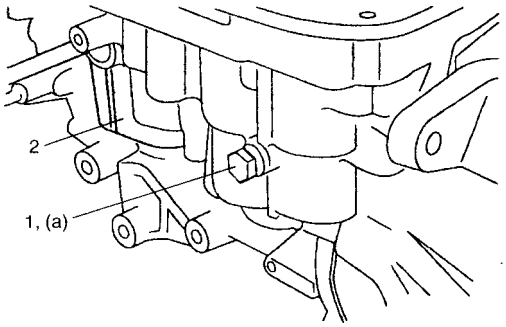
Tightening torque
Torque converter housing bolt (a): 33 N·m (3.3 kg-m, 24.0 lb-ft)



I3RM0B510069-

66) After applying A/T fluid to new O-ring, fit it to transaxle case plug (1). Then install the transaxle case plug to transaxle case (2).

Tightening torque
Transaxle case plug (a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



I2RH0B510317-

67) Install new O-rings to each accumulator piston and apply A/T fluid to them.

Accumulator O-ring dimension

O-ring name	Inside diameter	Section diameter
Large B1 accumulator O-ring (2) Large C1 accumulator O-ring (2) Large C2 accumulator O-ring (2) – Above three O-rings are same.	29.4 mm (1.16 in.)	2.6 mm (0.10 in.)
Small B1 accumulator O-ring (4)	19.7 mm (0.78 in.)	2.6 mm (0.10 in.)
Small C1 accumulator O-ring (6) Small C2 accumulator O-ring (6) – Above two O-rings are same.	21.8 mm (0.86 in.)	2.6 mm (0.10 in.)

NOTE:

Make sure that O-rings are not twisted or caught when installing.

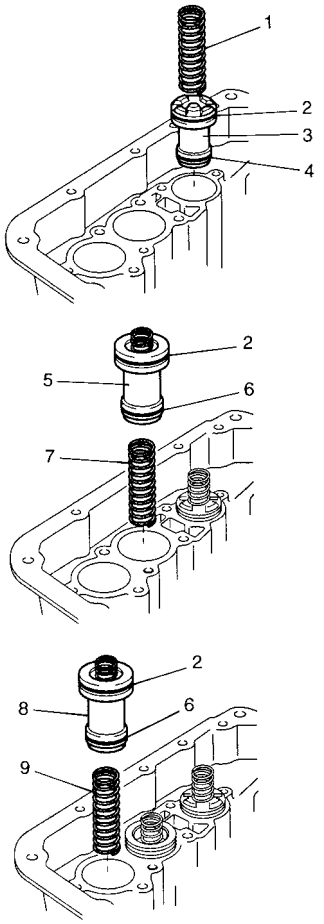
68) Install B1, C1, C2 accumulator pistons and springs.

Accumulator piston identification

Piston name	Identification as embossed letters on piston
B1 accumulator piston (3)	SB-1
C1 accumulator piston (5)	S2C-1
C2 accumulator piston (8)	S2C-2

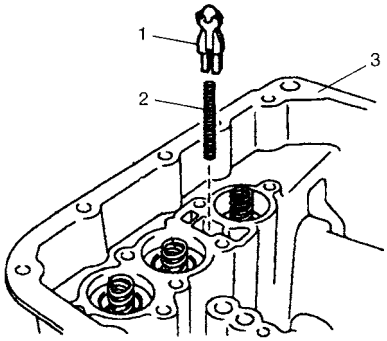
Accumulator spring identification

Spring name	Color of identification paint
B1 accumulator No.2 spring (1)	Pink
C1 accumulator No.2 spring (7)	Light blue
C2 accumulator No.2 spring (9)	Yellow



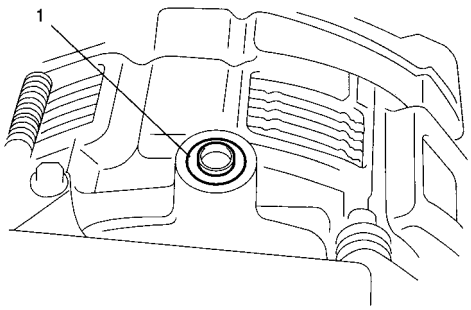
I2RH0B510318-

69) After applying A/T fluid to cooler check valve (1) and spring (2), install them to transaxle case (3).



I2RH0B510319-

70) After applying A/T fluid to new governor apply No.1 gasket (1), install it to transaxle case.



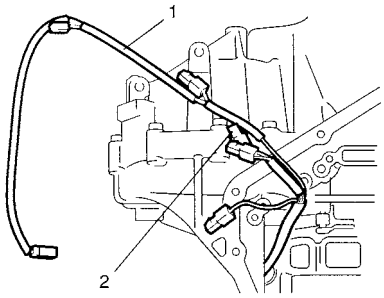
I2RH0B510320-

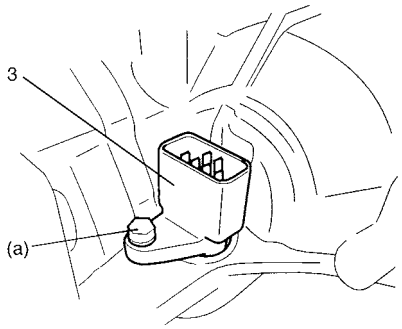
71) After applying A/T fluid to new O-ring, fit it to valve body harness connector (3), then install valve body harness to transaxle case.

CAUTION:

When put valve body harness (1) into transaxle case, take care not to damage transmission fluid temperature sensor (2) at narrow entrance of case.
Careless sensor treatment might cause sensor malfunction.

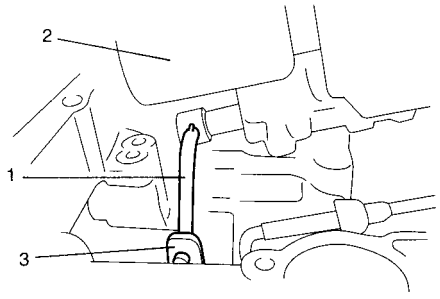
Tightening torque
Valve body harness connector bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)





I2RH0B510321-

72) Install manual valve rod (1) to manual valve lever (3) and then install valve body assembly (2) to transaxle case.



I2RH0B510322-

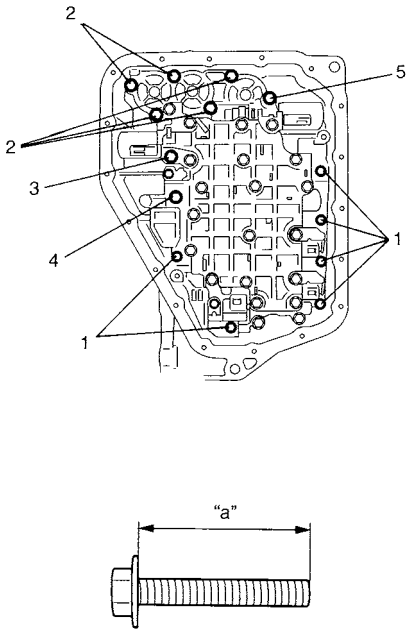
73) Tighten valve body bolts to specified torque.

Tightening torque
Valve body bolt: 11 N·m (1.1 kg-m, 8.0 lb-ft)

Valve body bolt length

Bolt	Length “a”	Pieces
A (1)	20 mm (0.79 in.)	6

Bolt	Length “a”	Pieces
B (2)	28 mm (1.10 in.)	5
C (3)	49 mm (1.93 in.)	1
D (4)	36 mm (1.42 in.)	1
E (5)	40 mm (1.58 in.)	1

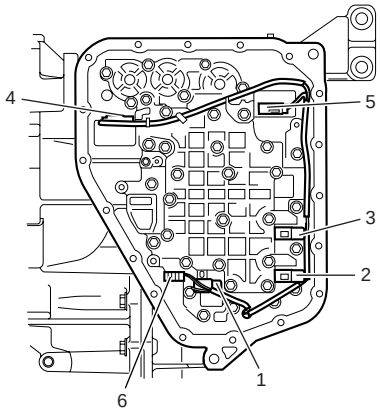


I2RH0B510323-

74) Connect solenoid connectors to solenoid valves identifying their installing positions by wire colors, and install transmission fluid temperature sensor to its clamp.

Solenoid valve coupler specification

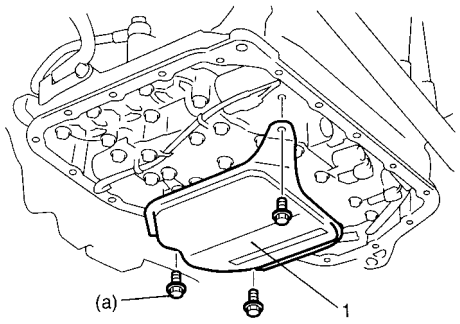
Solenoid valve coupler	Wire color
Shift solenoid valve-A (1)	White
Shift solenoid valve-B (2)	Black
Timing solenoid valve (3)	Yellow
TCC pressure control solenoid valve (4)	Light green / Brown
Pressure control solenoid valve (5)	Gray / Green
Transmission fluid temperature sensor (6)	Orange



I4RS0A510030-

75) Install oil strainer assembly (1).

Tightening torque
Oil strainer bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

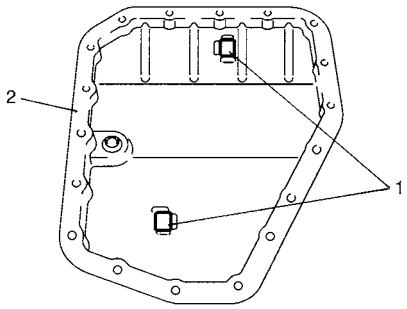


I2RH0B510325-

76) Install oil cleaner magnets (1) in oil pan (2).

NOTE:

If metal particles are attached to the magnets, clean them before installing.

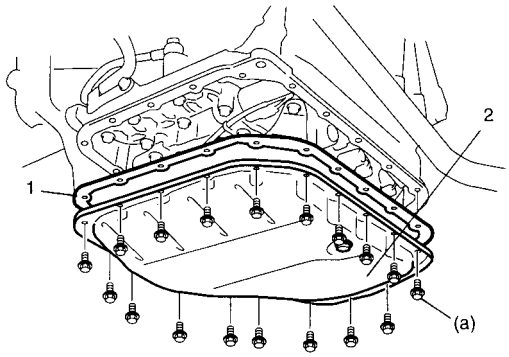


I2RH0B510326-

77) Install new oil pan gasket (1) between transaxle case and oil pan (2).

78) Tighten oil pan bolts to specified torque diagonally and little by little.

Tightening torque
Oil pan bolt (a): 7.0 N·m (0.7 kg-m, 5.0 lb-ft)



I2RH0B510327-

79) After applying A/T fluid to new O-rings, fit it to fluid inlet union (1). Then install fluid outlet union to transaxle case.

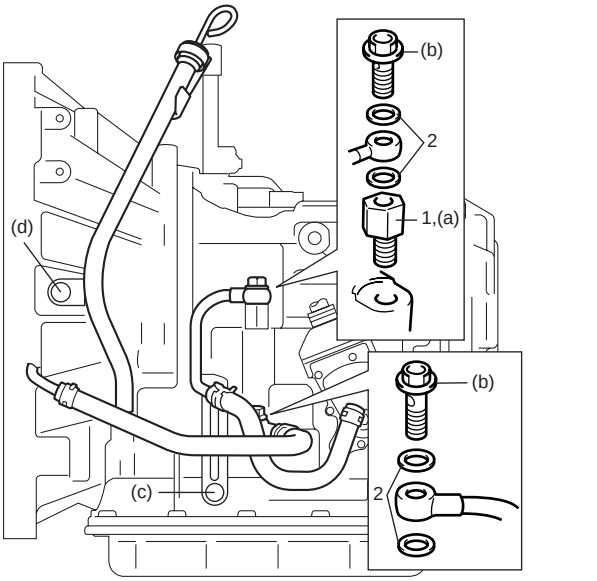
Tightening torque
Fluid outlet union (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

80) Install new gaskets (2) and then install fluid cooler pipes.

Tightening torque
Fluid cooler pipe union bolt (b): 22 N·m (2.2 kg-m, 16.0 lb-ft)
Fluid cooler pipe bracket bolt (c): 10 N·m (1.0 kg-m, 7.5 lb-ft)

81) After applying A/T fluid to new O-ring, fit it to fluid filler tube. Then install fluid filler tube to transaxle case.

Tightening torque
Fluid filler tube bolt (d): 10 N·m (1.0 kg-m, 7.5 lb-ft)



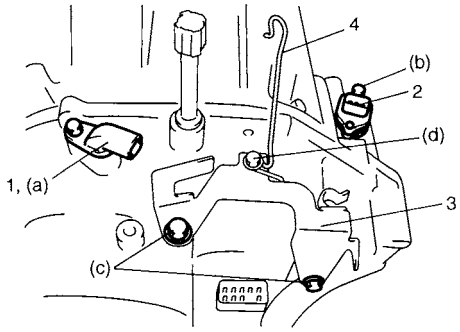
I3RM0B510070-

82) Apply A/T fluid to O-rings of each sensor and install input shaft speed sensor (1) and output shaft speed sensor (VSS) (2).

Tightening torque
Input shaft speed sensor bolt (a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)
Output shaft speed sensor (VSS) bolt (b): 13 N·m (1.3 kg-m, 9.5 lb-ft)

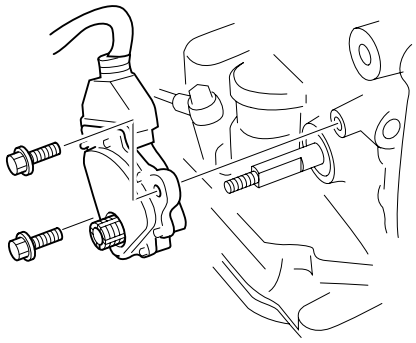
83) Install harness bracket (3) and select cable clamp (4).

Tightening torque
Harness bracket bolt (c): 23 N·m (2.3 kg-m, 17.0 lb-ft)
Select cable clamp bolt (d): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I3RM0B510071-

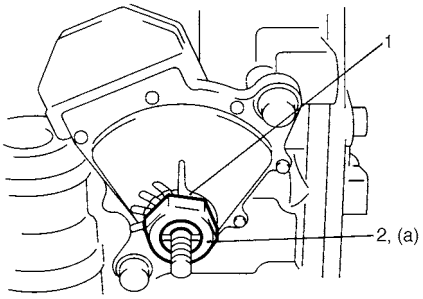
84) Install transmission range sensor to transaxle case, tighten bolts temporarily at this step.



I3RM0B510072-

85) Install lock washer (1) and tighten lock nut (2) to specified torque.

Tightening torque
Transmission range sensor lock nut (a): 7 N·m (0.7 kg-m, 5.0 lb-ft)



I3RM0B510073-

86) Install manual select lever (1) temporarily at this step.

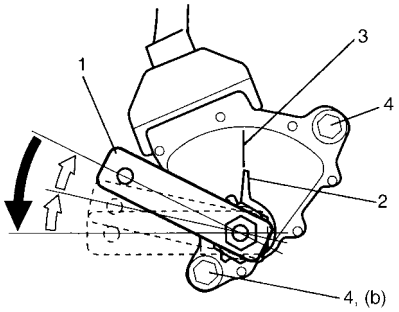
87) After shifting manual select lever counterclockwise fully, select “N” range position by bringing it back 2 notches clockwise.

88) Remove manual select lever (1) at this step.

89) Loosen sensor bolts (4) and align needle direction shaped on lock washer (2) with “N” reference line (3) on transmission range sensor by moving sensor in rotative direction.

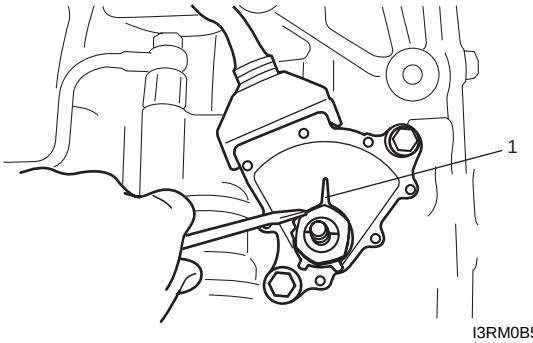
90) Tighten sensor bolts to specified torque.

Tightening torque
Transmission range sensor bolt (b): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



I3RM0B510074-

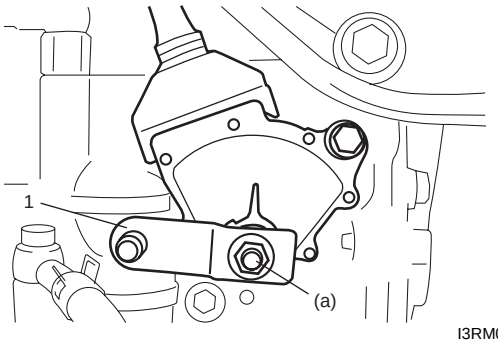
91) Bend dents of lock washer (1) in order to prevent displacement of lock washer.



I3RM0B510075-

92) Install manual select lever (1).

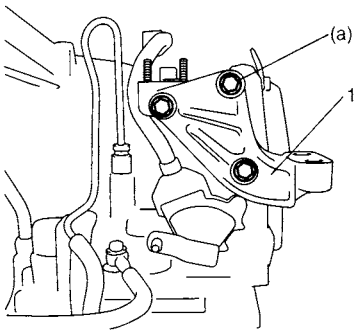
Tightening torque
Manual select lever nut (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I3RM0B510076-

93) Install engine mounting LH bracket (1).

Tightening torque
Engine mounting LH bracket bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)



I3RM0B510077-

94) Install torque converter (3) noting the following points.

CAUTION:

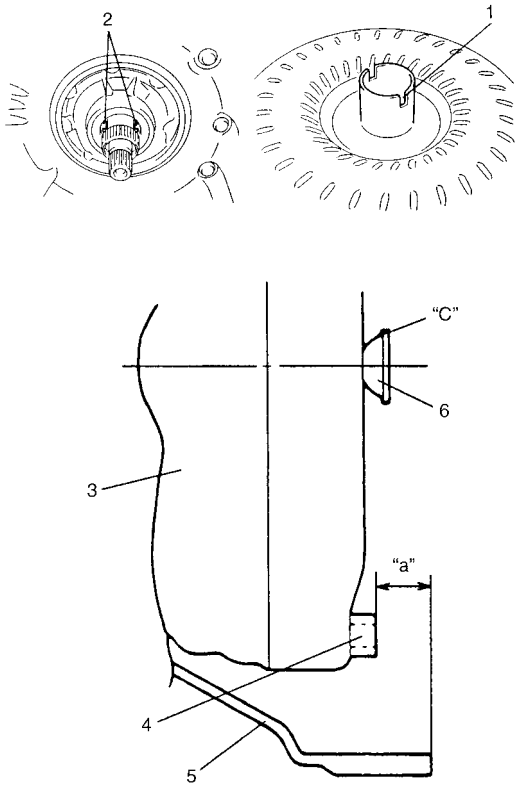
- **Before installing converter, make sure that its pump hub portion is free from nicks, burrs or damage which may cause oil seal to leak.**
- **Be very careful not to drop converter on oil pump gear. Damage in gear, should it occur, may cause a critical trouble.**

- Install torque converter aligning grooves (1) of torque converter and projection (2) of oil pump drive gear.
- Install torque converter, using care not to damage oil seal of oil pump.
- After installing torque converter, check that distance “a” is within specification.

Torque converter installing position
“a”: More than 19.9 mm (0.783 in.)

- Check torque converter for smooth rotation.
- Apply grease around cup (6) at the center of torque converter.

“C”: Grease 99000–25010



I2RH0B510337-

4.	Flange nut
5.	Torque converter housing

Specifications

Tightening Torque Specifications

S4RS0A5107001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
A/T fluid drain plug	17	1.7	12.5	☞ / ☞ / ☞
Transmission range sensor bolt	5.5	0.55	4.0	☞ / ☞
Output shaft speed sensor (VSS) bolt	13	1.3	9.5	☞ / ☞
Input shaft speed sensor bolt	5.5	0.55	4.0	☞ / ☞
Valve body harness connector bolt	5.5	0.55	4.0	☞ / ☞
Shift solenoid bolt	11	1.1	8.0	☞
Oil strainer bolt	10	1.0	7.5	☞ / ☞
Oil pan bolt	7.0	0.7	5.0	☞ / ☞
Transaxle and engine fastening bolt and nut	85	8.5	61.5	☞
Drive plate to torque converter bolt	25	2.5	18.0	☞
Transaxle stiffener bolt	55	5.5	40	☞
Starter motor bolt and nut	50	5.0	36.5	☞
Oil pump subassembly bolt	10	1.0	7.5	☞
Rear cover plug	7.5	0.75	5.5	☞
Solenoid valve bolt	11	1.1	8.0	☞
Final gear bolt	78	7.8	56.5	☞
Torque converter housing plug	7.5	0.75	5.5	☞
Lubrication tube clamp bolt	5.5	0.55	4.0	☞
Fluid reservoir RH plate bolt	5.5	0.55	4.0	☞
Torque converter housing bolt	33	3.3	24.0	☞ / ☞ / ☞
Manual detent spring bolt	10	1.0	7.5	☞
Parking lock pawl bracket bolt	7.5	0.75	5.5	☞
Rear cover bolt	25	2.5	18.0	☞
Fluid reservoir LH plate bolt	10	1.0	7.5	☞
Oil pump assembly bolt	25	2.5	18.0	☞
Transaxle case plug	7.5	0.75	5.5	☞
Valve body bolt	11	1.1	8.0	☞
Fluid outlet union	25	2.5	18.0	☞
Fluid cooler pipe union bolt	22	2.2	16.0	☞
Fluid cooler pipe bracket bolt	10	1.0	7.5	☞
Fluid filler tube bolt	10	1.0	7.5	☞
Harness bracket bolt	23	2.3	17.0	☞
Select cable clamp bolt	10	1.0	7.5	☞
Transmission range sensor lock nut	7	0.7	5.0	☞
Manual select lever nut	13	1.3	9.5	☞
Engine mounting LH bracket bolt	55	5.5	40.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Select Cable Components: ”
“Automatic Transaxle Unit Components: ”
“Automatic Transaxle Assembly Components: ”
“Oil Pump Assembly Components: ”
“Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components: ”
“Valve Body Assembly Components: ”
“Differential Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A5108001

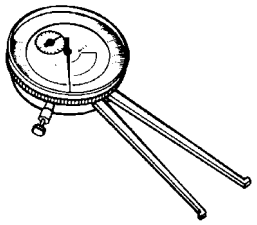
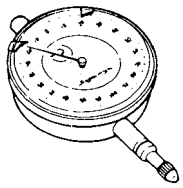
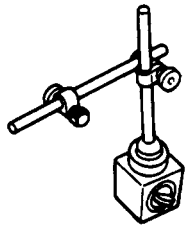
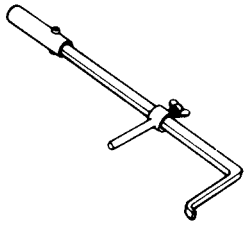
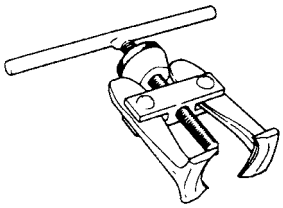
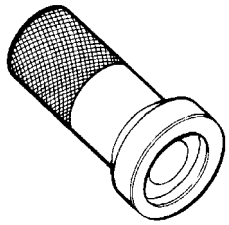
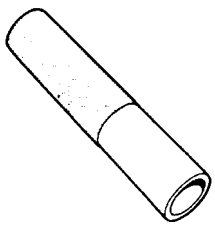
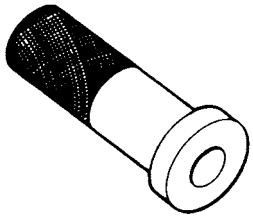
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞
	SUZUKI Super Grease C	P/No.: 99000–25030	☞ / ☞ / ☞ / ☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1216B	P/No.: 99000–31230	☞ / ☞ / ☞

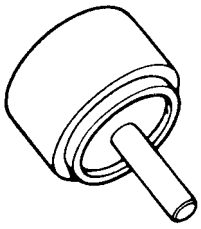
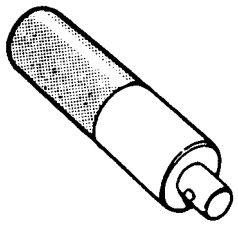
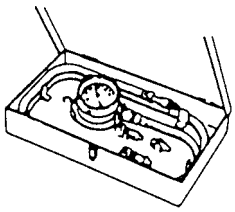
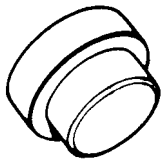
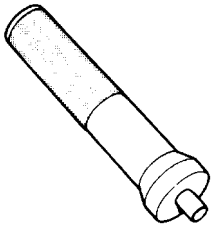
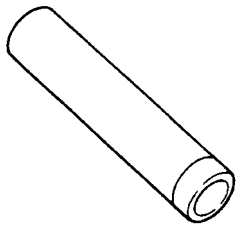
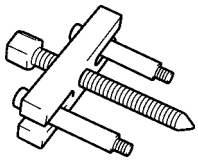
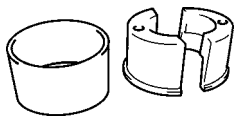
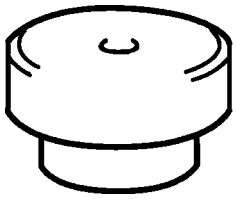
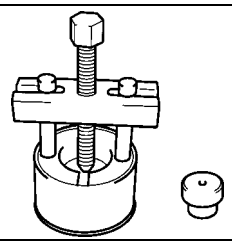
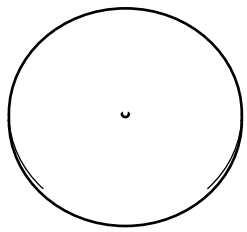
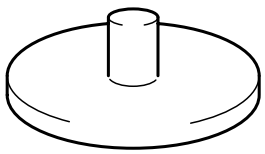
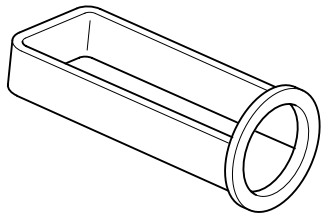
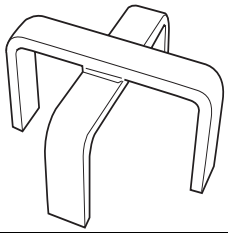
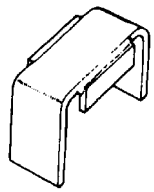
NOTE:

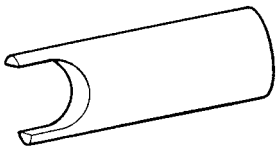
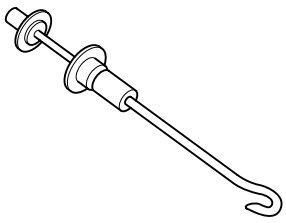
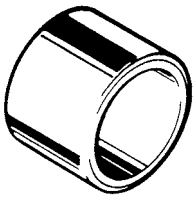
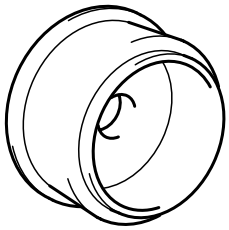
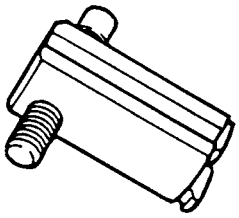
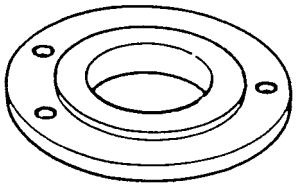
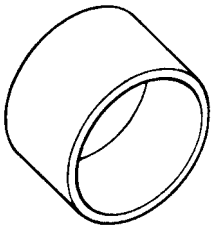
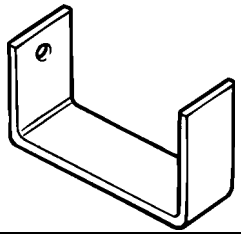
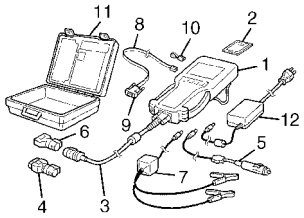
Required service material is also described in the following.
“Select Cable Components: ”
“Automatic Transaxle Unit Components: ”
“Automatic Transaxle Assembly Components: ”
“Oil Pump Assembly Components: ”
“Direct Clutch Assembly Components: ”
“Forward and Reverse Clutch Assembly Components: ”
“2nd Brake Piston Assembly Components: ”
“Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components: ”
“Countershaft Assembly Components: ”
“Valve Body Assembly Components: ”
“Differential Assembly Components: ”

Special Tool

S4RS0A5108002

09900–20605 Dial calipers (1/100 mm, 10-34 mm) ☞ / ☞ / ☞		09900–20607 Dial gauge ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞	
09900–20701 Magnetic stand ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞		09913–50121 Oil seal remover ☞	
09913–61510 Bearing puller ☞		09913–70123 Bearing installing tool ☞ / ☞	
09913–84510 Bearing installer ☞ / ☞ / ☞ / ☞		09913–85210 Bearing installer ☞	

09923–78210 Bearing installer ☞ 	09924–74510 Bearing and oil seal handle ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 
09925–37811–001 Oil pressure gauge ☞ 	09925–88210 Bearing puller attachment ☞ / ☞ 
09925–98210 Input shaft bearing installer ☞ 	09925–98221 Bearing installer ☞ 
09926–37610–001 Bearing puller ☞ / ☞ 	09926–37610–002 Bearing puller attachment ☞ / ☞ 
09926–37610–003 Bearing remover attachment ☞ / ☞ 	09926–37610 Bearing remover ☞ / ☞ 
09926–58010 Bearing remover attachment ☞ 	09926–96030 Clutch spring compressor No.7 ☞ / ☞ 
09926–96050 Brake piston compressor ☞ / ☞ 	09926–97610 Spring compressor ☞ / ☞ 
09926–97620 Spring compressor ☞ / ☞ 	09926–98310 Clutch spring compressor ☞ / ☞ 

09928–06050 Differential preload adapter ☞ / ☞ 	09942–15511 Sliding hammer ☞ / ☞ / ☞ / ☞ 
09944–78210 Bearing installer support ☞ / ☞ 	09944–88220 Oil seal installer ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 
09944–96011 Bearing outer race remover ☞ / ☞ / ☞ / ☞ 	09946–06710 Transfer bearing dummy ☞ / ☞ 
09951–18210 Oil seal remover & installer No. 2 ☞ / ☞ 	09952–06020 Dial gauge plate No.2 ☞ / ☞ / ☞ / ☞ 
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞ 	

Manual Transmission

General Description

Manual Transaxle Construction and Servicing

S4RS0A5201001

The transaxle provides five forward speeds and one reverse speed by means of three synchromeshs and three shafts (input shaft, countershaft and reverse gear shaft). All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.

The low speed synchronizer sleeve & hub is mounted on countershaft and engaged with countershaft 1st gear or 2nd gear, while the high speed synchronizer sleeve & hub is done on input shaft and engaged with input shaft 3rd gear or 4th gear. The 5th speed synchronizer sleeve & hub on input shaft is engaged with input shaft fifth gear mounted on the input shaft.

To prevent the cracking noise from the reverse gear when shifting transaxle gear into the reverse gear, the reverse shift braking device is used.

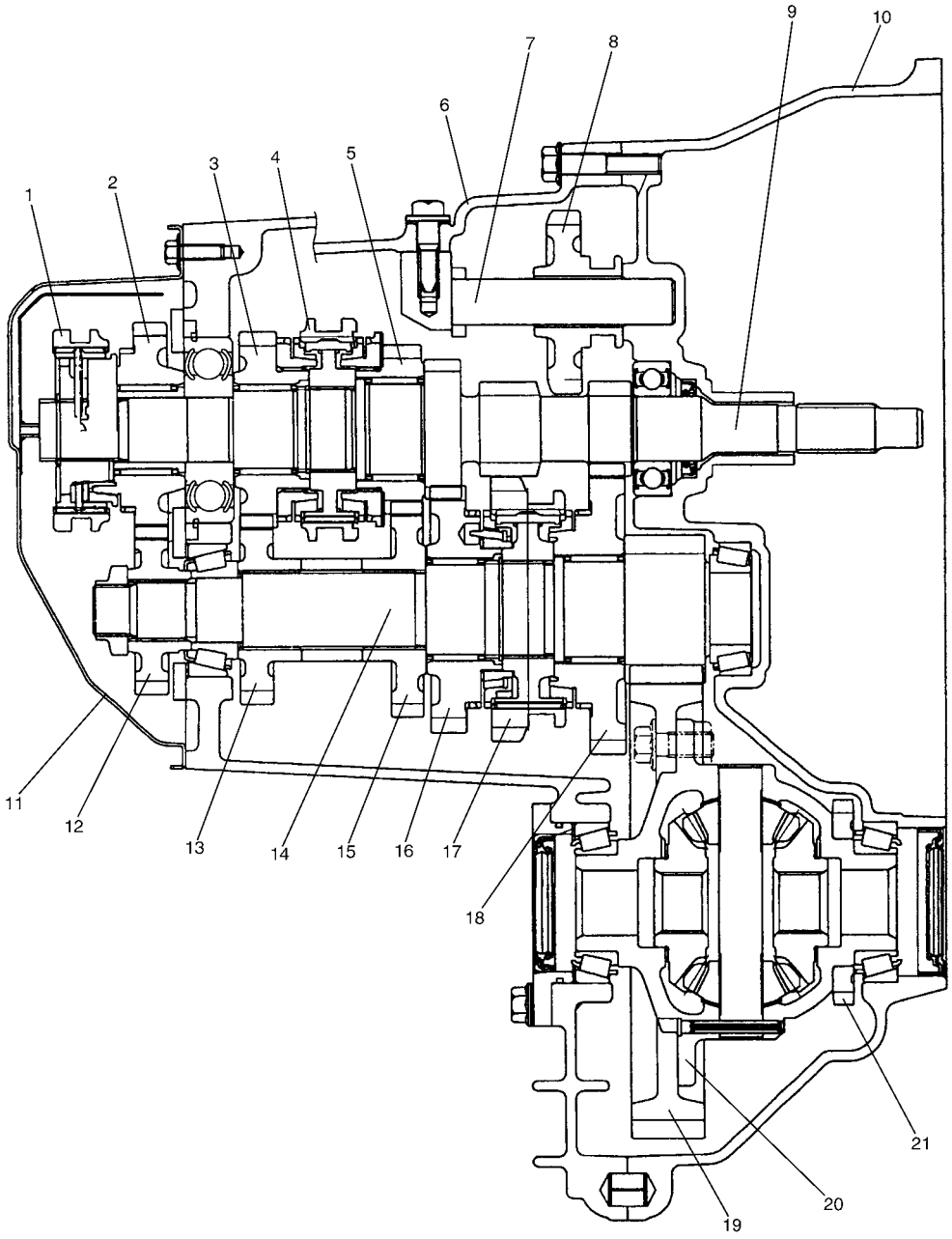
The device utilizes the 5th synchromesh, which is the lever synchro type, to apply the brake on the input shaft rotation.

The double cone synchronizing mechanism is provided to 2nd gear synchromesh device for high performance of shifting to 2nd gear.

The countershaft turns the final gear and differential assembly, thereby turning the front drive shafts which are attached to the front wheels.

For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transaxle case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

Further, care must be taken to adjust preload of countershaft taper roller bearings. New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.



I3RM0B521001-

1. 5th speed sleeve & hub	8. Reverse idler gear	15. Countershaft 3rd gear
2. Input shaft 5th gear	9. Input shaft	16. Countershaft 2nd gear
3. Input shaft 4th gear	10. Right case	17. Low speed synchronizer sleeve & hub
4. High speed synchronizer sleeve & hub	11. Side cover	18. Countershaft 1st gear
5. Input shaft 3rd gear	12. Countershaft 5th gear	19. Final gear
6. Left case	13. Countershaft 4th gear	20. Differential case
7. Reverse gear shaft	14. Countershaft	21. Vehicle speed sensor rotor

Diagnostic Information and Procedures

Manual Transaxle Symptom Diagnosis

S4RS0A5204001

Condition	Possible cause	Correction / Reference Item
Gears slipping out of mesh	Worn shift fork shaft	*Replace.*
	Worn shift fork or synchronizer sleeve	*Replace.*
	Weak or damaged locating springs	*Replace.*
	Worn bearings on input shaft or countershaft	*Replace.*
	Worn chamfered tooth on sleeve and gear	*Replace sleeve and gear.*
Hard shifting	Maladjusted gear select control cable	*Adjust.*
	Inadequate or insufficient lubricant	*Replenish.*
	Improper clutch pedal free travel	*Replace clutch master cylinder or clutch pedal arm.*
	Distorted or broken clutch disc	*Replace.*
	Damaged clutch pressure plate	*Replace clutch cover.*
	Worn synchronizer ring	*Replace.*
	Worn chamfered tooth on sleeve or gear	*Replace sleeve or gear.*
	Worn gear shift / select control cables joint	*Replace.*
	Distorted shift shaft	*Replace.*
	Worn gear shift / select control cables	*Replace.*
Noise	Inadequate or insufficient lubricant	*Replenish.*
	Damaged or worn bearing(s)	*Replace.*
	Damaged or worn gear(s)	*Replace.*
	Damaged or worn synchronizer parts	*Replace.*

Repair Instructions

Manual Transaxle Oil Change

S4RS0A5206001

1) Before changing or inspecting oil, be sure to stop engine and lift vehicle horizontally.
2) With vehicle lifted up, check oil level and leakage. If leakage exists, correct it.

NOTE:

Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage.

3) Remove oil filler plug (2).
4) Remove drain plug (1), and drain old oil.
5) Apply sealant to thread of drain plug (1), and tighten it to specified torque.

"A": Sealant 99000–31260

Tightening torque
Transaxle oil drain plug (a): 21 N·m (2.1 kg-m, 15.5 lb-ft)

6) Pour new specified oil until oil level reaches bottom of oil filler plug hole (3) as shown in figure.

NOTE:

It is highly recommended to use API GL-4 75W-90 gear oil.

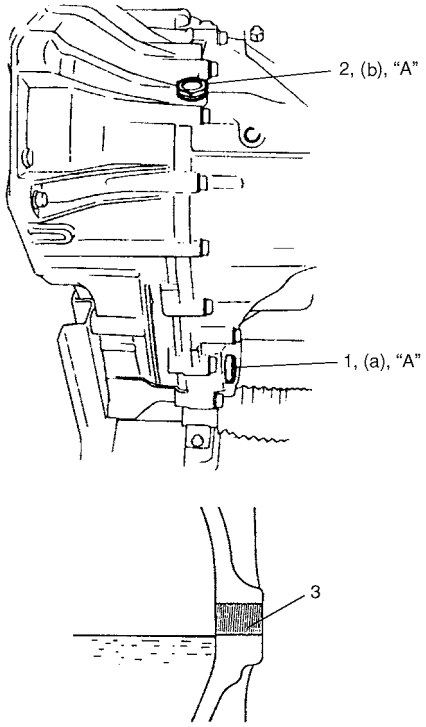
Transaxle oil specification
: API GL-4 (For SAE classification, refer to viscosity chart [A] in figure.)

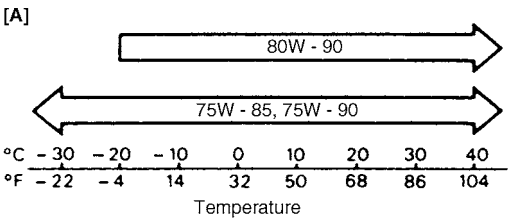
Transaxle oil capacity (Reference)
: 2.2 liters (4.8/3.9 US/Imp. pt)

7) Apply sealant to thread of level / filler plug, and then tighten it to specified torque.

"A": Sealant 99000–31260

Tightening torque
Transaxle oil level / filler plug (b): 21 N·m (2.1 kg-m, 15.5 lb-ft)





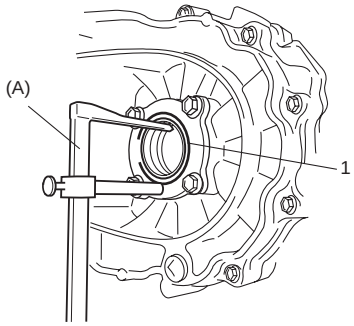
I4RS0A520001-

Differential Side Oil Seal Replacement

S4RS0A5206002

1) Lift up vehicle and drain transaxle oil.
2) Remove front drive shaft and/or center shaft referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
3) Remove oil seal (1) using special tool.

Special tool
(A): 09913–50121



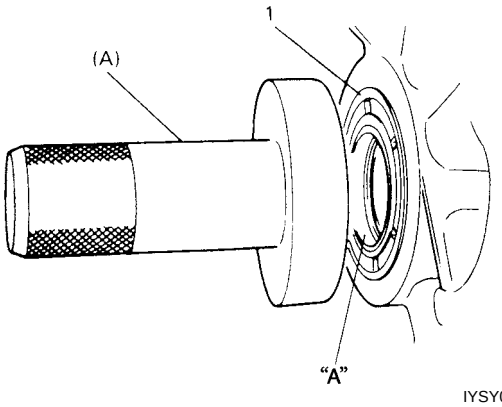
I4RH01520003-

4) Install oil seal (1) facing its spring side inward. Use special tool and hammer for installation.

Special tool
(A): 09913–85210

5) Apply grease to oil seal lip and at the same time check drive shaft where oil seal contacts and make sure of its smoothness.

"A": Grease 99000–25010

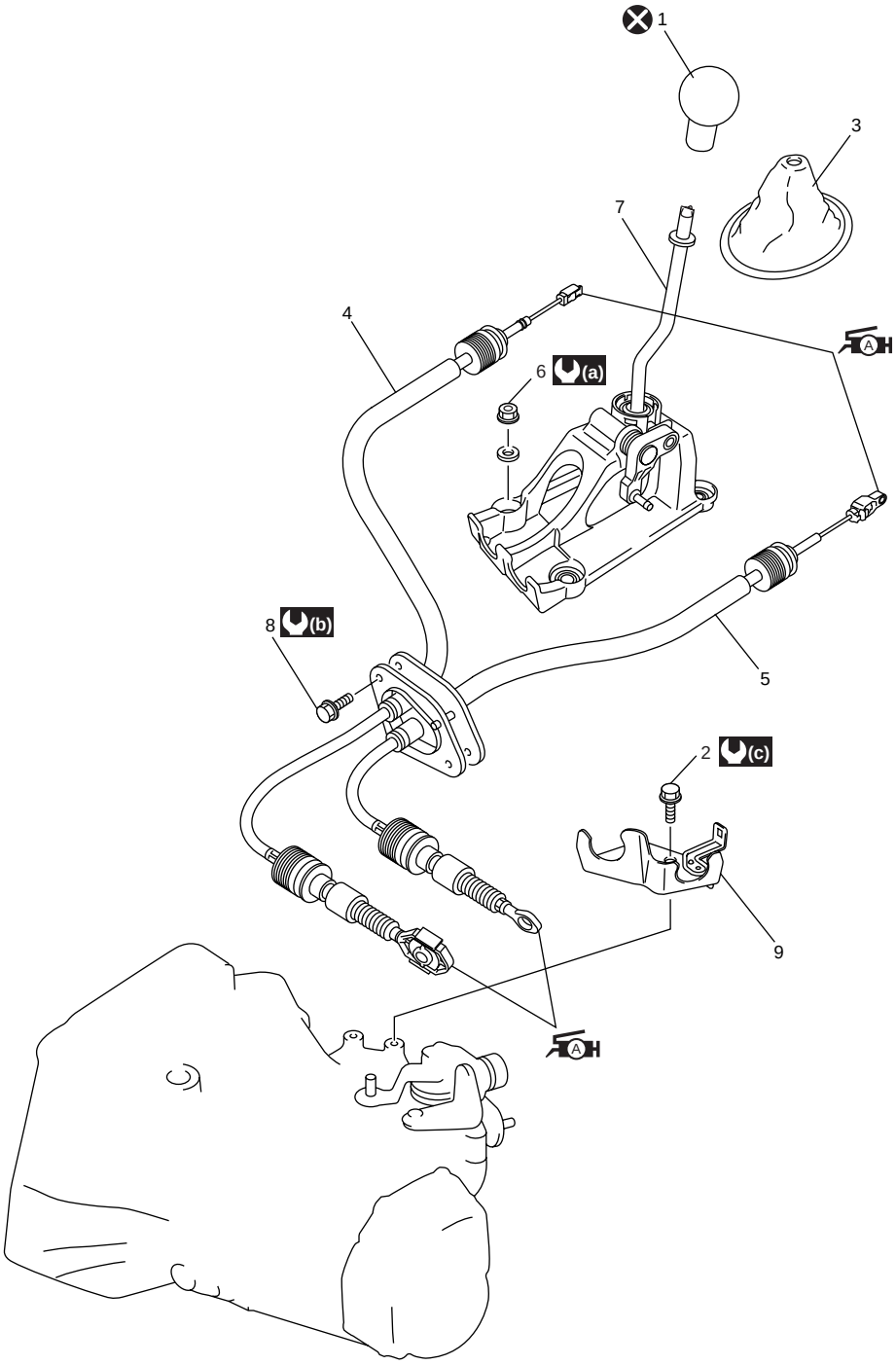


IYSY01520005-

6) Insert front drive shaft and/or center shaft referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
7) Fill transaxle oil as specified referring to "Manual Transaxle Oil Change: ", and make sure that oil has been sealed with oil seal.

Gear Shift Control Lever and Cable Components

S4RS0A5206003



I4RS0A520002-

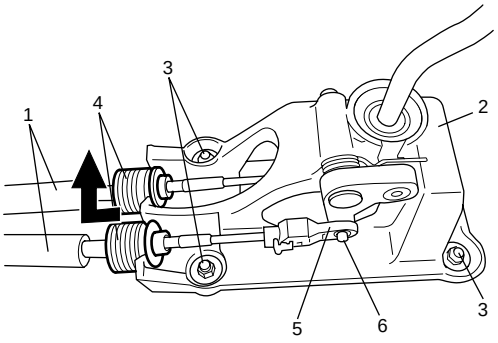
1. Gear shift control lever knob	6. Gear shift control lever assembly mounting nut	(b) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
2. Cable bracket bolt	7. Gear shift control lever assembly	(c) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
3. Gear shift lever boot	8. Cable grommet bolt	: Do not reuse.
4. Gear shift control cable : Apply grease 99000-25010 to cable end.	9. Cable bracket	
5. Gear select control cable : Apply grease 99000-25010 to cable end.	(a) : 13 N·m (1.3 kg-m, 9.5 lb-ft)	

Gear Shift Control Lever and Cable Removal and Installation

S4RS0A5206004

Removal

1) Remove console box.
2) Disconnect cable ends (5) from pivot (6) of gear shift control lever assembly.
3) Disconnect gear shift and select control cables (1) from gear shift control lever assembly (2) while pulling quick joint (4) as shown in figure.
4) Remove gear shift control lever assembly mounting nuts (3) and gear shift lever assembly from floor panel.
5) Disconnect gear shift and select control cables from transaxle.
6) Remove cable grommet bolt, and then remove gear shift and select control cables from floor panel.



I4RS0A520003-

Installation

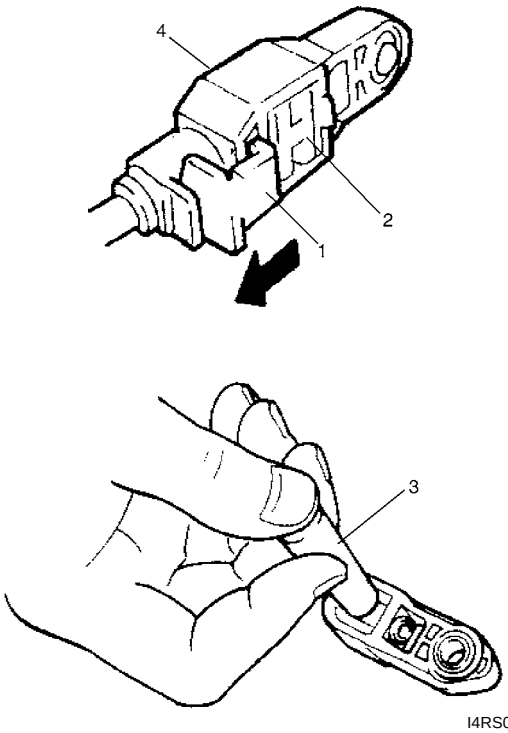
Reverse removal procedure for installation nothing the following.

- Tighten each bolts and nuts to specified torque referring to “Gear Shift Control Lever and Cable Components: ”.
- Adjust gear select control cable referring to “Gear Select Control Cable Adjustment: ”.

Gear Select Control Cable Adjustment

S4RS0A5206026

1) Release lock plate (1) which restricts moving of cable end holder (2).
2) Push cable end holder (2) out from adjuster (4) using appropriate tool (3) to disengage cable.



I4RS0A520004-

3) Apply grease to pin (5) of gear shift control lever, and then install adjuster (1) into pin of gear shift control lever securely.

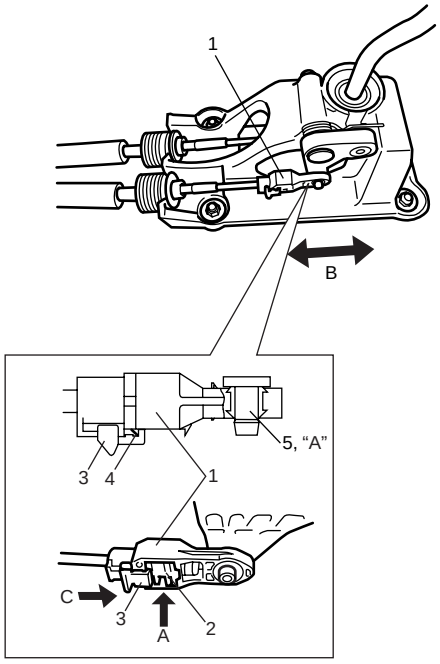
“A”: Grease 99000–25010

4) Push cable end holder (2) in the direction of A.

NOTE:

At this time, do not apply force in the cable operation direction B to adjuster.

5) Slide lock plate (3) in the direction of C, until it gets over the claw (4) of cable end holder.



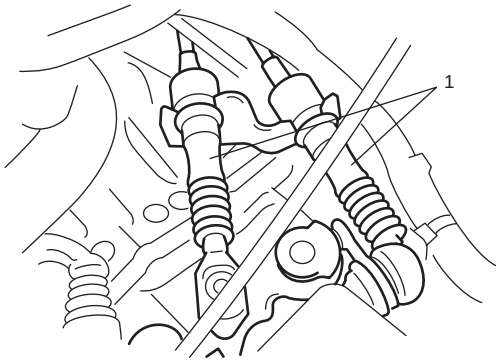
I4RS0A520005-

Vehicle Speed Sensor (VSS) Removal and Installation

S4RS0A5206027

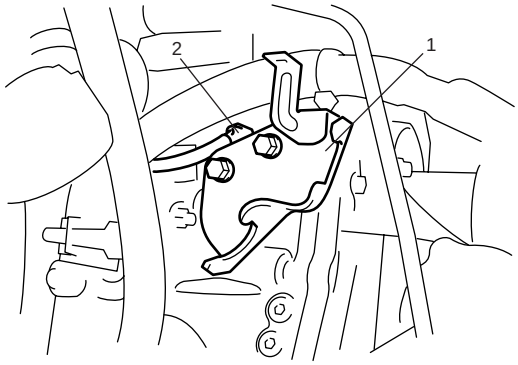
Removal

1) Remove battery and tray with coolant reservoir.
2) Disconnect gear shift and select control cables (1) from transaxle.



I4RS0A520006-

3) Remove cable bracket (1) from transaxle.
4) Disconnect VSS coupler (2).
5) Remove VSS.

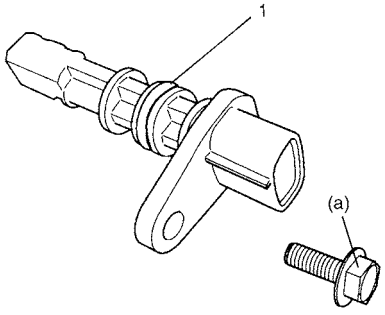


I4RS0A520007-

Installation

1) Apply oil to new O-ring (1) and then install VSS to transaxle.

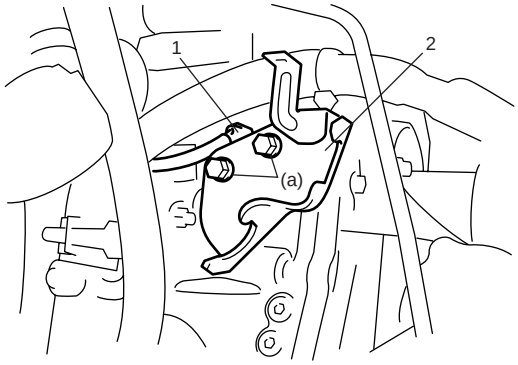
Tightening torque
VSS bolt (a): 5 N·m (0.5 kg-m, 4.0 lb-ft)



I4RS0A520008-

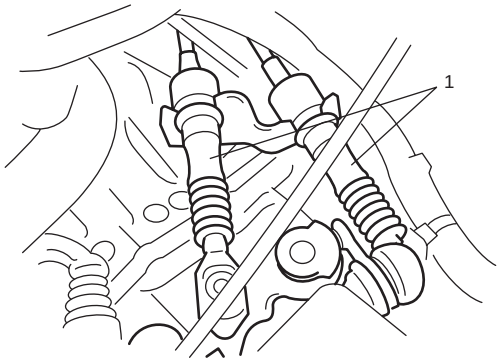
2) Connect VSS coupler (1).
3) Install cable bracket (2) to transaxle.

Tightening torque
Cable bracket bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)



I4RS0A520009-

4) Connect gear shift and select control cables (1) to transaxle.



I4RS0A520006-

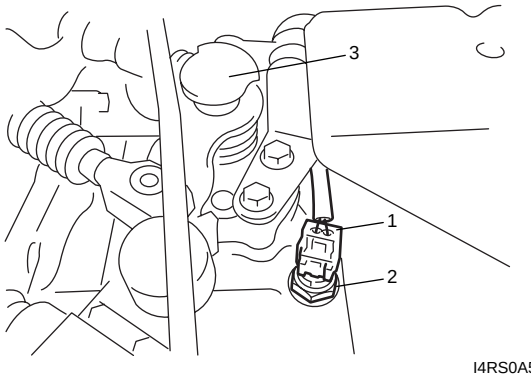
5) Install battery and tray, and then install coolant reservoir to battery tray.

Back Up Lamp Switch Removal and Installation

S4RS0A5206007

Removal

1) Remove battery and tray with coolant reservoir.
2) Disconnect back up lamp switch coupler (1).
3) Remove back up lamp switch (2).



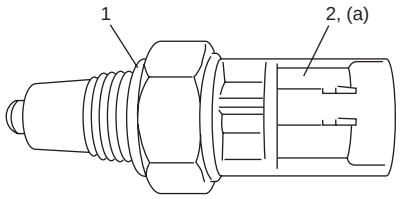
I4RS0A520010-

3. Gear shift and select shaft assembly

Installation

1) Apply oil to new O-ring (1) and tighten back up lamp switch (2) to specified torque.

Tightening torque
Back up lamp switch (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I3RH0A520006-

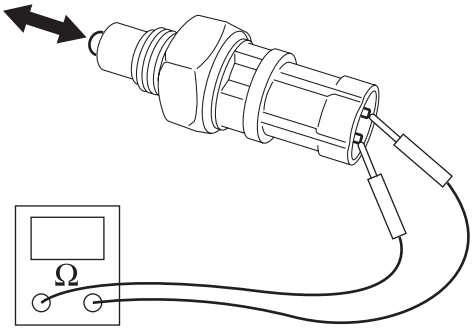
2) Connect back up lamp switch coupler.
3) Install battery and tray, and then install coolant reservoir to battery tray.

Back Up Lamp Switch Inspection

S4RS0A5206008

Check back up lamp switch for function using ohmmeter.

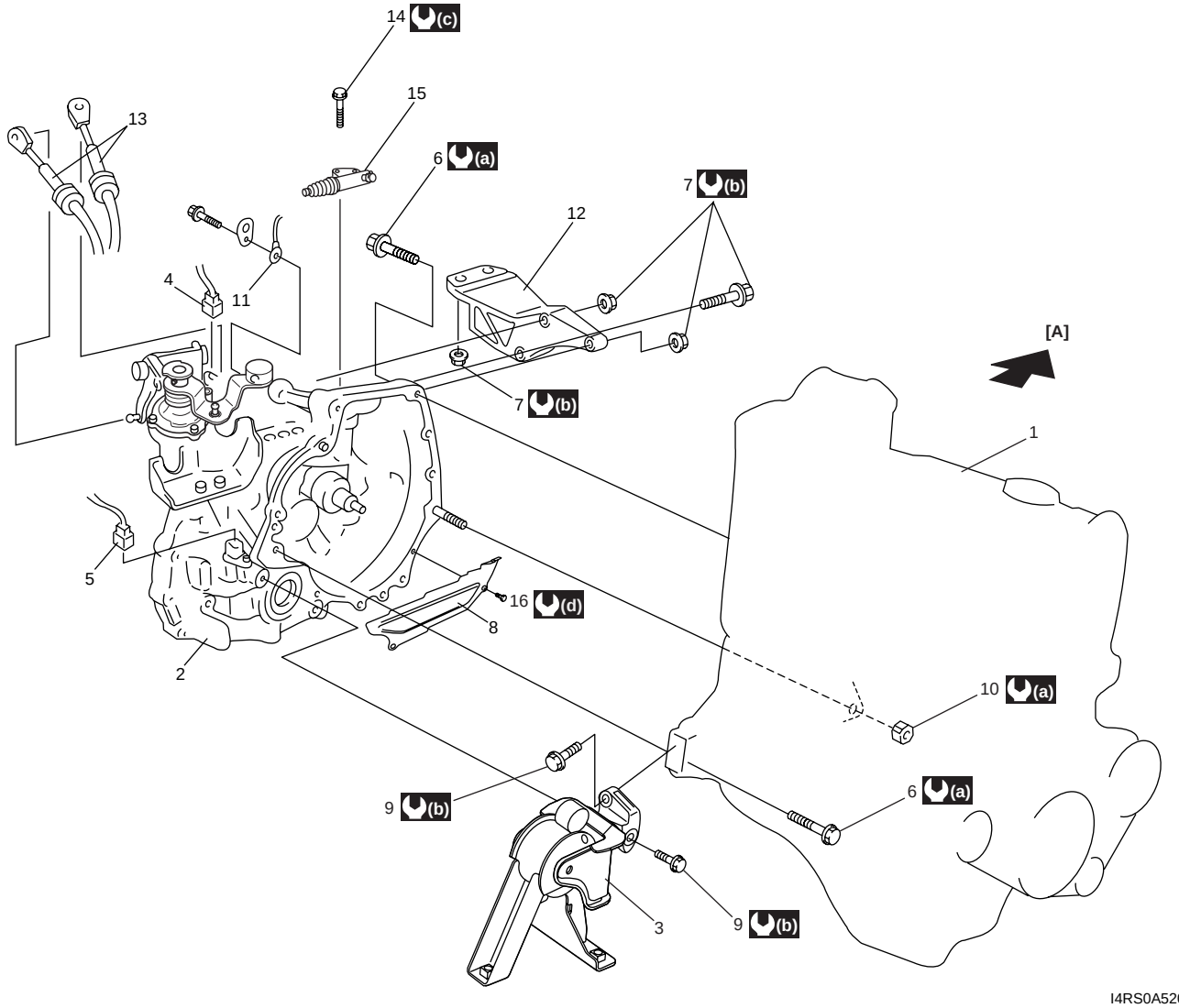
Back up lamp switch specification
Switch ON (Push): Continuity
Switch OFF (Release): No continuity



I4RS0A520011-

Manual Transaxle Unit Components

S4RS0A5206009



I4RS0A520012-

[A]: Forward	7. Engine left mounting bracket bolt and nuts	14. Clutch operating cylinder bolt
1. Engine	8. Clutch housing lower plate	15. Clutch operating cylinder
2. Transaxle	9. Engine rear mounting bracket bolts	16. Clutch housing lower plate bolts

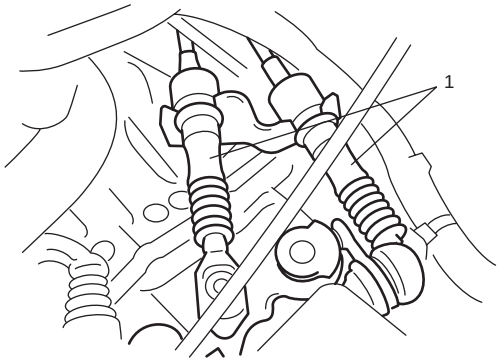
3. Engine rear mounting and bracket	10. Transaxle to engine nut	(a) : 85 N·m (8.5 kg-m, 61.5 lb-ft)
4. Back up lamp switch connector	11. Ground cable	(b) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
5. VSS connector	12. Engine left mounting bracket	(c) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
6. Transaxle to engine bolt	13. Gear shift & select control cables	(d) : 11 N·m (1.1 kg-m, 8.0 lb-ft)

Manual Transaxle Unit Dismounting and Remounting

S4RS0A5206033

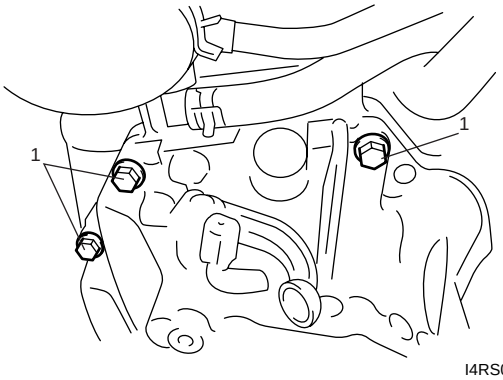
Dismounting

1) Drain coolant.
2) Remove coolant reservoir with reservoir hose.
3) Remove battery and tray.
4) Remove air cleaner case and resonator.
5) Disconnect gear shift and gear select control cables (1) from transaxle.



I4RS0A520006-

6) Disconnect back up lamp switch coupler and VSS coupler and undo wiring harness clamps.
7) Remove ground cable from transaxle.
8) Remove clutch operating cylinder with fluid hose from transaxle.
9) Remove water inlet No.2 pipe from transaxle.
10) Remove starting motor referring to “Starting Motor Dismounting and Remounting: in Section 1I”.
11) Remove transaxle to engine bolts (1) of upper side.

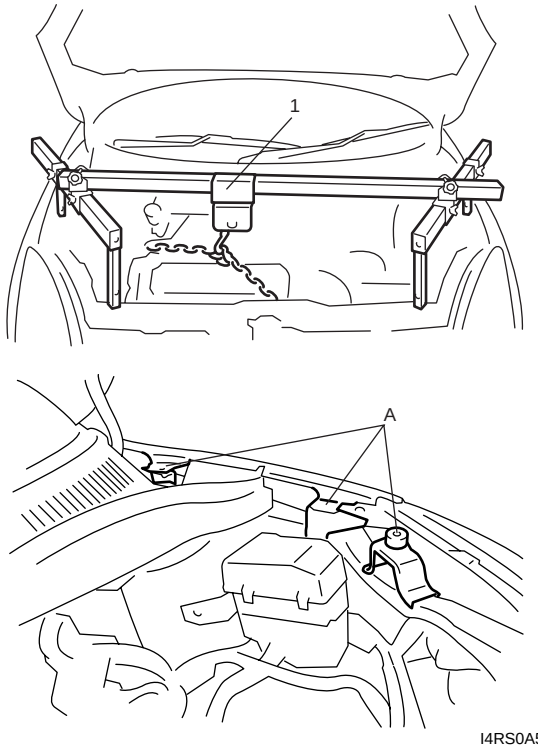


I4RS0A520018-

12) Support engine using supporting device (1).

CAUTION:

Do not apply supporting device to projection part A. If do so, it may be deformed.

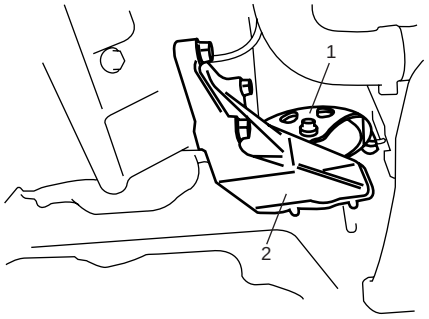


I4RS0A520019-

13) Remove front drive shafts and center shaft referring to “Front Drive Shaft Assembly Removal and Installation: in Section 3A”.
14) Remove exhaust No.2 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: in Section 1K”.
15) Remove clutch housing lower plate (1).

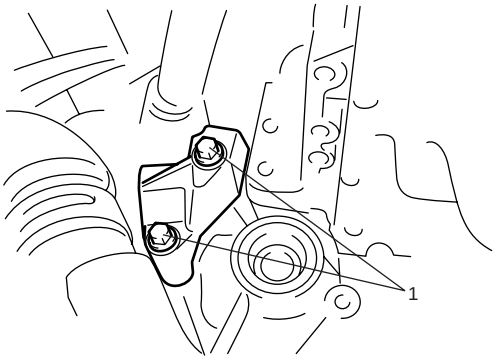
I4RS0A520020-

16) Remove engine under covers.
17) Support transaxle with transmission jack.
18) Remove transaxle to engine bolts and nut of lower side.
19) Remove engine left mounting (1) with bracket (2).



I4RS0A520021-

20) Remove engine rear mounting bracket bolts (1).



I4RS0A520022-

21) Remove other attached parts from transaxle, if any.
22) Pull transaxle so as to disconnect input shaft from clutch disc, and then lower it.

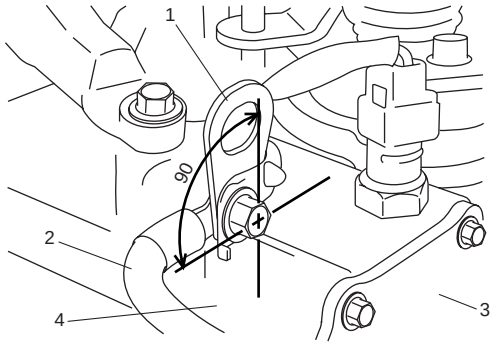
Remounting

CAUTION:

- **Care should be taken not to scratch oil seal lip with drive shaft while raising transaxle.**
- **Do not hit drive shaft joint with hammer when installing it into differential gear.**

Reverse dismounting procedure for remounting noting the following.

- Tighten each bolts and nuts to specified torque referring to “Manual Transaxle Unit Components: ”.
- Set each clamp for wiring securely.
- Fill transaxle oil referring to “Manual Transaxle Oil Change: ”.
- Install hook (1) and ground cable (2) at specified position as shown in figure.



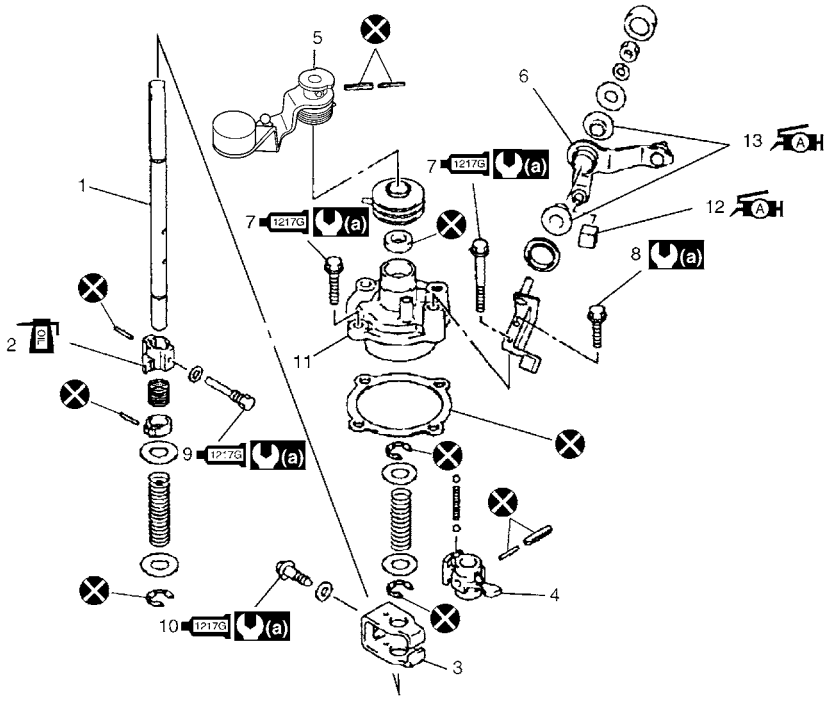
I4RS0A520023-

3.	Transaxle side cover
4.	Transaxle left case

- Connect battery and check function of engine, clutch and transaxle.

Gear Shift and Select Shaft Assembly Components

S4RS0A5206029



I4RS0A520014-

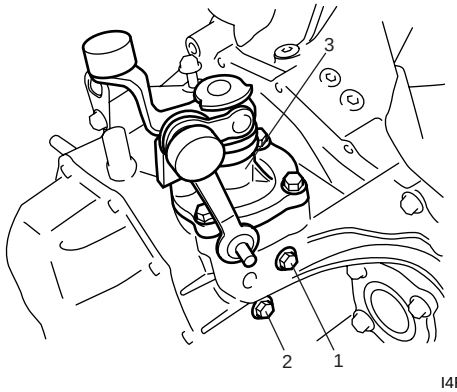
1. Gear shift & select shaft	1217G 7. Gear shift guide case bolt : Apply sealant 99000-31260 to bolt thread.	13. Select lever boss : Apply grease 99000-25010 to internal and external diameter.
2. 5th & reverse gear shift cam	8. Select lever bracket bolt	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
3. Gear shift interlock plate	1217G 9. 5th to reverse interlock guide bolt : Apply sealant 99000-31260 to bolt thread.	: Do not reuse.
4. Gear shift & select lever	1217G 10. Gear shift interlock bolt : Apply sealant 99000-31260 to bolt thread.	: Apply transaxle oil.
5. Shift cable lever	11. Guide case	
6. Select cable lever	12. Select lever shaft bush : Apply grease 99000-25010 to whole area of bush.	

Gear Shift and Select Shaft Assembly Removal and Installation

S4RS0A5206016

Removal

1) Remove gear shift interlock bolt (1) and 5th to reverse interlock guide bolt (2) from transaxle case.
2) Remove gear shift & select shaft assembly (3).



I4RS0A520024-

Installation

1) Apply grease to select lever shaft bush and select lever boss, and install gear shift and select shaft assembly with new gasket into transaxle.

"A": Grease 99000–25010

2) Apply sealant to gear shift guide case bolts (1). Tighten gear shift guide case bolts to specified torque.

"B": Sealant 99000–31260

Tightening torque
Gear shift guide case bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

3) Tighten select lever bracket bolt with select lever bracket to specified torque.

Tightening torque
Select lever bracket bolt: 23 N·m (2.3 kg-m, 17.0 lb-ft)

4) Install washer and gear shift interlock bolt (2) to which sealant have been applied and then tighten it to specified torque.

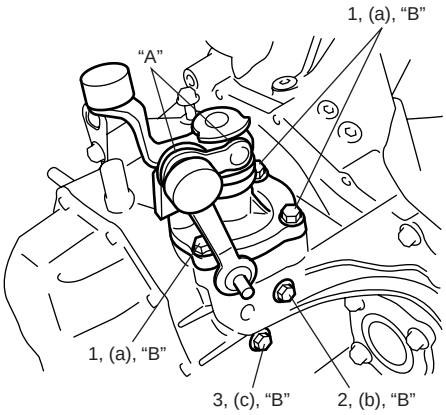
"B": Sealant 99000–31260

Tightening torque
Gear shift interlock bolt (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

5) Install washer and 5th to reverse interlock guide bolt (3) to which sealant have been applied and then tighten it to specified torque.

"B": Sealant 99000–31260

Tightening torque
5th to reverse interlock guide bolt (c): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A520025-

Gear Shift and Select Shaft Disassembly and Assembly

S4RS0A5206017

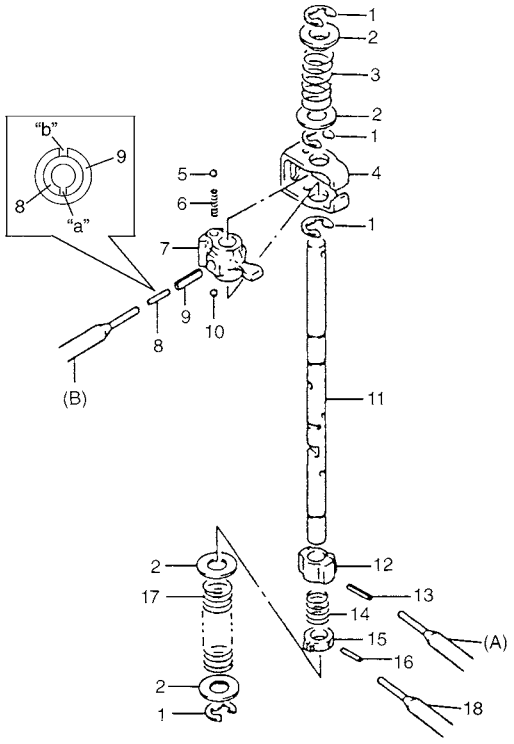
1) Push pins out using 2.8 – 3.0 mm (0.11 – 0.12 in.) commercially available spring pin remover and specified spring pin removers as shown below.

Special tool
(A): 09922–85811 (4.5 mm)
(B): 09925–78210 (6.0 mm)

2) Inspect component parts for wear, distortion or damage. If any detect is found, replace detective part with new one.

NOTE:

- **Set new gear shift & select lever inner pin (8) and outer pin (9) facing each gap ("a", "b") in the opposite direction as shown in figure.**
- **When driving in pins, prevent shaft from being bent by supporting it with wood block.**
- **Assemble 5th & reverse gear shift cam with its pit and pin aligned.**
- **Make sure to select an appropriate spring by identifying the painted colors to keep gear shifting performance as designed.**
  - **Low speed select spring – Blue**
  - **Reverse select spring – Pink**

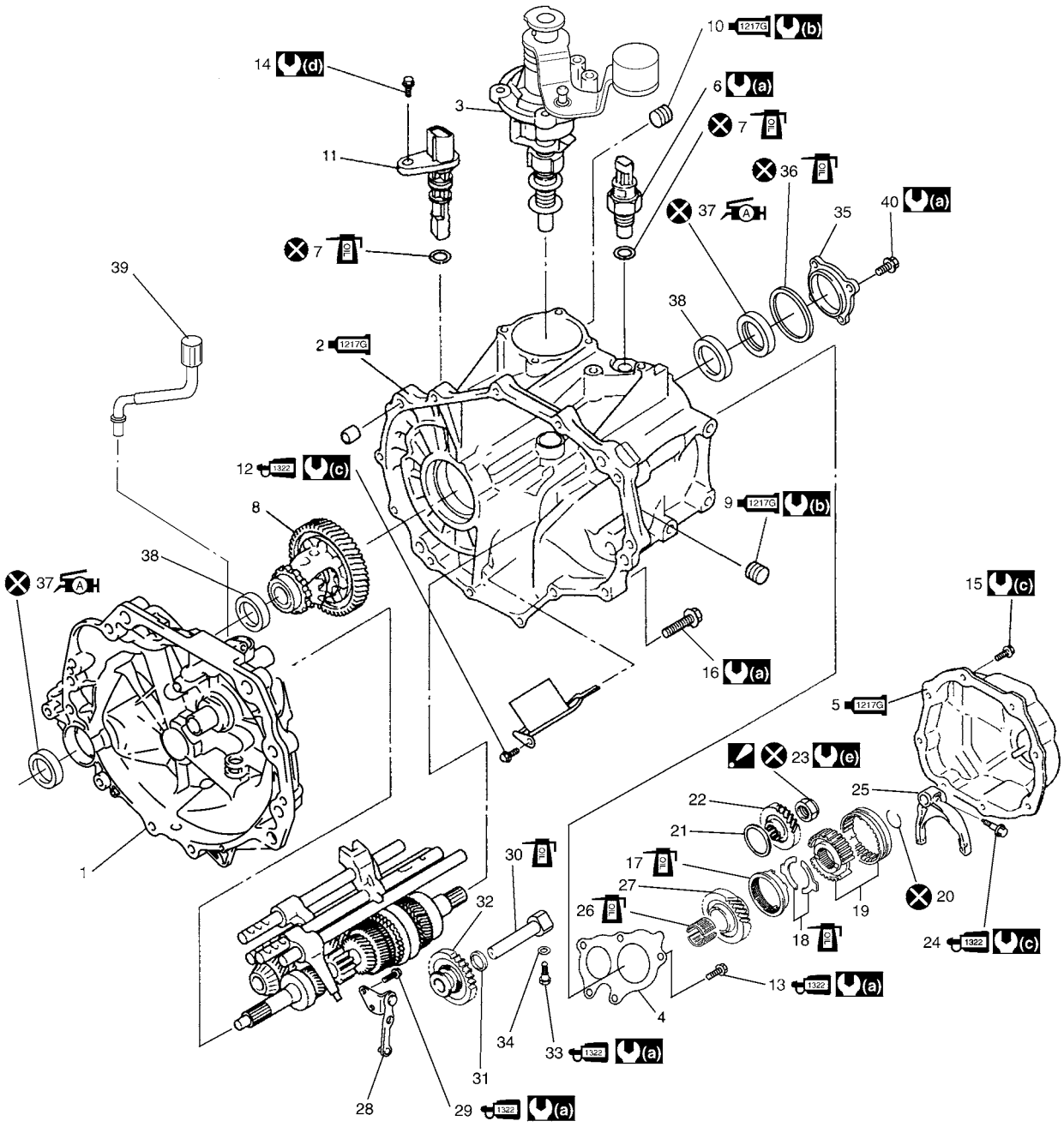


I4RS0A520026-

1. E-ring	10. Ball
2. Washer	11. Gear shift & select shaft
3. Reverse select spring	12. 5th & reverse gear shift cam
4. Gear shift interlock plate	13. 5th & reverse gear shift cam guide pin
5. Ball	14. Cam guide return spring
6. Gear shift interlock spring	15. 5th & reverse gear shift cam guide
7. Gear shift & select lever	16. Gear shift cam guide pin
8. Inner pin	17. Low speed select spring
9. Outer pin	18. Spring pin remover

Manual Transaxle Assembly Components

S4RS0A5206028



I4RS0A520013-

1. Transaxle right case	25. 5th gear shift fork
1217G 2. Transaxle left case : Apply sealant 99000-31260 to mating surface of left case and right case.	26. Needle bearing (Separated steel cage type.)
3. Gear shift and select shaft assembly	27. Input shaft 5th gear
4. Transaxle left case plate	28. Reverse gear shift lever
1217G 5. Transaxle side cover : Apply sealant 99000-31260 to mating surface of side cover and left case.	1322 29. Reverse gear shift lever bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
6. Back up lamp switch	30. Reverse gear shaft
7. O-ring	31. Washer
8. Differential assembly	32. Reverse idler gear
1217G 9. Oil level/filler plug : Apply sealant 99000-31260 to all around thread part of plug.	1322 33. Reverse shaft bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
1217G 10. Oil drain plug : Apply sealant 99000-31260 to all around thread part of plug.	34. Washer
11. VSS	35. Side bearing retainer
1322 12. Oil gutter bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	36. O-ring
1322 13. Left case plate bolts : Apply thread lock 99000-32110 to all around thread part of bolt.	A 37. Oil seal : Apply grease 99000-25010 to oil seal lip.
14. VSS bolt	38. Outer race
15. Side cover bolts	39. Breather hose
16. Transaxle case bolts	40. Side bearing retainer bolt
17. 5th speed synchronizer ring	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
18. 5th speed synchronizer lever	(b) : 21 N·m (2.1 kg-m, 15.5 lb-ft)
19. 5th speed synchronizer sleeve & hub	(c) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
20. Circlip	(d) : 5 N·m (0.5 kg-m, 4.0 lb-ft)
21. Bearing set shim	(e) : 100 N·m (10.0 kg-m, 72.5 lb-ft)
22. Countershaft 5th gear	: Do not reuse.
23. Countershaft nut : After tightening nut to specified torque, caulk nut securely.	: Apply transaxle oil.
1322 24. Shift fork bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	

Fifth Gear Disassembly and Assembly

S4RS0A5206018

Disassembly

1) Remove 9 bolts and take off transaxle side cover (1).

CAUTION:

Care should be taken not to distort side cover when it is removed from left case.

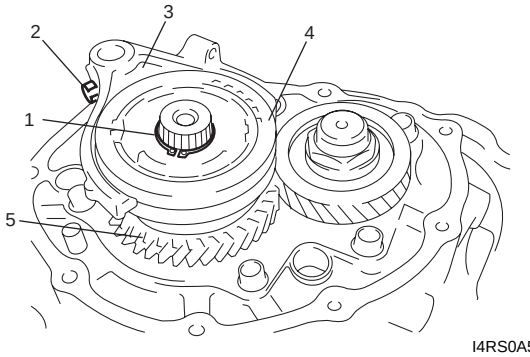
I4RS0A520027-

2) Using special tool, remove circlip (1).

Special tool
: 09900–06107

3) Remove 5th shift fork bolt (2).

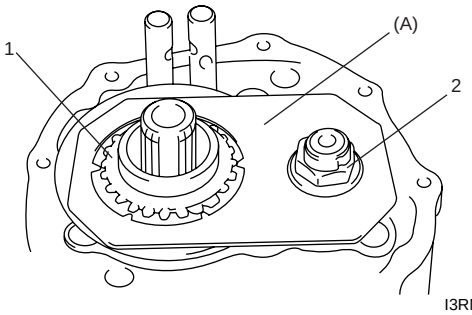
4) Remove gear shift fork (3), synchronizer sleeve & hub assembly (4), synchronizer levers, synchronizer ring and input shaft 5th gear (5) all together. Use gear puller for removal if spline fitting of hub is tight.



I4RS0A520028-

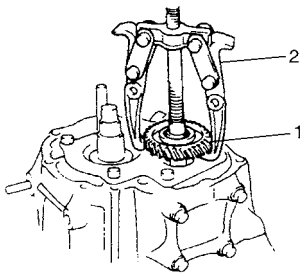
5) Unfasten caulking of countershaft nut (2), install input shaft 5th gear (1) and special tool to stop rotation of shafts, and then remove countershaft nut (2).

Special tool
(A): 09927–76060



I3RM0B521014-

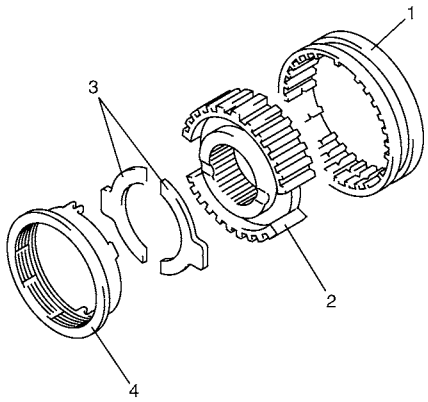
6) Remove input shaft 5th gear, needle bearing and then countershaft 5th gear (1). Gear puller (2) would be necessary if spline fitting of countershaft 5th gear is tight.



I4RS0A520041-

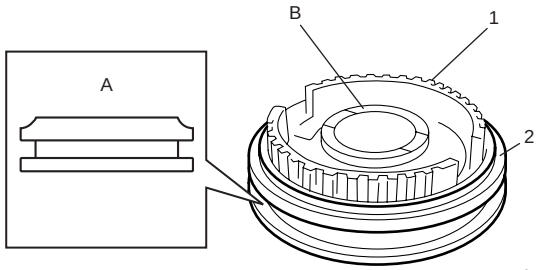
Assembly

1) Assemble 5th speed synchronizer sleeve (1), hub (2), 5th speed synchronizer levers (3) and synchronizer ring (4) as follows.



I4RH01520054-

a) Install hub (1) to 5th speed synchronizer sleeves (2) in specified direction as shown in the figure.



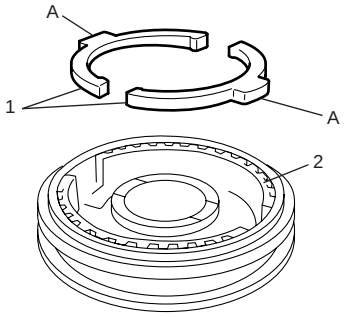
I4RH01520048-

A: Chamfered side	B: Long boss

b) Fit 5th speed synchronizer levers (1) to hub (2) as shown in the figure.

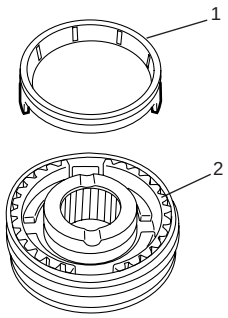
NOTE:

- **Align protrusion A of 5th speed synchronizer levers (1) with groove of hub (2).**



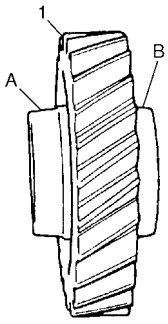
I4RH01520049-

c) Install synchronizer ring (1) to hub (2) as shown in the figure.



I4RH01520055-

2) Install 5th gear (1) to countershaft facing machined boss A inward.



I2RH01520088-

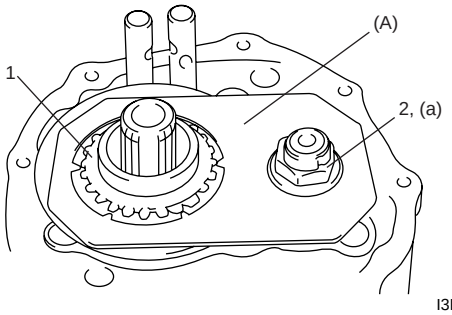
A: Machined boss (Inside)	
B: No machining (Outside)	

3) Install needle bearing of separated steel cage type to input shaft, apply oil then install input shaft 5th gear (1) and special tool to stop shaft rotation.

Special tool
(A): 09927–76060

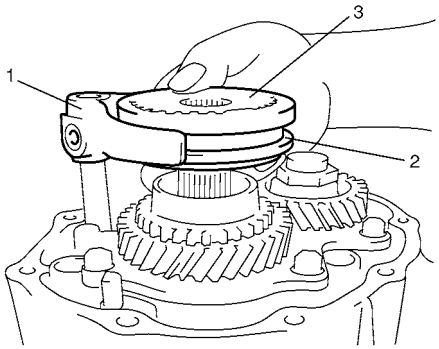
4) Tighten new countershaft nut (2) to specified torque, and caulk countershaft nut securely.

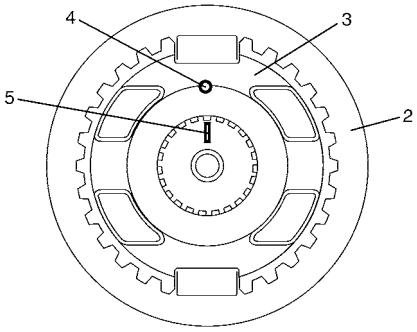
Tightening torque
Countershaft nut (a): 100 N·m (10.0 kg-m, 72.5 lb-ft)



I3RM0B521016-

5) Fit 5th gear shift fork (1) to synchronizer sleeve (2) and hub (3) assembly and install them into input shaft and gear shift shaft aligning punch mark (4) with matching mark (5) on input shaft.





I4RS0A520029-

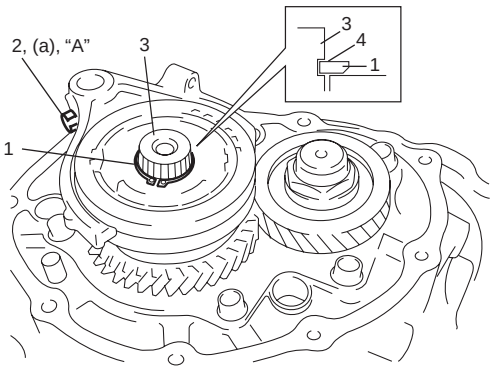
6) Tighten shift fork bolt (2) to which thread lock cement has been applied.

"A": Thread lock cement 99000–32110

Tightening torque
Shift fork bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

7) Using special tool, install new circlip (1) to input shaft (3) in specified direction as shown in the figure.

Special tool
: 09900–06107



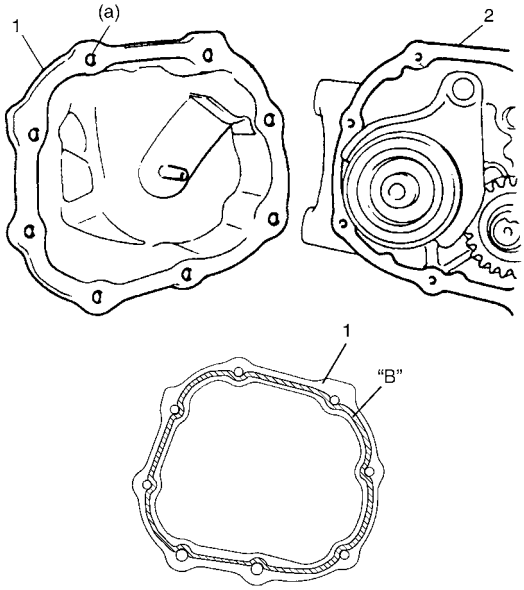
I4RS0A520030-

4. Polished surface

8) Clean mating surface of both left case (2) and side cover (1), apply sealant to side cover (1) as shown in figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, mate it with left case and then tighten bolts to specified torque.

"B": Sealant 99000–31260

Tightening torque
Side cover bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A520031-

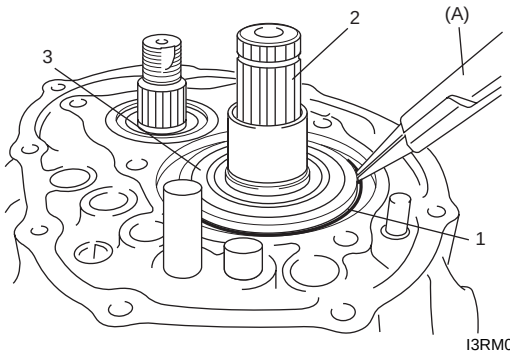
Manual Transaxle Assembly Disassembly and Reassembly

S4RS0A5206034

Disassembly

1) Remove gear shift and select shaft assembly referring to “Gear Shift and Select Shaft Assembly Removal and Installation: ”.
2) Remove fifth gear referring to “Fifth Gear Disassembly and Assembly: ”.
3) Remove left case plate.
4) Remove snap ring (1) using special tool.

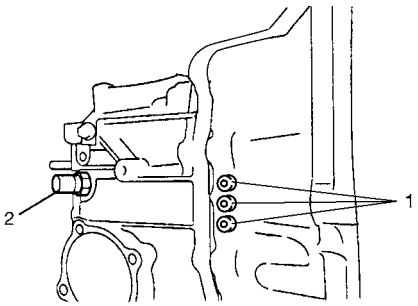
Special tool
(A): 09900–06107



I3RM0A520037-

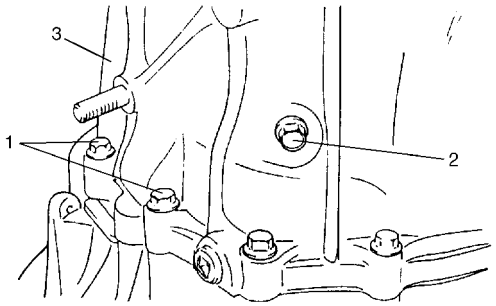
2.	Input shaft
3.	Input shaft left bearing

5) Remove gear shift locating bolts (1) with washers, then take out locating springs and steel balls.
6) Remove back up lamp switch (2).



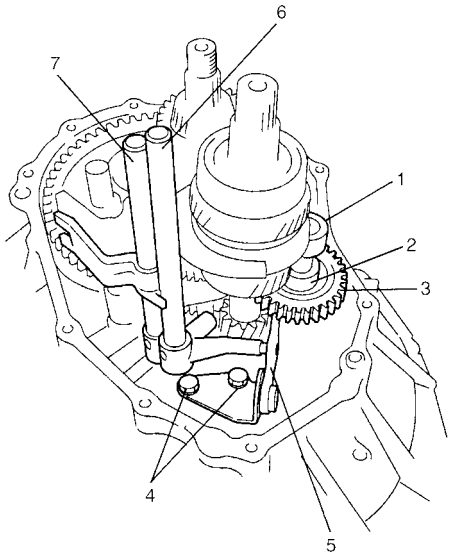
I2RH01520032-

7) Remove reverse shaft bolt (2) with washer.
8) Remove case bolts (1) from outside and another bolts from clutch housing side.
9) Tapping left case flanges with plastic hammer, remove left case (3).



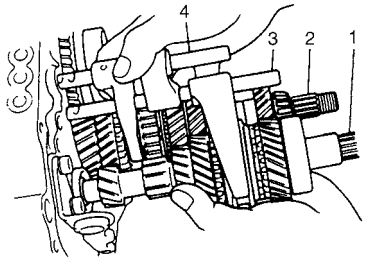
I4RS0A520032-

10) Pull out reverse gear shaft (1) with washer (2), then take off reverse idler gear (3).
11) Remove reverse gear shift lever bolts (4) and reverse gear shift lever (5).
12) Pull out 5th & reverse gear shift guide shaft (6) together with 5th & reverse gear shift shaft (7).



I4RS0A520033-

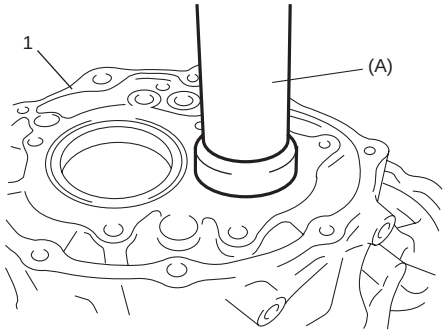
13) Tapping input shaft end with plastic hammer, push it out as assembly from case a little, then take out input shaft assembly (1), countershaft assembly (2), high speed gear shift shaft (3) and low speed gear shift shaft (4) all at once.



I2RH01520035-

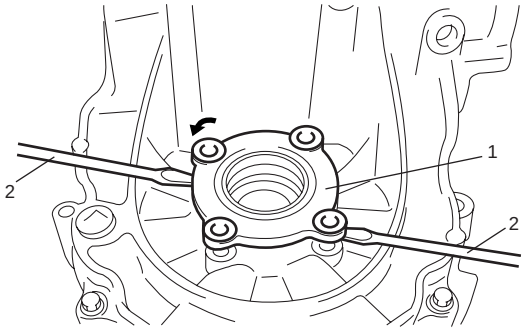
14) Remove countershaft left bearing outer race from left case (1) using special tool.

Special tool
(A): 09913–70123



I4RH01520021-

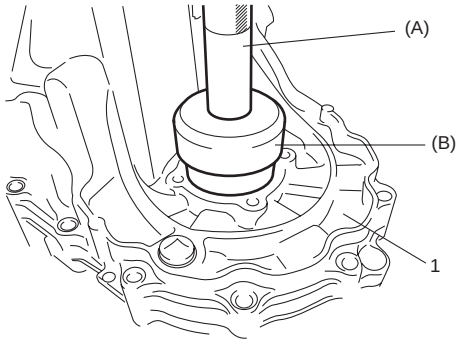
15) Remove side bearing retainer bolts.
16) Turn side bearing retainer (1) counterclockwise until it stops, and remove side bearing retainer using 2 flat end rods (2) or the like.
17) Remove O-ring from side bearing retainer.



I4RS0A520034-

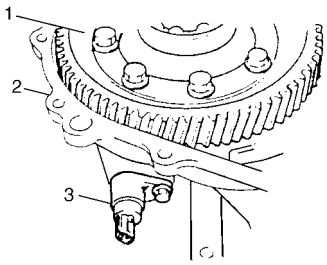
18) Remove differential bearing shim.
19) Remove differential side bearing outer race from left case (1) using special tools.

Special tool
(A): 09924–74510
(B): 09926–27610



I4RS0A520035-

20) Remove differential gear assembly (1) from right case (2).

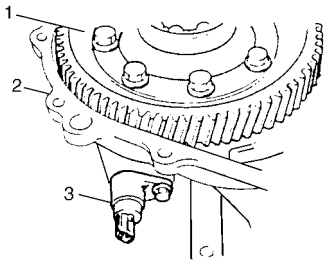


I2RH01520036-

3. VSS

Installation

1) Install differential assembly (1) into right case (2).



I2RH01520036-

3. VSS

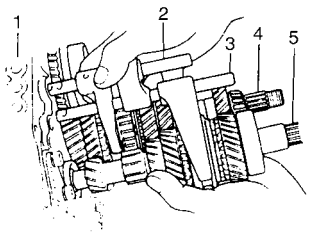
2) Join input shaft assembly (5), countershaft assembly (4), low speed gear shift shaft (2) and high speed gear shift shaft (3) assemblies all together, then install them into right case (1).

CAUTION:

Take care not to damage oil seal lip by input shaft, or oil leakage may take place.

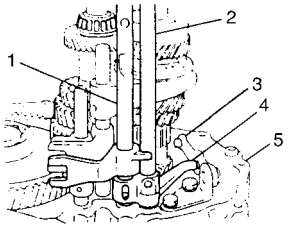
NOTE:

- **Input shaft right bearing on shaft can be installed into right case tapping shaft with plastic hammer.**
- **Check to make sure that countershaft is engaged with final gear while installing.**



I2RH01520080-

3) Install 5th & reverse gear shift shaft (1) with 5th & reverse gear shift guide shaft (2) into right case (5). Reverse gear shift arm (4) has to be joined with reverse gear shift lever (3) at the same time.



I2RH01520081-

4) Make reverse idler gear (1) with reverse gear shift lever (2), insert reverse gear shaft (3) into case (4) through idler gear and then align “A” in shaft with “B” in case.

5) Fasten reverse gear shift lever bolts after applying thread lock cement.

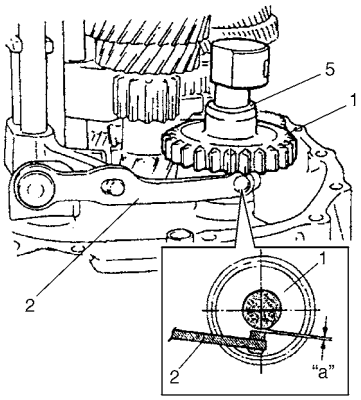
: Thread lock cement 99000–32110

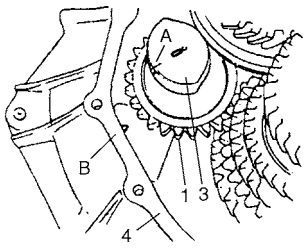
Tightening torque
Reverse gear shift lever bolt: 23 N·m (2.3 kg-m, 17.0 lb-ft)

NOTE:

- **Make sure that washer (5) has been installed in shaft at above the gear.**
- **Check to confirm that reverse gear shift lever end has clearance “a” to idler gear groove.**

  Distance between lever and idler gear shaft
  “a”: 0.5 – 1.0 mm (0.02 – 0.04 in.)





I4RS0A520036-

6) Clean mating surfaces of both right and left cases, apply sealant to right case (2) as shown in the figure by such amount that its section is 1.5 mm (0.059 in.) in diameter then mate it with left case (1).

“B”: Sealant 99000–31260

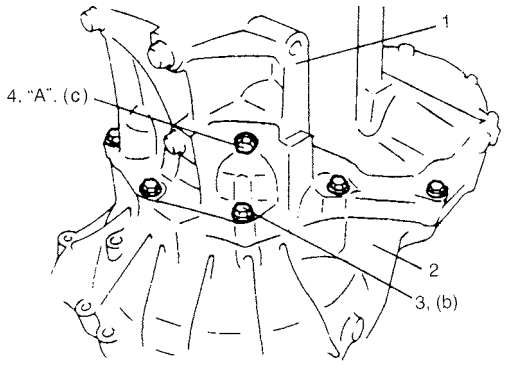
7) Install reverse shaft bolt (4) to which thread lock cement has been applied, with aluminum washer and tighten it to specified torque.

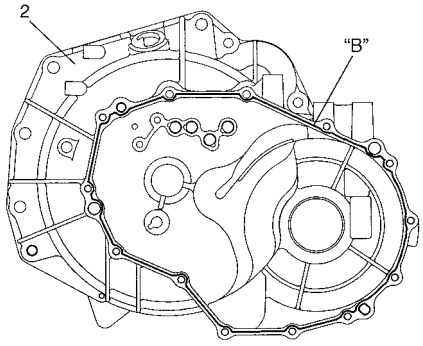
“A”: Thread lock cement 99000–32110

Tightening torque
Reverse shaft bolt (c): 23 N·m (2.3 kg-m, 17.0 lb-ft)

8) Tighten case bolts (3) from outside tighten another case bolts from clutch housing side to specified torque.

Tightening torque
Transaxle case bolt (b): 23 N·m (2.3 kg-m, 17.0 lb-ft)





I3RM0A520043-

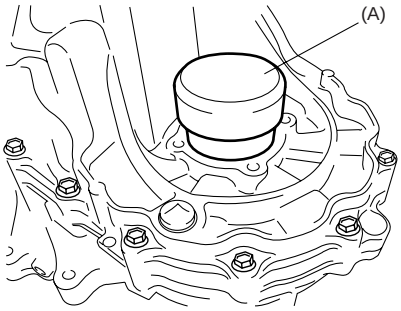
9) Install side bearing retainer as follows.

a) Install differential side bearing outer race to left case and then tap and accustom outer race using special tool and plastic hammer.

CAUTION:

Do not drive in a race with hammer.
Driving it may cause to damage bearing.

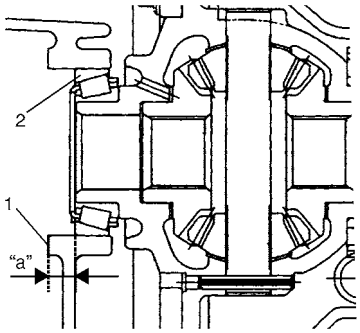
Special tool
(A): 09926–27610



I4RH01520053-

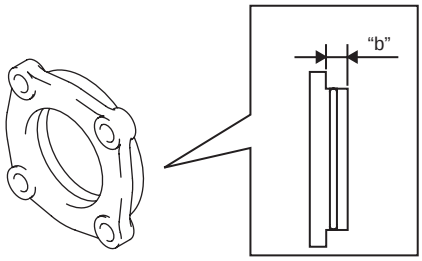
b) Select a shim of differential side bearing as follows.

i) Measure depth “a” from left case (1) face to side bearing outer race (2) using depth gauge.



I4RS0A520037-

ii) Measure height “b” of side bearing retainer with depth gauge.



I4RS0A520038-

iii) Calculate clearance a – b, and select differential shim according to the following table.

Bearing shim specification

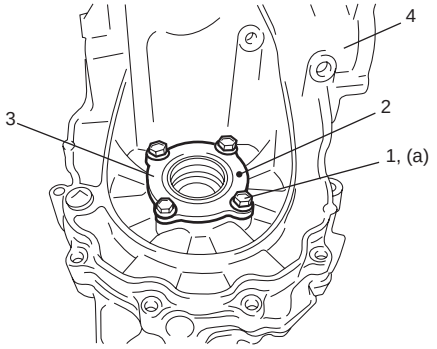
Clearance “a” – “b”	Thickness of bearing shim to be installed
0.636 – 0.665 mm (0.0250 – 0.0261 in.)	0.75 mm (0.030 in.)
0.666 – 0.695 mm (0.0262 – 0.0273 in.)	0.78 mm (0.031 in.)
0.696 – 0.725 mm (0.0274 – 0.0285 in.)	0.81 mm (0.032 in.)
0.726 – 0.755 mm (0.0286 – 0.0297 in.)	0.84 mm (0.033 in.)
0.756 – 0.785 mm (0.0298 – 0.0309 in.)	0.87 mm (0.034 in.)
0.786 – 0.815 mm (0.0310 – 0.0320 in.)	0.90 mm (0.035 in.)
0.816 – 0.845 mm (0.0321 – 0.0332 in.)	0.93 mm (0.037 in.)
0.846 – 0.875 mm (0.0333 – 0.0344 in.)	0.96 mm (0.038 in.)
0.876 – 0.905 mm (0.0345 – 0.0356 in.)	0.99 mm (0.039 in.)
0.906 – 0.935 mm (0.0357 – 0.0368 in.)	1.02 mm (0.040 in.)
0.936 – 0.965 mm (0.0369 – 0.0379 in.)	1.05 mm (0.041 in.)
0.966 – 0.995 mm (0.0380 – 0.0391 in.)	1.08 mm (0.043 in.)
0.996 – 1.025 mm (0.0392 – 0.0403 in.)	1.11 mm (0.044 in.)
1.026 – 1.055 mm (0.0404 – 0.0415 in.)	1.14 mm (0.045 in.)
1.056 – 1.085 mm (0.0416 – 0.0427 in.)	1.17 mm (0.046 in.)
1.086 – 1.115 mm (0.0428 – 0.0438 in.)	1.20 mm (0.047 in.)
1.116 – 1.145 mm (0.0439 – 0.0450 in.)	1.23 mm (0.048 in.)
1.146 – 1.175 mm (0.0451 – 0.0462 in.)	1.26 mm (0.050 in.)
1.176 – 1.205 mm (0.0463 – 0.0474 in.)	1.29 mm (0.051 in.)
1.206 – 1.235 mm (0.0475 – 0.0486 in.)	1.32 mm (0.052 in.)
1.236 – 1.265 mm (0.0487 – 0.0498 in.)	1.35 mm (0.053 in.)
1.266 – 1.295 mm (0.0499 – 0.0509 in.)	1.38 mm (0.054 in.)
1.296 – 1.325 mm (0.0510 – 0.0521 in.)	1.41 mm (0.056 in.)

c) Install differential side bearing shim to left case (4).
d) Apply oil to new O-ring of side bearing retainer (3), and install side bearing retainer with new O-ring to left case.
e) Tighten side bearing retainer bolts (1) to specified torque.

NOTE:

Install side bearing retainer with its punch mark (2) facing upward.

Tightening torque
Side bearing retainer bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A520039-

10) Check locating springs (2, 4 and 5) for deterioration and replace with new one as necessary.

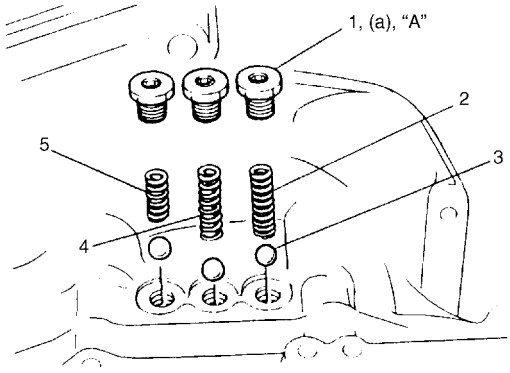
Locating spring

Locating spring free length	Standard	Service limit
Low speed (2)	53.1 mm (2.091 in.)	50.5 mm (1.988 in.)
High speed (4)	45.9 mm (1.807 in.)	44.0 mm (1.732 in.)
5th & reverse (5)	29.9 mm (1.777 in.)	28.5 mm (1.122 in.)

11) Install steel balls (3) and locating springs (2, 4 and 5) for respective gear shift shaft and tighten bolts (1) to which sealant has been applied.

"A": Sealant 99000–31260

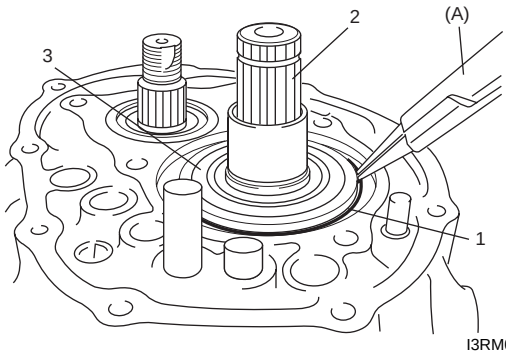
Tightening torque
Gear shift locating bolt (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)



I2RH01520084-

12) Install new snap ring (1) using special tool.

Special tool
(A): 09900–06107

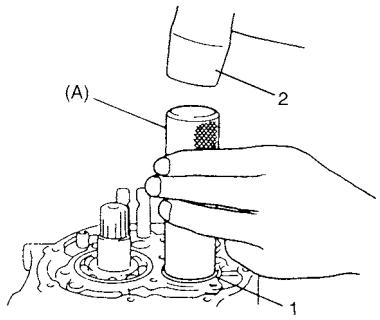


I3RM0A520037-

2. Input shaft
3. Input shaft left bearing

13) To seat countershaft left bearing outer race (1) to bearing cone, and tap countershaft left bearing outer race (1) using special tool and plastic hammer (2).

Special tool
(A): 09913–70123



I3RM0A520030-

14) With putting a shim (2) on bearing outer race (3), place straightedge (1) over it and compress it by hand through straightedge, and then measure clearance "a" between case surface (4) and straightedge using feeler gauge (5).

Clearance between case surface and straightedge (Shim protrusion)
"a": 0.13 – 0.17 mm (0.0051 – 0.0067 in.)

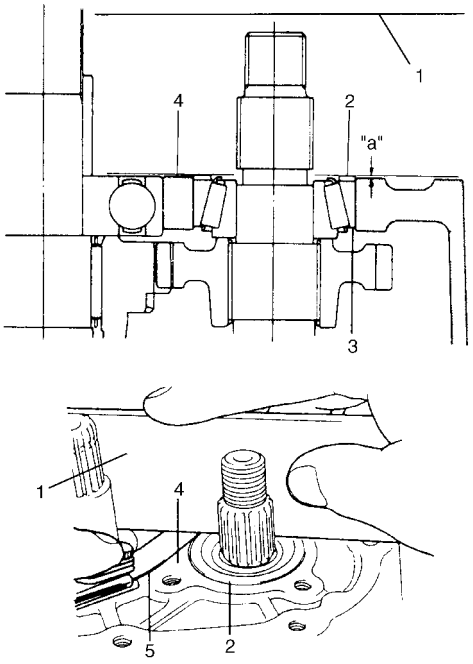
15) By repeating Step 14), select a suitable shim which adjusts clearance “a” to specification and put it on bearing outer race.

NOTE:

Insert 0.15 mm (0.0059 in.) feeler to know whether or not a shim fulfills specification quickly.

Available shim thickness

0.55 mm (0.021 in.)	**0.90 mm (0.035 in.)**
0.60 mm (0.023 in.)	**0.95 mm (0.037 in.)**
0.65 mm (0.025 in.)	**1.00 mm (0.039 in.)**
0.70 mm (0.027 in.)	**1.05 mm (0.041 in.)**
0.75 mm (0.029 in.)	**1.10 mm (0.043 in.)**
0.80 mm (0.031 in.)	**1.15 mm (0.059 in.)**
0.85 mm (0.033 in.)	



I3RM0A520031-

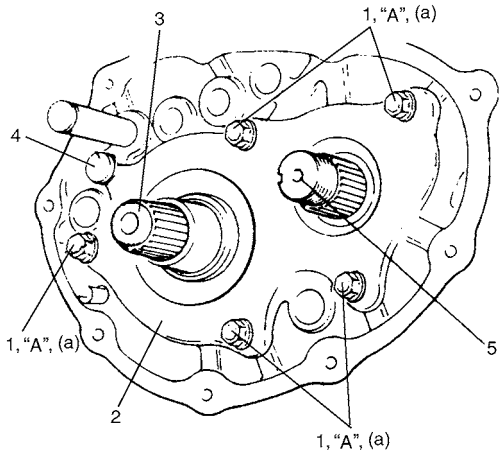
16) Place left case plate (2) inserting its end in groove of shift guide shaft (4) and tighten bolts (1) to which thread lock cement has been applied.

NOTE:

After tightening bolts, make sure that countershaft (5) can be rotated by hand feeling certain load.

“A”: Thread lock cement 99000–32110

Tightening torque
Left case plate bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A520042-

3. Input shaft

17) Install fifth gear referring to “Fifth Gear Disassembly and Assembly: ”.
18) Install gear shift and select shaft assembly referring to “Gear Shift and Select Shaft Assembly Removal and Installation: ”.
19) Install back up lamp switch referring to “Back Up Lamp Switch Removal and Installation: ”.
20) Check input shaft for rotation in each gear position.
21) Also confirm continuity of back up lamp switch in reverse position using ohmmeter.

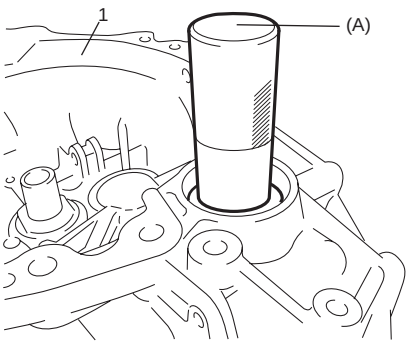
Transaxle Right Case Disassembly and Assembly

S4RS0A5206020

Disassembly

1) Remove gear shift shaft, input shaft assembly and countershaft assembly referring to “Manual Transaxle Assembly Disassembly and Reassembly: ”.
2) Remove differential side bearing outer race from right case (1) using special tool.

Special tool
(A): 09925–15410



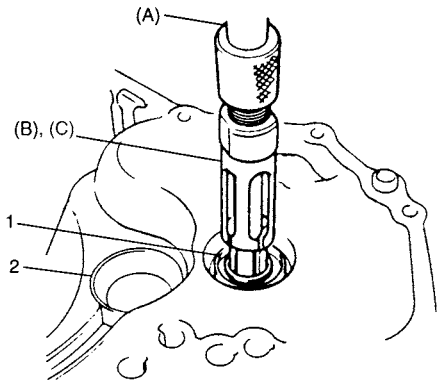
I3RM0B521021-

3) Remove input shaft oil seal (1) using special tools, if necessary.

Special tool
(A): 09930–30104
(B): 09923–74510

4) Pull out countershaft right bearing outer race (2) using special tools, if necessary.

Special tool
(A): 09930–30104
(C): 09941–64511



I4RS0A520040-

5) Replace differential side oil seal from right case referring to “Differential Side Oil Seal Replacement: ” if necessary.

Assembly

NOTE:

Before installation, wash each part and apply specified transaxle oil to sliding faces of bearing and gear.

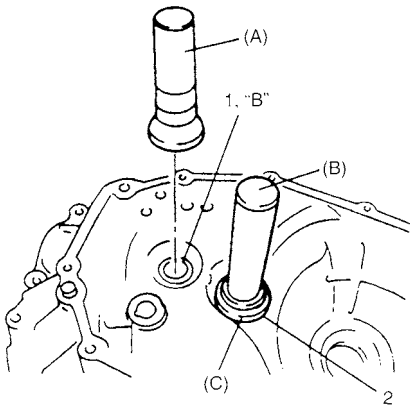
1) Install differential side oil seal into right case referring to “Differential Side Oil Seal Replacement: ” if removed.
2) If input shaft oil seal (1) has been removed, install it with its spring side facing upward. Use special tool and hammer for installation and apply grease to oil seal lip.

“B”: Grease 99000–25010

Special tool
(A): 09913–84510

3) If countershaft right bearing outer race (2) has been removed, install it using special tools and hammer.

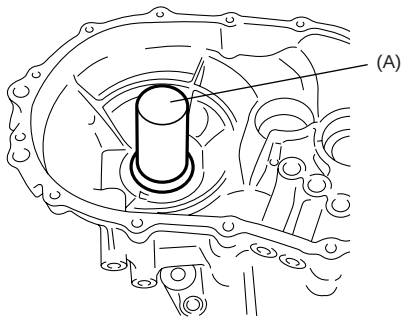
Special tool
(B): 09925–98210
(C): 09924–84510–004



I3RM0A520047-

4) Install differential side bearing outer race to right case using special tool and hammer.

Special tool
(A): 09913–85210



I4RH01520027-

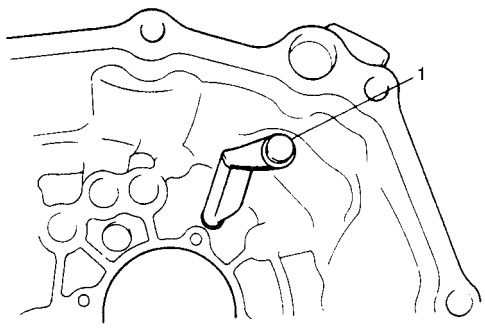
5) Install gear shift shaft, input shaft assembly and countershaft assembly referring to “Manual Transaxle Assembly Disassembly and Reassembly: ”.

Transaxle Left Case Disassembly and Assembly

S4RS0A5206035

Disassembly

1) Replace differential side oil seal from left case referring to “Differential Side Oil Seal Replacement: ”, if necessary.
2) Remove input oil gutter (1) from left case, if necessary.



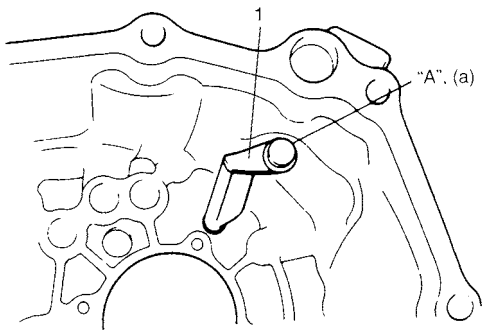
I4RH01520028-

Assembly

1) If input oil gutter (1) has been removed, install it with bolt to which thread lock cement has been applied.

"A": Thread lock cement 99000–32110

Tightening torque
Oil gutter bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

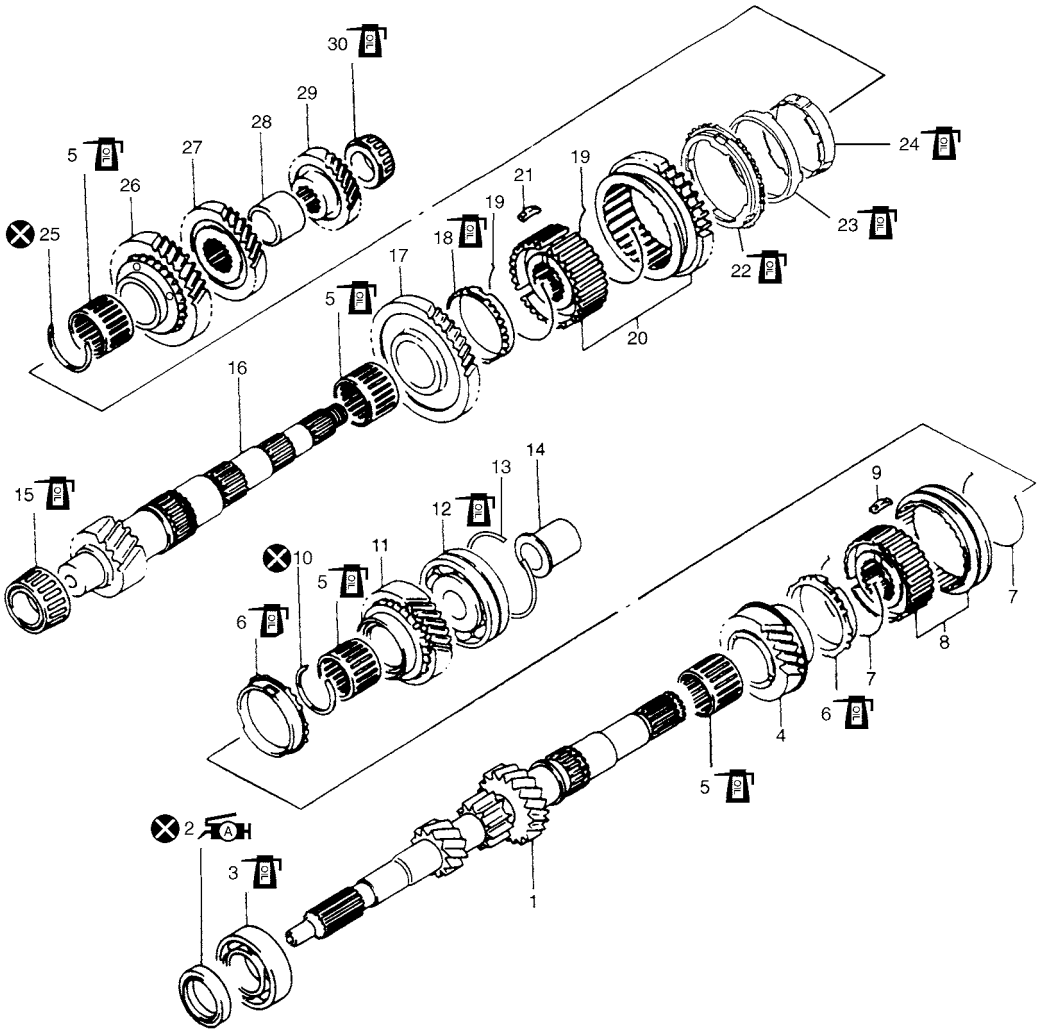


I3RM0A520048-

2) If differential side oil seal is removed, install it to left case referring to "Differential Side Oil Seal Replacement: ".

Input Shaft and Countershaft Components

S4RS0A5206030



I3RM0B521010-

1. Input shaft	12. Input shaft left bearing	23. 2nd gear synchronizer center cone
2. Oil seal : Apply grease 99000-25010 to oil seal lip.	13. Circlip	24. 2nd gear synchronizer inner ring
3. Input shaft right bearing	14. 5th gear spacer	25. Circlip
4. Input shaft 3rd gear	15. Countershaft right bearing	26. Countershaft 2nd gear
5. Needle bearing (resin cage type)	16. Countershaft	27. Countershaft 3rd gear
6. High speed synchronizer ring	17. Countershaft 1st gear	28. 3rd & 4th gear spacer
7. High speed synchronizer spring	18. 1st gear synchronizer ring	29. Countershaft 4th gear

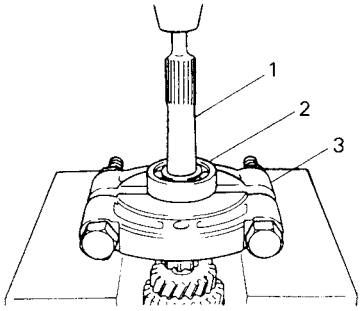
8. High speed synchronizer sleeve & hub	19. Low speed synchronizer spring	30. Countershaft left bearing
9. High speed synchronizer key	20. Low speed synchronizer sleeve & hub	: Do not reuse.
10. Circlip	21. Low speed synchronizer key	: Apply transaxle oil.
11. Input shaft 4th gear	22. 2nd gear synchronizer outer ring	

Input Shaft Assembly Disassembly and Reassembly

S4RS0A5206021

Disassembly

1) Remove input shaft right bearing (2) from input shaft (1) using bearing puller (3) and hydraulic press.

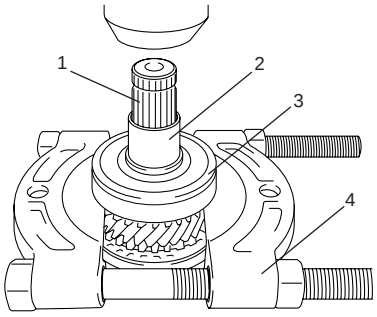


IYSY01521048-

2) Drive out 5th gear spacer (2) and left bearing (3) from input shaft (1) using bearing puller (4) and hydraulic press.

CAUTION:

To avoid gear tooth from being damaged, support it at flat side of bearing puller.

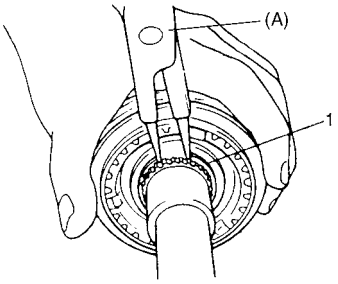


I4RH01520030-

3) Take out 4th gear, 4th gear needle bearing of resin cage type and high speed synchronizer ring.

4) Using special tool, remove circlip (1).

Special tool
(A): 09900–06107

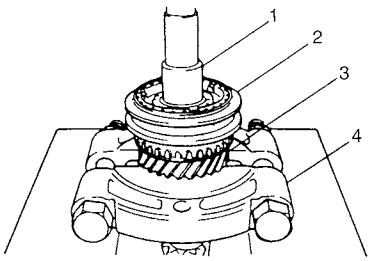


I2RH01520046-

5) Drive out high speed synchronizer sleeve & hub assembly (2) together with 3rd gear (3) from input shaft (1) using bearing puller (4) and hydraulic press.

CAUTION:

Make sure to use flat side of bearing puller to avoid causing damage to 3rd gear tooth.



I2RH01520097-

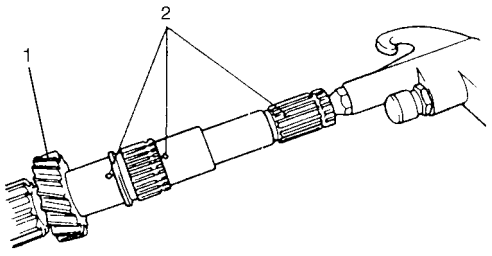
6) Take out 3rd gear needle bearing of resin cage type from shaft.

7) Disassemble high speed synchronizer sleeve & hub assembly.

Assembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.

2) To ensure lubrication of input shaft (1), air blow oil holes (2) and make sure that they are free from any obstruction.



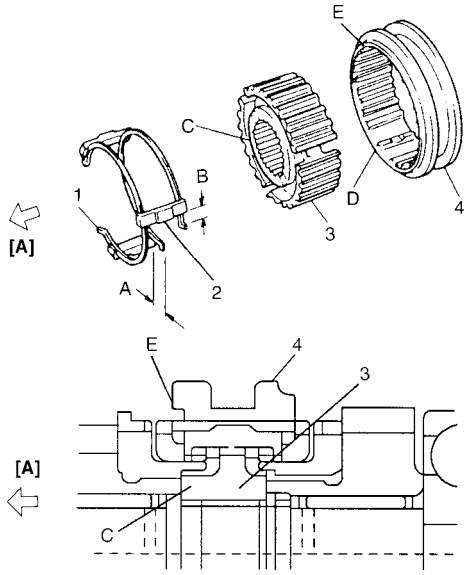
I2RH01520049-

3) Fit high speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs (1) as shown in the figure.

NOTE:

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Size of high speed synchronizer sleeve, hub, keys and springs is between those of low speed and 5th speed ones.**

Synchronizer key installation position
A = B

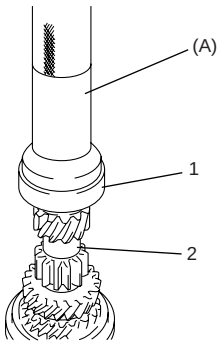


I3RM0B521022-

[A]: 3rd gear side	D: Key way
C: Long flange	E: Projecting end

4) Drive in right bearing (1) to input shaft (2) using special tool and hammer.

Special tool
(A): 09951–16080



I4RH01520031-

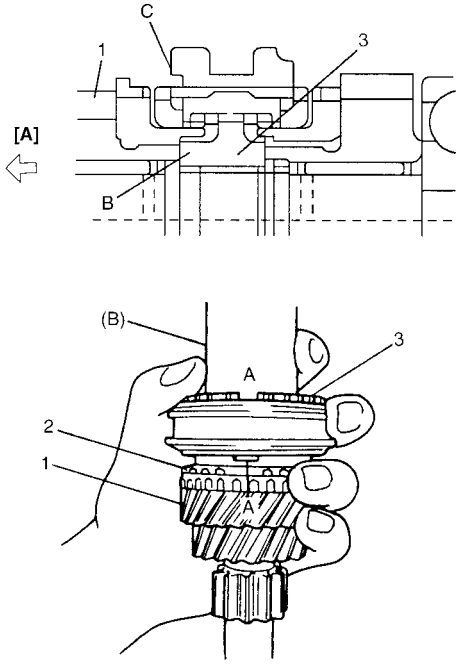
5) Install 3rd gear needle bearing of resin cage type, apply oil to it, then install 3rd gear (1) and synchronizer ring (2).

6) Drive in high speed synchronizer sleeve & hub assembly (3) using special tool and hammer, facing long flange side of hub to 3rd gear.

NOTE:

- **While press-fitting sleeve & hub, make sure that synchronizer ring key slots are aligned with keys in sleeve & hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.**
- **Synchronizer rings for 3rd and 4th are identical.**

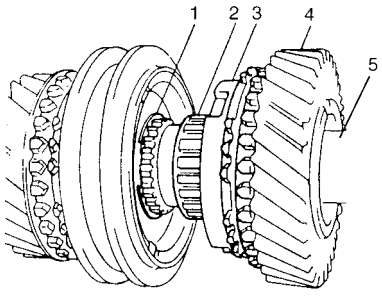
Special tool
(B): 09913–84510



I3RM0B521023-

[A]: 3rd gear side	B: Long flange
A: Key way	C: Projecting end

7) Install circlip (1) and confirm that circlip is installed in groove securely. Install needle bearing (2) of resin cage type, apply oil to it and then install synchronizer ring (3) and 4th gear (4).



I2RH01520052-

5. Input shaft

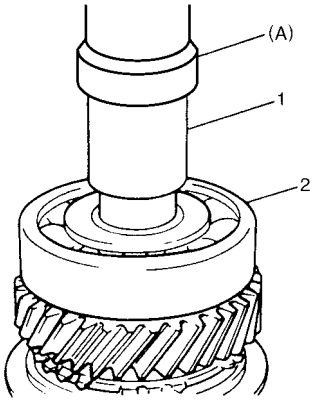
8) Press-fit left bearing (2) using special tool and hammer.

Special tool
(A): 09913–70123

9) Using the same special tool at Step 8), drive in 5th gear spacer (1).

CAUTION:

To prevent 5th gear spacer from being distorted because of excessive compression, do not press-fit it with left bearing at once.



I4RH01520032-

Countershaft Assembly Disassembly and Reassembly

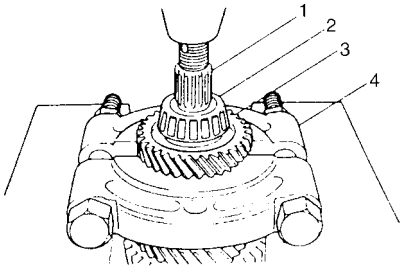
S4RS0A5206022

Disassembly

1) Drive out left bearing cone (2) with 4th gear (3) from countershaft (1) using bearing puller (4) and hydraulic press.

CAUTION:

- **Use bearing puller and hydraulic press that will bear at least 5 ton (11,000 lb) safely.**
- **To avoid tooth damage, support 4th gear at flat side of bearing puller.**

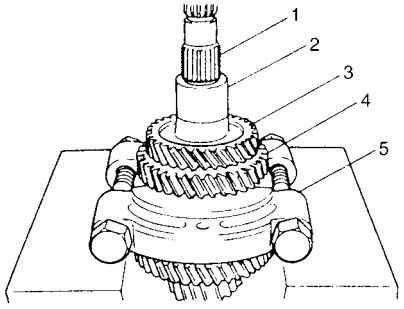


I2RH01520054-

2) Apply bearing puller (5) to 2nd gear (4) and drive out 3rd & 4th gear spacer (2) and 3rd gear (3) together with 2nd gear from countershaft (1) using hydraulic press. Take out needle bearing of resin cage type from countershaft.

CAUTION:

- **If compression exceeds 5 ton (11,000 lb), release compression once, reset bearing puller support and then continue press work again.**
- **To avoid gear tooth from being damaged, support it at flat side of bearing puller.**

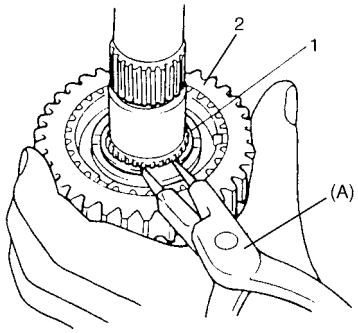


I2RH01520055-

3) Take out 2nd gear synchronizer outer ring, center cone and inner ring.

4) Using special tool, remove circlip (1).

Special tool
(A): 09900–06107



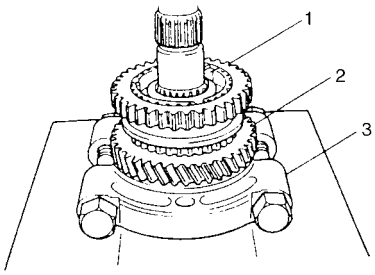
I2RH01520056-

2. Low speed synchronizer sleeve

5) Apply bearing puller (3) to 1st gear (2) and drive out low speed synchronizer sleeve & hub assembly (1) with 1st gear using hydraulic press.

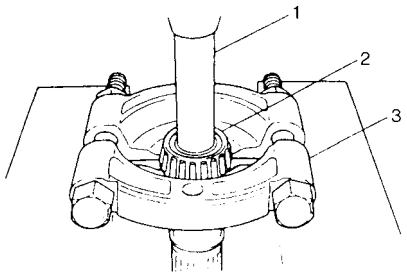
CAUTION:

To avoid gear tooth from being damaged, support it at flat side of bearing puller.



I2RH01520057-

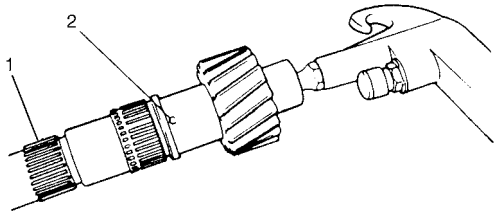
6) Disassemble low speed synchronizer sleeve & hub assembly.
7) Take out 1st gear needle bearing of resin cage type from shaft.
8) Remove right bearing cone (2) using bearing puller (3), metal stick (1) and hydraulic press.



I2RH01520058-

Assembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2) To ensure lubrication of countershaft (1), air blow oil holes (2) and make sure that they are free from any obstruction.



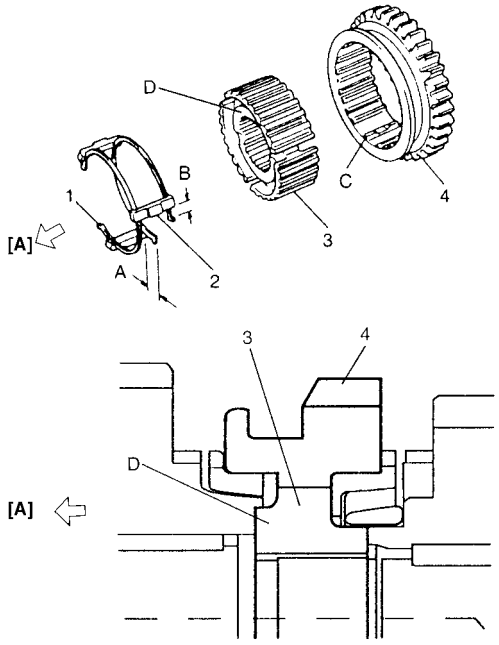
I2RH01520060-

3) Fit low speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs (1) as shown in the figure.

NOTE:

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Size of low speed synchronizer keys and springs are the largest compared with those of high speed and 5th speed ones.**

Synchronizer key installation position
A = B

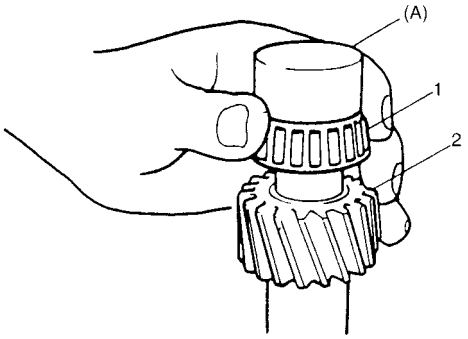


I3RM0A520051-

[A]: 1st gear side	D: Short flange
C: Key way	

4) Install right bearing cone (1) to countershaft (2) using special tool and hammer.

Special tool
(A): 09923–78210



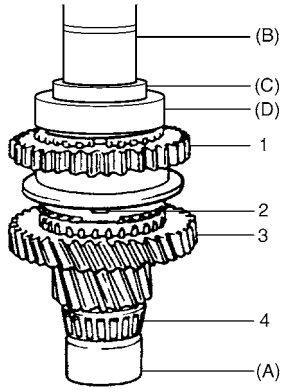
I2RH01520062-

5) Install needle bearing of resin cage type, apply oil to it, then install 1st gear and 1st gear synchronizer ring.
6) Drive in low speed synchronizer sleeve & hub assembly (1) using special tools and hammer.

NOTE:

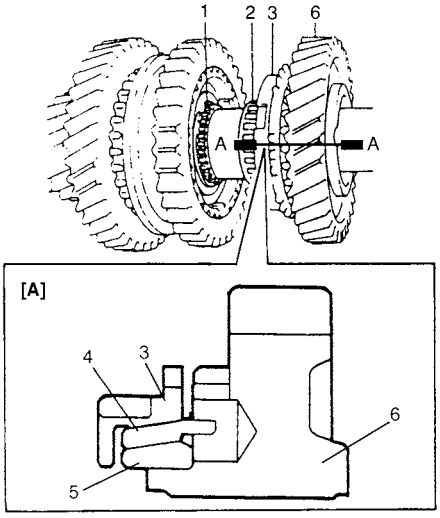
- **Support shaft with special tool as shown in the figure so that retainer of bearing cone (4) will be free from compression.**
- **Make sure that synchronizer ring (2) key slots are aligned with keys while press-fitting sleeve & hub assembly.**
- **Check free rotation of 1st gear (3) after press-fitting sleeve & hub assembly.**

Special tool
(A): 09923–78210
(B): 09940–51710
(C): 09924–07730
(D): 09924–07710



I4RH01520057-

7) Install circlip (1) and confirm that circlip is installed in groove securely.
Install needle bearing (2) of separated steel cage type, apply oil to bearing.
With synchronizer outer ring (3), center cone (4) and inner ring (5) put together and installed to 2nd gear (6) as shown in the figure.



I2RH01520064-

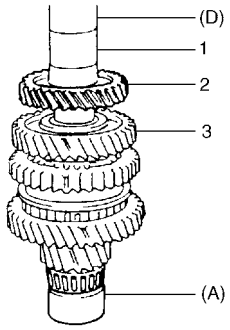
[A]: Section A – A

8) Press-fit 3rd gear (2) and spacer (1) using special tools and hydraulic press.

CAUTION:

Press-fit spacer (1) and 3rd gear (2) first, and then 4th gear later separately so that countershaft will not be compressed excessively.

Special tool
(A): 09923–78210
(D): 09913–84510



I2RH01520065-

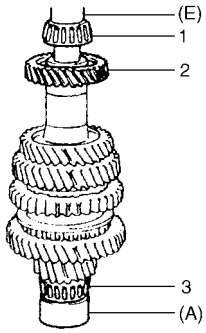
3. 2nd gear

9) Press-fit 4th gear (2) using the same procedure as Step 8).
10) Install left bearing cone (1) using special tools and hammer.

NOTE:

For protection of right bearing cone (3), always support shaft with special tool as shown in the figure.

Special tool
(A): 09923–78210
(E): 09913–80113



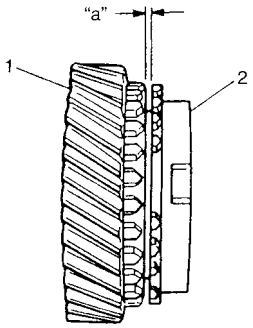
I2RH01520066-

Synchronizer Parts Inspection

S4RS0A5206036

Check clearance “a” between synchronizer ring (2) and gear (1), each chamfered tooth of gear, synchronizer ring and sleeve, then determine parts replacement.

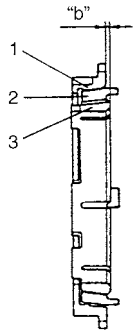
Clearance “a” between synchronizer ring and gear
Standard: 1.0 – 1.4 mm (0.039 – 0.055 in.)
Service limit: 0.5 mm (0.019 in.)



I2RH01520048-

Put the 2nd gear synchronizer outer ring (1), inner ring (3) and the cone (2) together and then measure the step difference between the outer ring and the inner ring. And also check each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

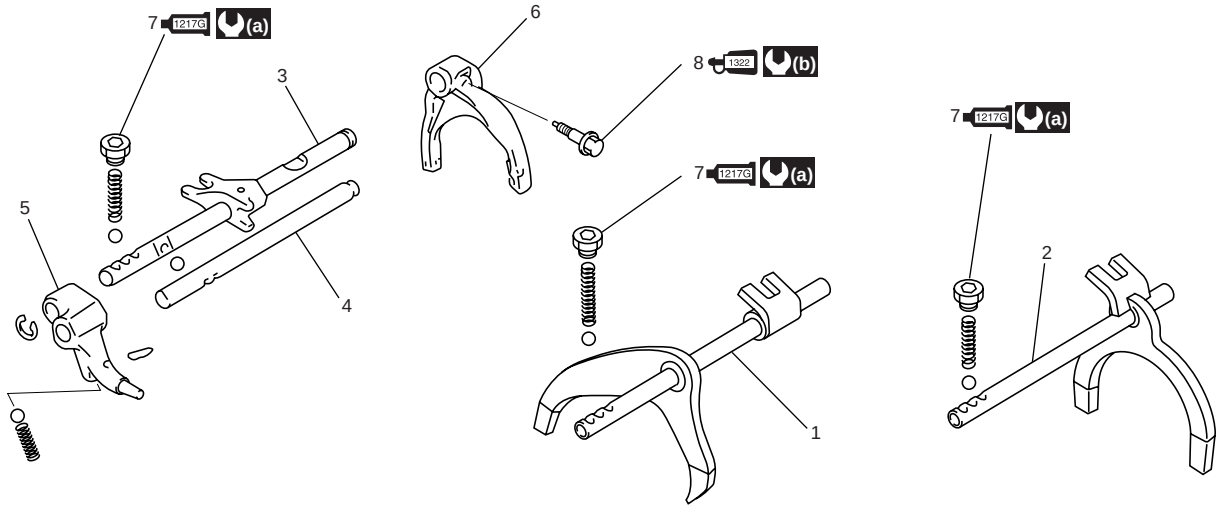
Difference “b” between synchronizer outer ring and inner ring
Standard: 1.0 – 1.4 mm (0.039 – 0.055 in.)
Service limit: 0.5 mm (0.019 in.)



I2RH01520059-

Gear Shift Shaft Components

S4RS0A5206031



I4RS0A520015-

1. Low speed gear shift shaft	5. Reverse gear shift arm	(a) : 13 N·m (1.3 kg-m, 9.5 lb-ft)
2. High speed gear shift shaft	6. 5th gear shift fork	(b) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
3. 5th & reverse gear shift shaft	1217G 7. Gear shift locating bolt : Apply sealant 99000-31260 to bolt thread.	
4. 5th & reverse gear shift guide shaft	1322 8. Shift fork bolt : Apply thread lock 99000-32110 to bolt thread.	

5th and Reverse Gear Shift Shafts Disassembly and Assembly

S4RS0A5206024

Disassembly

Disassemble component parts using special tool and hammer.

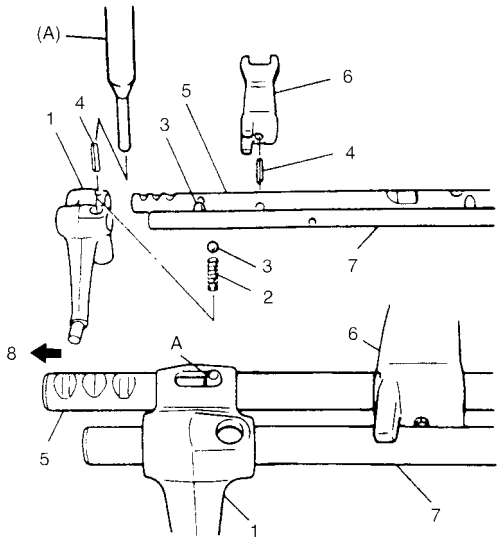
Special tool
(A): 09922–85811

Assembly

Replace or correct parts as required and assemble shafts making sure that component parts are in proper order as shown.

NOTE:

- **Distinguish reverse gear shift arm spring (Blue) (2) from low speed locating spring (Yellow).**
- **Install 2 steel balls (3) in reverse gear shift arm (1) without fail.**
- **Drive in spring pin for reverse gear shift arm facing slit A toward 5th gear side.**



I3RM0A520053-

A:	Face pin slit toward 5th gear side
4.	Spring pin
5.	5th & reverse gear shift shaft
6.	5th & reverse gear shift yoke
7.	5th & reverse gear shift guide shaft
8.	5th gear side

Gear Shift Shaft and Fork Inspection

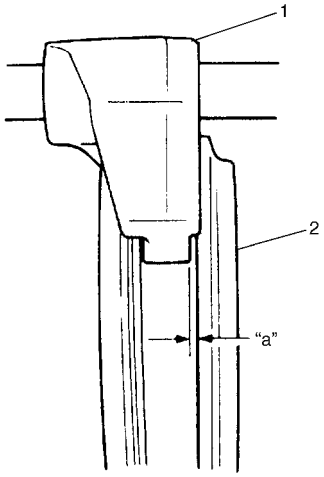
S4RS0A5206037

Using feeler gauge, check clearance between fork (1) and sleeve (2) and replace those parts if it exceeds limit.

NOTE:

For correct judgement of parts replacement, carefully inspect contact portion of fork and sleeve.

Clearance “a” between fork and sleeve
Service limit “a”: 1.0 mm (0.039 in.)

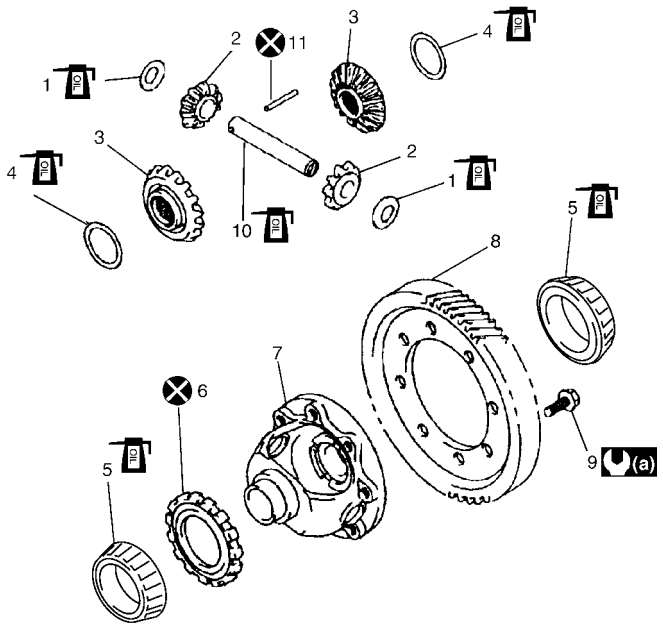


I2RH01520068-

Insert each gear shift shaft into case and check that it moves smoothly. If it doesn’t, correct using oilstone, reamer or the like.

Differential Components

S4RS0A5206032



I4RS0A520016-

1. Differential pinion washer	8. Final gear
2. Differential side pinion gear	9. Final gear bolt
3. Differential side gear	10. Differential pinion shaft
4. Side gear washer	11. Differential pinion shaft pin
5. Differential side bearing	(a) : 90 N·m (9.0 kg-m, 65.0 lb-ft)
6. Speed sensor ring	: Do not reuse.
7. Differential case	: Apply transaxle oil.

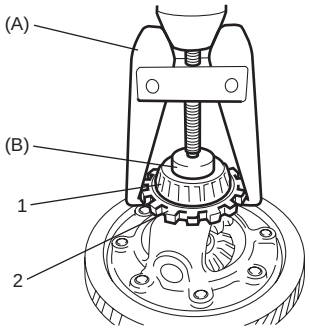
Differential Disassembly and Assembly

S4RS0A5206025

Disassembly

1) Using special tools, remove right bearing (1) and sensor rotor (2).

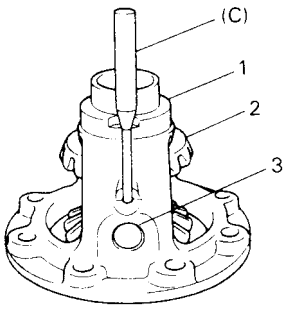
Special tool
(A): 09913–60910
(B): 09925–88210



I4RH01520039-

2) Remove left bearing in the same manner at Step 1).
3) Support differential case with soft jawed vise and remove final gear bolts then take out final gear.
4) Using special tool and hammer, drive out differential pinion shaft pin and then disassemble component parts.

Special tool
(C): 09922–85811



IYSY01521077-

1. Differential case	
2. Differential gear	
3. Differential pinion shaft	

Assembly

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly. Make sure that all parts are clean.

1) Assemble differential gear and measure thrust play of differential gear as follows.

Special tool
(A): 09900–20607
(B): 09900–20701

Differential gear thrust play
0.03 – 0.31 mm (0.001 – 0.012 in.)

Left side

1. Hold differential assembly with soft jawed vise and apply measuring tip of dial gauge to top surface of gear (2).
2. Using 2 screwdrivers (1), move gear up and down and read movement of dial gauge pointer.

Right side

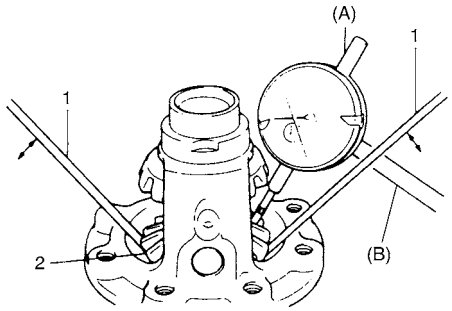
1. Using similar procedure to the left side, set dial gauge tip to gear (2) shoulder.
2. Move gear up and down by hand and read dial gauge.

2) If thrust play is out of specification, select suitable thrust washer from among the following available size, install it and check again that specified gear play is obtained.

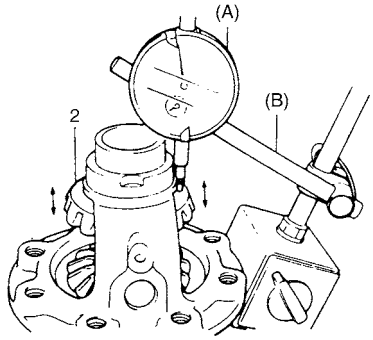
Available thrust washer thickness

0.90 mm (0.035 in.)	**1.05 mm (0.041 in.)**
0.95 mm (0.037 in.)	**1.10 mm (0.043 in.)**
1.00 mm (0.039 in.)	**1.15 mm (0.045 in.)**

[A]



[B]



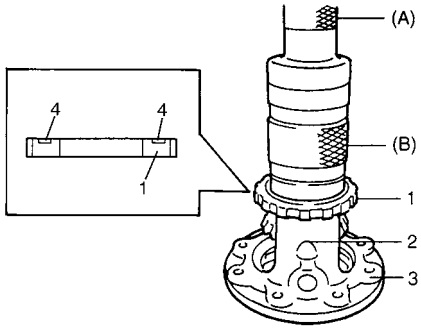
I3RH0A520083-

[A]: Left side	[B]: Right side

3) Drive in new differential pinion shaft pin (2) till the depth from differential case (3) surface is about 1 mm (0.04 in.).

4) Press-fit new sensor rotor (1) with groove (4) upward as shown using special tools and copper hammer.

Special tool
(A): 09913–76010
(B): 09940–54910



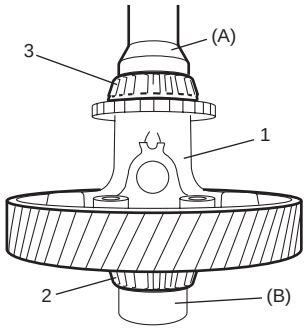
I3RM0B521024-

5) Press-fit left bearing (2) using special tools and copper hammer.

Special tool
(A): 09913–76010

6) Support differential assembly (1) as illustrated so as to left bearing is floating, and then press-fit right bearing (3) using special tools.

Special tool
(A): 09913–76010
(B): 09951–16060



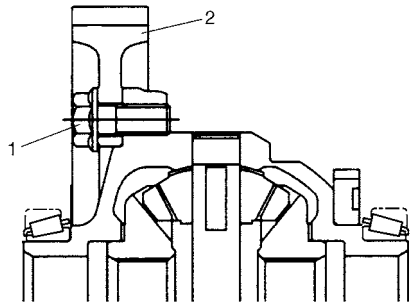
I3RM0B521025-

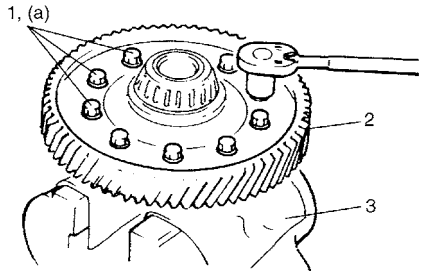
7) Hold differential assembly with soft jawed vise (3), install final gear (2) as shown in the figure and then tighten bolts (1) to specified torque.

CAUTION:

Use of any other bolts than specified ones is prohibited.

Tightening torque
Final gear bolt (a): 90 N·m (9.0 kg-m, 65.0 lb-ft)





I4RS0A520043-

Specifications

Tightening Torque Specifications

S4RS0A5207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Transaxle oil drain plug	21	2.1	15.5	☞
Transaxle oil level / filler plug	21	2.1	15.5	☞
VSS bolt	5	0.5	4.0	☞
Cable bracket bolt	55	5.5	40.0	☞
Back up lamp switch	23	2.3	17.0	☞
Gear shift guide case bolt	23	2.3	17.0	☞
Select lever bracket bolt	23	2.3	17.0	☞
Gear shift interlock bolt	50	5.0	36.5	☞
5th to reverse interlock guide bolt	23	2.3	17.0	☞
Countershaft nut	100	10.0	72.5	☞
Shift fork bolt	10	1.0	7.5	☞
Side cover bolt	10	1.0	7.5	☞
Reverse gear shift lever bolt	23	2.3	17.0	☞
Reverse shaft bolt	23	2.3	17.0	☞
Transaxle case bolt	23	2.3	17.0	☞
Side bearing retainer bolt	23	2.3	17.0	☞
Gear shift locating bolt	13	1.3	9.5	☞
Left case plate bolt	23	2.3	17.0	☞
Oil gutter bolt	10	1.0	7.5	☞
Final gear bolt	90	9.0	65.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Gear Shift Control Lever and Cable Components: ”
“Manual Transaxle Unit Components: ”
“Gear Shift and Select Shaft Assembly Components: ”
“Manual Transaxle Assembly Components: ”
“Gear Shift Shaft Components: ”
“Differential Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A5208001

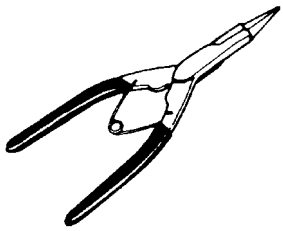
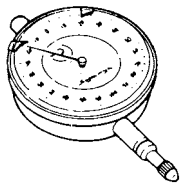
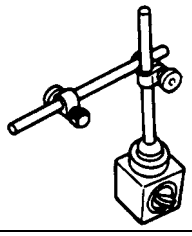
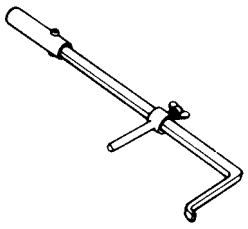
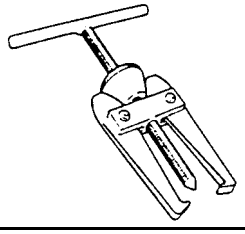
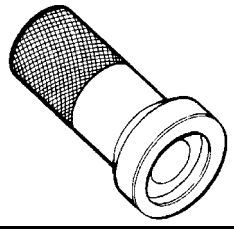
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞ / ☞ / ☞ / ☞ / ☞

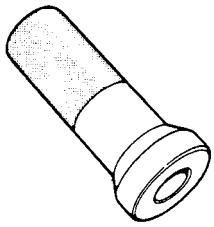
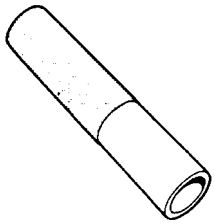
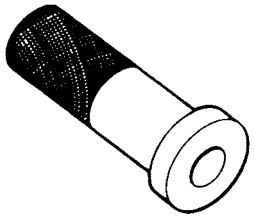
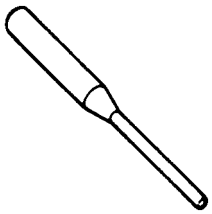
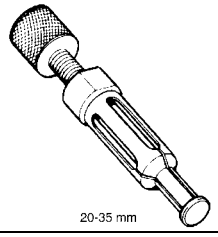
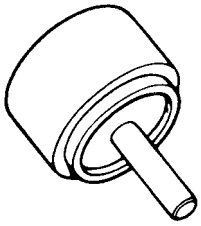
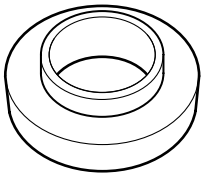
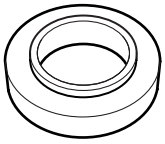
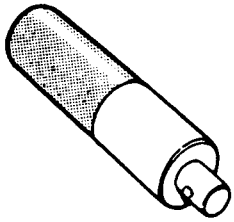
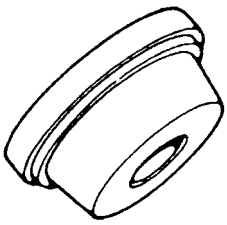
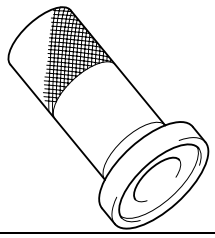
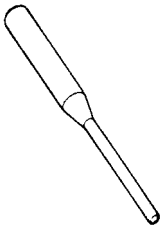
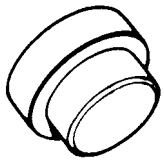
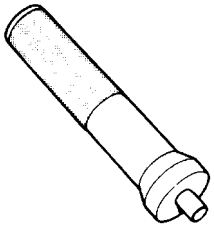
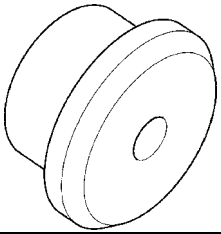
NOTE:

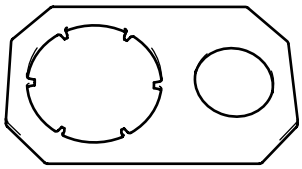
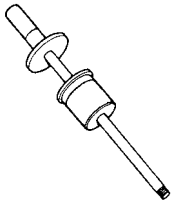
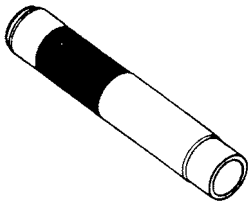
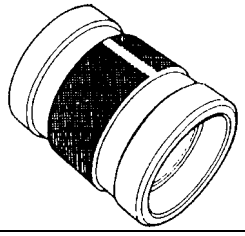
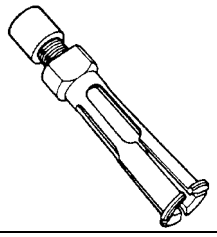
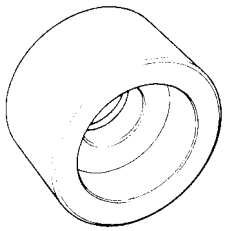
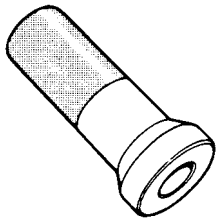
Required service material is also described in the following.
“Gear Shift Control Lever and Cable Components: ”
“Gear Shift and Select Shaft Assembly Components: ”
“Manual Transaxle Assembly Components: ”
“Input Shaft and Countershaft Components: ”
“Gear Shift Shaft Components: ”
“Differential Components: ”

Special Tool

S4RS0A5208002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ / ☞ / ☞ / ☞ / ☞		09900–20607 Dial gauge ☞	
09900–20701 Magnetic stand ☞		09913–50121 Oil seal remover ☞	
09913–60910 Bearing and gear puller (40-60mm) ☞		09913–70123 Bearing installing tool ☞ / ☞ / ☞	

09913–76010 Bearing installer ☞ / ☞ / ☞ 	09913–80113 Bearing installer ☞
09913–84510 Bearing installer ☞ / ☞ / ☞ 	09913–85210 Bearing installer ☞ / ☞ 
09922–85811 Spring pin remover (4.5 mm) ☞ / ☞ / ☞ 	09923–74510 Bearing puller (20-35 mm) ☞ 
09923–78210 Bearing installer ☞ / ☞ / ☞ / ☞ 	09924–07710 Synchronizer hub installer ☞ 
09924–07730 Bearing installer ☞ 	09924–74510 Bearing and oil seal handle ☞ 
09924–84510–004 Bearing installer attachment ☞ 	09925–15410 Oil seal installer ☞ 
09925–78210 Spring pin remover (6 mm) ☞ 	09925–88210 Bearing puller attachment ☞ 
09925–98210 Input shaft bearing installer ☞ 	09926–27610 Oil seal installer ☞ / ☞ 

09927–76060 Gear holder ☞ / ☞ 	09930–30104 Sliding shaft ☞ / ☞ 
09940–51710 Bearing installer ☞ 	09940–54910 Front fork oil seal install driver ☞ 
09941–64511 Bearing and oil seal remover (30 mm Min.) ☞ 	09951–16060 Control arm bush remover ☞ 
09951–16080 Bearing installer ☞ 	

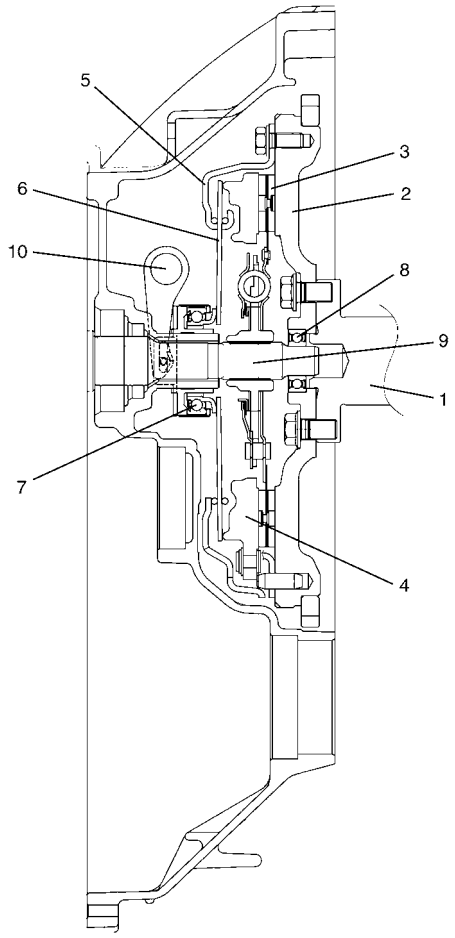
Clutch

General Description

Clutch Construction

S4RS0A5301001

The clutch is a diaphragm spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapered fingers pointing inward.
The disc, carrying four torsional coil springs, is positioned on the transaxle input shaft with an involute spline fit.
The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge part of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch release bearing is held back. This is the engaged condition of the clutch.
Depressing the clutch pedal causes the release bearing to advance and pushes on the tips of the tapered fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transaxle input shaft.



I4RS0A530001-

1. Crankshaft	5. Clutch cover	9. Input shaft
2. Flywheel	6. Diaphragm spring	10. Release shaft
3. Clutch disc	7. Release bearing	
4. Pressure plate	8. Input shaft bearing	

Diagnostic Information and Procedures

Clutch System Symptom Diagnosis

S4RS0A5304001

Condition	Possible cause	Correction / Reference Item
Slipping	Improper clutch pedal free travel	*Replace master cylinder or clutch pedal arm.*
	Worn or oily clutch disc facing	*Replace disc.*
	Warped disc, pressure plate or flywheel surface	*Replace disc, clutch cover or flywheel.*
	Weakened diaphragm spring	*Replace clutch cover.*
	Master cylinder piston or seal cup not returning	*Replace master cylinder.*
Dragging clutch	Improper clutch pedal free travel	*Replace master cylinder or clutch pedal arm.*
	Weakened diaphragm spring, or worn spring tip	*Replace clutch cover.*
	Rusted input shaft splines	*Lubricate.*
	Damaged or worn splines of transaxle input shaft	*Replace input shaft.*
	Excessively wobbly clutch disc	*Replace disc.*
	Clutch facings broken or dirty with oil	*Replace disc.*
	Fluid leakage	*Repair or replace.*
Clutch vibration	Glazed (glass-like) clutch facings	*Repair or replace disc.*
	Clutch facings dirty with oil	*Replace disc.*
	Release bearing slides unsmoothly on input shaft bearing retainer	*Lubricate or replace input shaft bearing retainer.*
	Wobbly clutch disc, or poor facing contact	*Replace disc.*
	Weakened torsion springs in clutch disc	*Replace disc.*
	Clutch disc rivets loose	*Replace disc.*
	Distorted pressure plate or flywheel surface	*Replace clutch cover or flywheel.*
	Weakened engine mounting	*Replace engine mounting.*
	Loosened engine mounting bolt or nut	*Retighten engine mounting bolt or nut.*
Noisy clutch	Worn or broken release bearing	*Replace release bearing.*
	Input shaft front bearing worn down	*Replace input shaft bearing.*
	Excessive rattle of clutch disc hub	*Replace disc.*
	Cracked clutch disc	*Replace disc.*
	Pressure plate and diaphragm spring rattling	*Replace clutch cover.*
Grabbing clutch	Clutch disc facings soaked with oil	*Replace disc.*
	Clutch disc facings excessively worn	*Replace disc.*
	Rivet heads showing out of facing	*Replace disc.*
	Weakened torsion springs	*Replace disc.*

Repair Instructions

Clutch Pedal Inspection

S4RS0A5306019

Clutch Pedal Free Travel “A”

1) Depress clutch pedal (1), stop the moment clutch resistance is felt, and measure how much pedal has moved (clutch pedal free travel) as represented by “A” in the figure. Then check its conformance to specification shown below.

   Clutch pedal free travel
   “A”: 2 – 8 mm (0.08 - 0.31 in.)

2) If “A” is not within specification, check pedal arm (2) and master cylinder (3) and replace defective part.

Cylinder Push Rod Play “B”

1) Press clutch pedal (1) gradually with finger, stop when slight increase of resistance is felt and measure how much pedal has moved (push rod play) as represented by “B” as shown. Then check its conformance to below specification.

   Push rod play
   “B”: Max. 3 mm (0.12 in.)

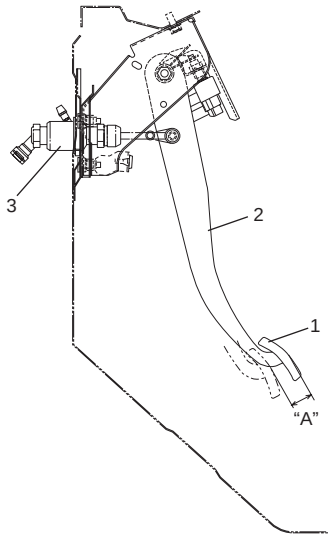
2) If “B” is not within specification, replace master cylinder (3) or pedal arm (2).

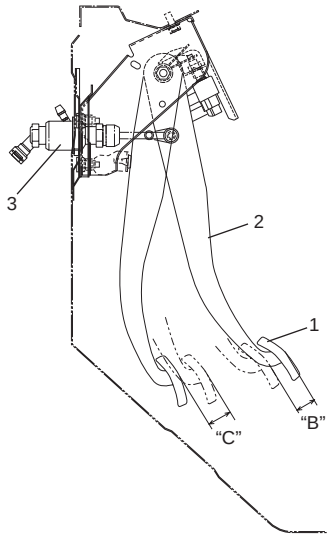
Clutch Release Margin “C”

1) Pull up parking brake fully and block wheels.
2) Start engine and keep engine at idle with neutral gear position.
3) Without clutch pedal (1) depressed, be slow to shift the shift lever to reverse position until transaxle emits gear contact noise.
4) Be slow to depress clutch pedal (1), and at gear contact noise died position (release point) stop depressing.
5) Measure distance between release point and full stroke point on clutch pedal (1) which is shown by “C” in the figure.

   Clutch release margin
   “C”: 25 - 55 mm (0.98 - 2.17 in.)

6) If “C” is not within specification, it is possible that air is trapped in this system. If suspected so, bleed air referring to “Air Bleeding of Clutch System: ”.Upon completion of above inspection and adjustment, start engine and check clutch for proper operation.





I4RS0A530002-

Clutch Fluid Level Inspection

S4RS0A5306020

Refer to “Master Cylinder and Brake Fluid Level Inspection: in Section 4A”.

Air Bleeding of Clutch System

S4RS0A5306021

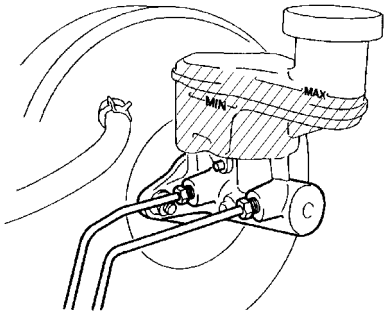
CAUTION:

Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

Bleeding operation is necessary to remove air whenever it entered hydraulic clutch system.

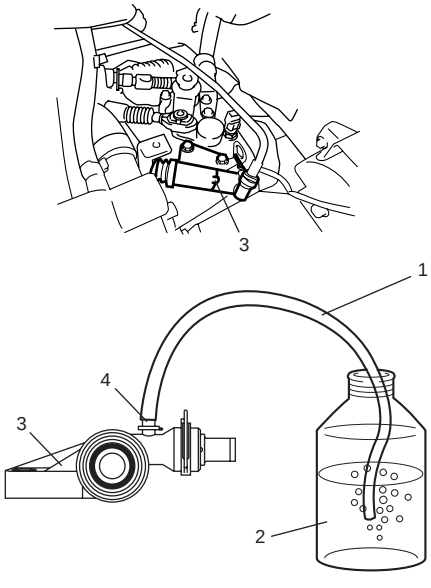
1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.

   : Brake fluid (DOT 3)



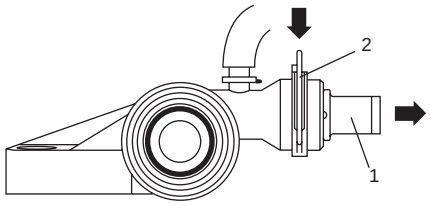
I4RS0A530023-

2) Remove bleeder plug cap from clutch operating cylinder (3). Attach a vinyl tube (1) to bleeder plug (4), and insert the other end into container (2).



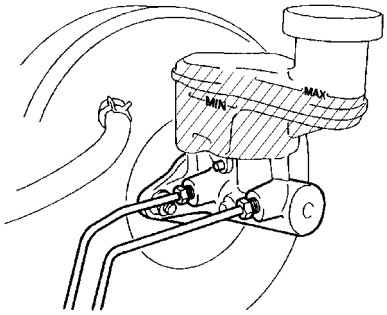
I4RS0A530003-

3) Depress clutch pedal several times, and then while holding it depressed, push snap ring (2) and pull pipe connector (1) one notch.



I4RS0A530004-

4) When fluid pressure in cylinder is almost depleted, push pipe connector.
5) Repeat this operation until there are no more air bubbles in hydraulic line.
6) When bubbles stop, depress and hold clutch pedal, push pipe connector, and pull snap ring.
7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.

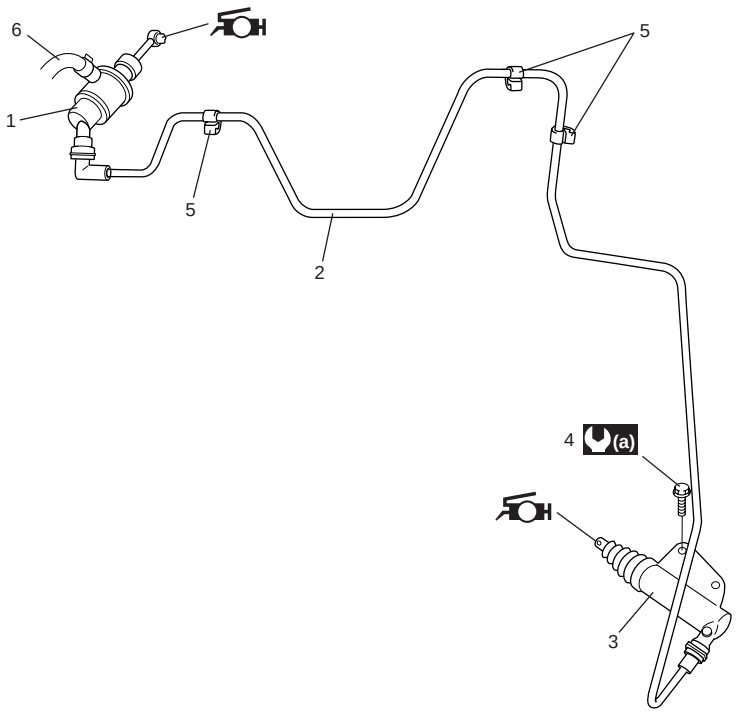


I4RS0A530023-

10) Check clutch pedal for sponginess. If found spongy, repeat entire procedure of bleeding.

Clutch Fluid Pipe and Hose Components

S4RS0A5306022



I4RS0A530005-

1. Master cylinder : Apply grease 99000-25100 to push rod end.	5. Clamp
2. Pipe	6. Clutch reservoir hose
3. Operating cylinder : Apply grease 99000-25100 to rod tip.	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
4. Operating cylinder bolt	

Clutch Fluid Pipe Removal and Installation

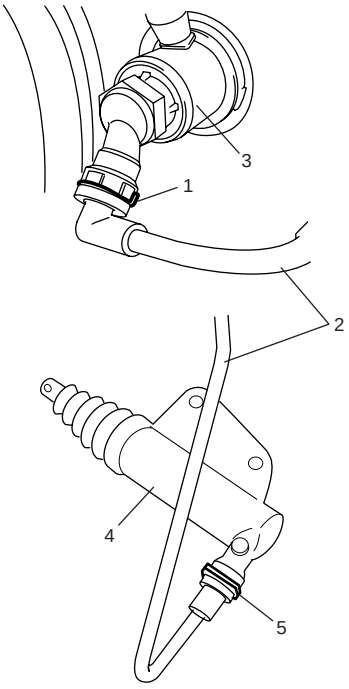
S4RS0A5306023

Removal

CAUTION:

Do not allow fluid to get on painted surface. It may cause painted surface damage.

1) Remove dust and dirt from each joint of pipe to be disconnected and clean around brake master cylinder reservoir cap.
2) Take out fluid with syringe or such from brake master cylinder reservoir.
3) Pull clamp (1) of master cylinder and push clamp (5) of operating cylinder, and then disconnect clutch fluid pipe (2).



I4RS0A530006-

3. Clutch master cylinder	
4. Clutch operating cylinder	

Installation

Reverse removal procedure for installation noting the following.

CAUTION:

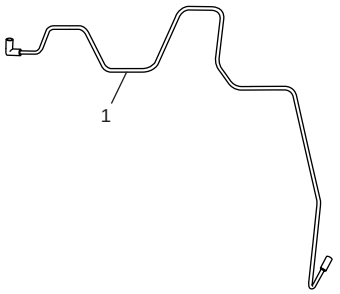
- **Do not allow fluid to get on painted surface.**
- **Do not allow pipe to contact hard against vehicle body or other parts.**

- Install each clamp securely.
- After installation, check clutch pedal free travel and bleed air from system referring to “Clutch Pedal Inspection: ” and “Air Bleeding of Clutch System: ”.
- Check fluid leakage.
- Add fluid to MAX level of reservoir.

Clutch Fluid Pipe Inspection

S4RS0A5306026

Check pipe (1) for dent, kink, crack, dirt and dust. Replace if check result is not satisfactory.



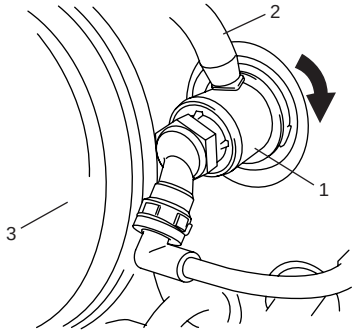
I4RS0A530007-

Clutch Master Cylinder Removal and Installation

S4RS0A5306024

Removal

1) Clean around brake master cylinder reservoir cap and take out fluid with syringe or such from brake master cylinder reservoir.
2) Disconnect clutch fluid pipe from clutch master cylinder (1) referring to “Clutch Fluid Pipe Removal and Installation: ”.
3) Disconnect clutch reservoir hose (2).
4) Remove push rod from clutch pedal.
5) Turn clutch master cylinder (1) clockwise as shown in figure, and then remove it.



I4RS0A530008-

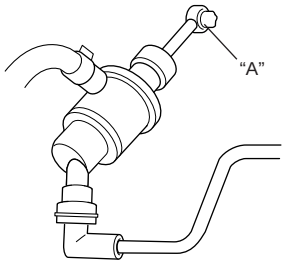
3. Brake booster

Installation

Reverse removal procedure for installation noting the following.

- Apply grease to push rod tip.

“A”: Grease 99000–25100



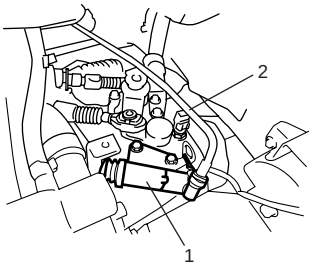
I4RS0A530009-

Clutch Operating Cylinder Removal and Installation

S4RS0A5306025

Removal

1) Clean around brake master cylinder reservoir cap and take out fluid with syringe or such from brake master cylinder reservoir.
2) Disconnect clutch fluid pipe (2) from operating cylinder referring to “Clutch Fluid Pipe Removal and Installation: ”.
3) Remove clutch operating cylinder (1).

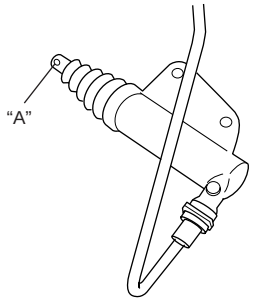


I4RS0A530010-

Installation
Reverse removal procedure for installation noting the following.

- Apply grease to push rod tip.

  "A": Grease 99000–25100



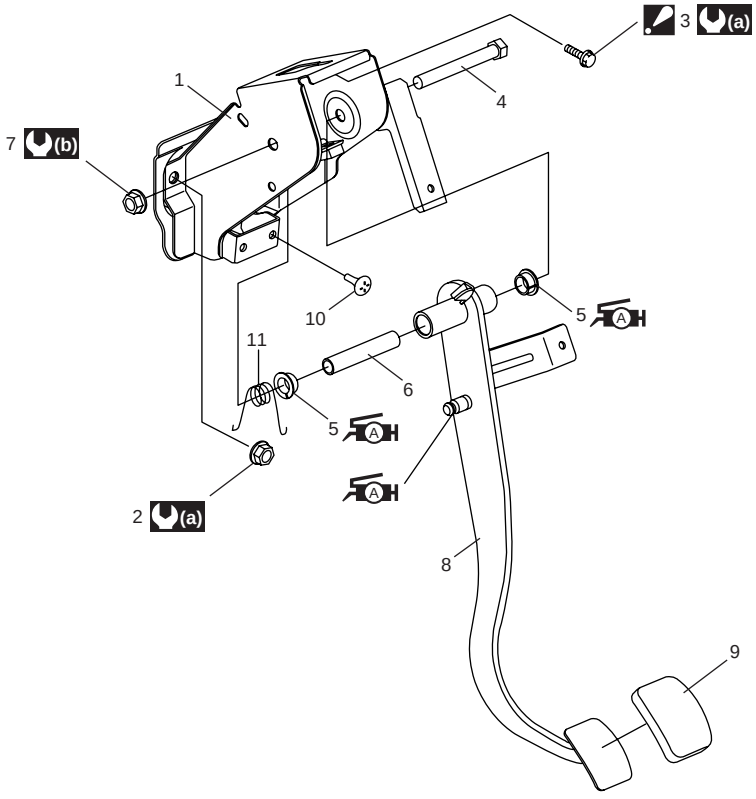
I4RS0A530011-

- Tighten clutch operating cylinder bolt to specified torque.

  Tightening torque
  Clutch operating cylinder bolt: 23 N·m (2.3 kg-m, 17.0 lb-ft)

Clutch Pedal and Clutch Pedal Bracket Components

S4RS0A5306007

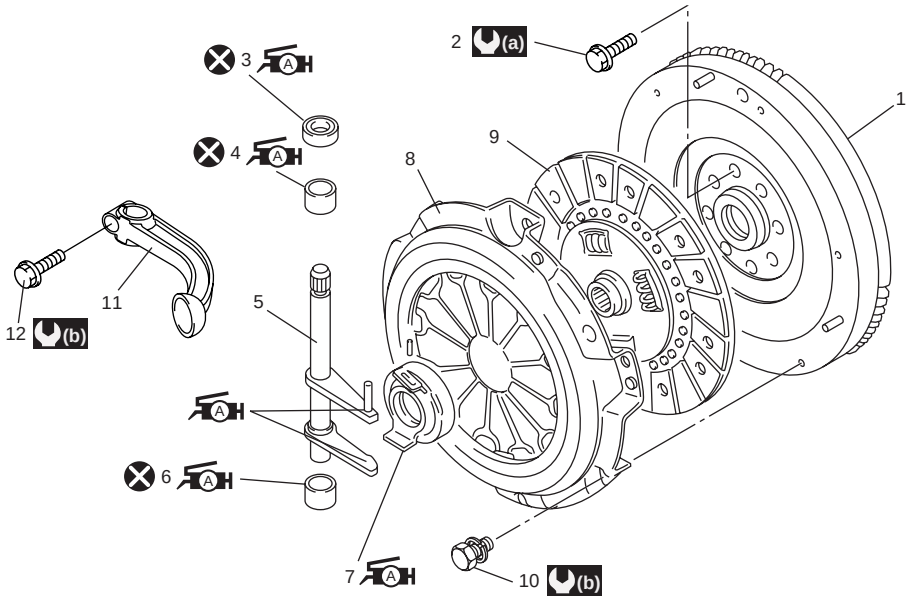


I4RS0A530012-

1. Clutch pedal bracket	A 8. Clutch pedal : Apply grease 99000-25010 to outside surf of pin.
2. Pedal bracket nut	9. Pedal pad
3. Pedal bracket bolt : Pedal bracket bolt must be tighten after pedal bracket nut.	10. Cushion
4. Pedal shaft bolt	11. Return spring
A 5. Pedal bush : Apply grease 9900-25010 to outside of bush.	(a) : 13 N·m (1.3 kg-m, 9.5 lb-ft)
6. Pedal shaft spacer	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
7. Pedal shaft nut	

Clutch Cover, Clutch Disc and Flywheel Components

S4RS0A5306014



I4RS0A530013-

1. Flywheel	9. Clutch disc
2. Flywheel bolt	10. Clutch cover bolt
3. Clutch release shaft seal : Apply grease 99000-25010 to seal lip. (0.3 g (0.01 oz))	11. Release arm
4. Clutch release shaft No.2 bush : Apply grease 99000-25010 to bush inside. (0.3 g (0.01 oz))	12. Release arm bolt
5. Clutch release shaft : Apply grease 99000-25010 to the end of release shaft arm. (0.3 g (0.01 oz))	(a) : 70 N·m (7.0 kg-m, 51.0 lb-ft)
6. Clutch release shaft No.1 bush : Apply grease 99000-25010 to bush inside. (0.3 g (0.01 oz))	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
7. Release bearing : Apply grease 99000-25010 to joint of bearing and release shaft and also bearing inside. (0.3 g (0.01 oz))	Do not reuse.
8. Clutch cover	

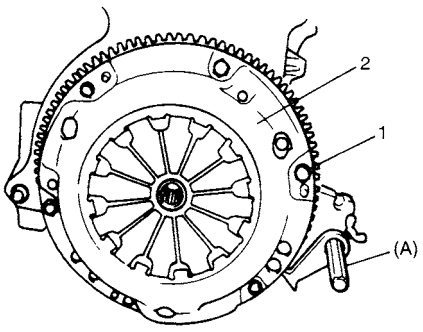
Clutch Cover, Clutch Disc and Flywheel Removal and Installation

S4RS0A5306015

Removal

1) Dismount manual transaxle assembly referring to “Manual Transaxle Unit Dismounting and Remounting: in Section 5B”.
2) Hold flywheel with special tool and remove clutch cover bolts (1), clutch cover (2) and clutch disc.

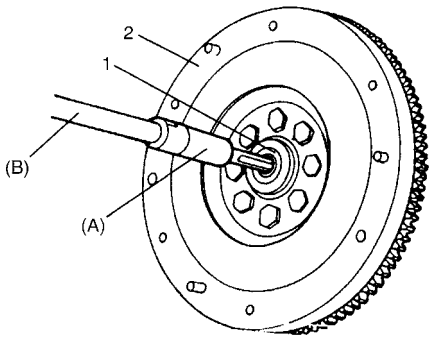
Special tool
(A): 09924–17810



I4RS0A530014-

3) Pull out input shaft bearing (1) from flywheel (2), use the following special tool if necessary.

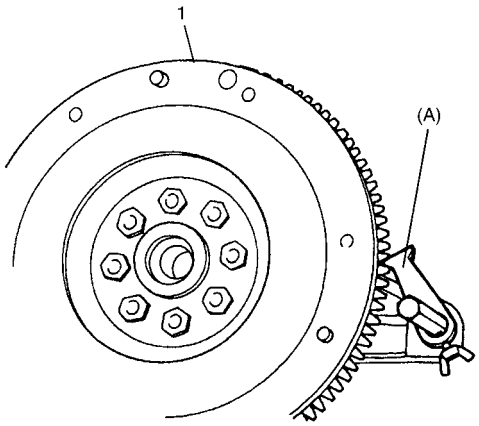
Special tool
(A): 09921–26020
(B): 09930-30104



I2RH01530023-

4) Remove flywheel (1) from crank shaft using special tool.

Special tool
(A): 09924–17810



I4RS0A530015-

Installation

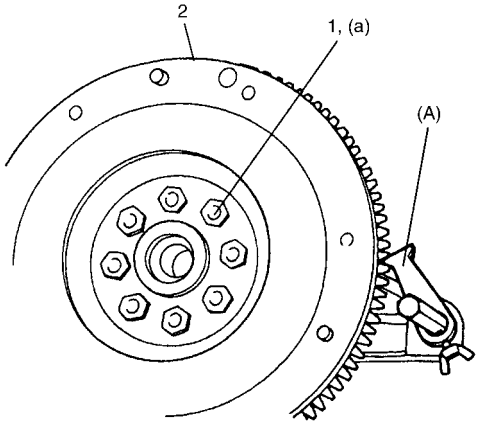
NOTE:

Before assembling, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

1) Install flywheel (2) to crankshaft and tighten bolts (1) to specification.

Special tool
(A): 09924–17810

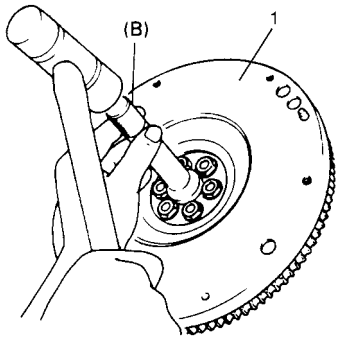
Tightening torque
Flywheel bolt (a): 70 N·m (7.0 kg-m, 51.0 lb-ft)



I2RH01530024-

2) Using special tool, install input shaft bearing to flywheel (1).

Special tool
(B): 09925–98210



I4RS0A530016-

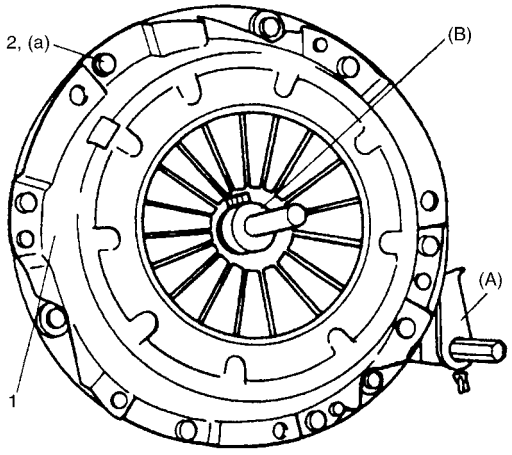
3) Aligning clutch disc to flywheel center using special tool, install clutch cover (1) and bolts (2). Then tighten bolts (2) to specification.

NOTE:

- **While tightening clutch cover bolts, compress clutch disc with special tool (clutch center guide) by hand so that disc is centered.**
- **Tighten cover bolts little by little evenly in diagonal order.**

Special tool
(A): 09924–17810
(B): 09923-36320

Tightening torque
Clutch cover bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



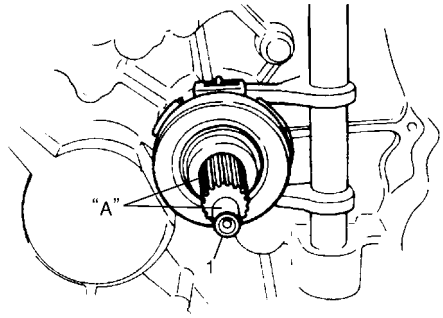
I4RS0A530017-

4) Slightly apply grease to input shaft (1), then join manual transaxle assembly with engine referring to “Manual Transaxle Unit Dismounting and Remounting: in Section 5B”.

“A”: Grease 99000–25210

NOTE:

When inserting transaxle input shaft to clutch disc, turn crankshaft little by little to match the splines.



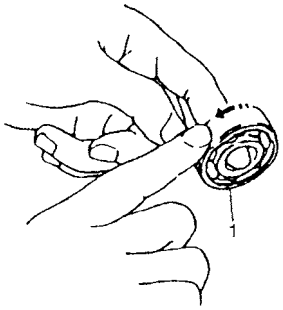
I4RS0A530018-

Clutch Cover, Clutch Disc and Flywheel Inspection

S4RS0A5306016

Input Shaft Bearing

Check bearing (1) for smooth rotation and replace it if abnormality is found.

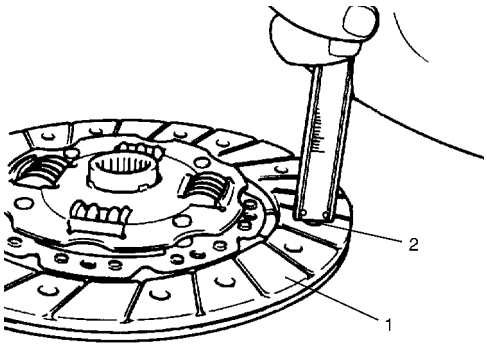


I3RM0A530014-

Clutch Disc

Measure depth of rivet head depression, i.e. distance between rivet head and facing surface.
If depression is found to have reached service limit at any of rivet holes (2), replace clutch disc assembly (1).

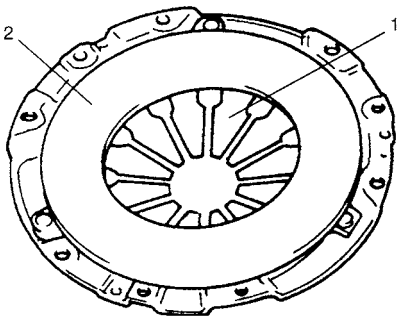
Rivet head depth
Standard: 1.65 – 2.25 mm (0.06 – 0.09 in.)
Limit: 0.5 mm (0.02 in.)



I4RS0A530019-

Clutch Cover

1) Check diaphragm spring (1) for abnormal wear or damage.
2) Inspect pressure plate (2) for wear or heat spots.
3) If abnormality is found, replace clutch cover. Do not disassemble it into diaphragm spring and pressure plate.



I3RM0A530015-

Flywheel

Check surface contacting clutch disc for abnormal wear or heat spots. Replace or repair as required.

Clutch Release System Removal and Installation

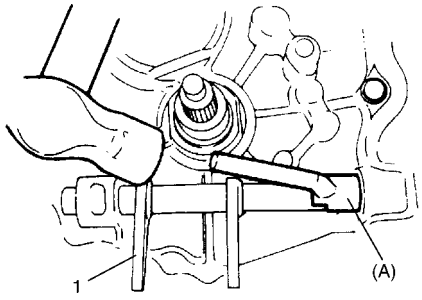
S4RS0A5306017

Removal

1) Remove release arm by loosening its bolt.
2) Take out release bearing by turning release shaft (1).
3) Drive out No.2 bush using special tool and hammer. Release shaft seal will also be pushed out.

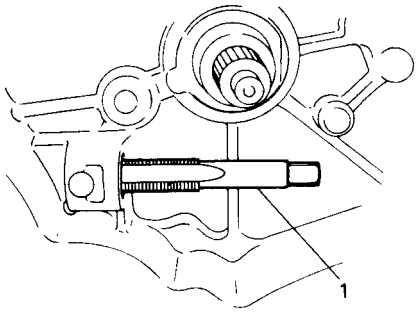
   Special tool
   (A): 09922-46010

4) Remove release shaft (1).



I4RS0A530020-

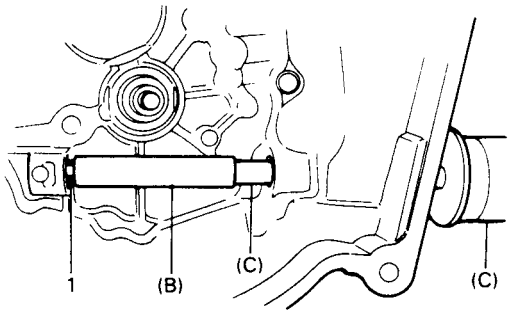
5) Install tap (M16 X 1.5) (1) to clutch release shaft No.1 bush.



IYSY01531016-

6) Pull No.1 bush out using tap (1) and special tools.

Special tool
(B): 09923–46020
(C): 09930-30104



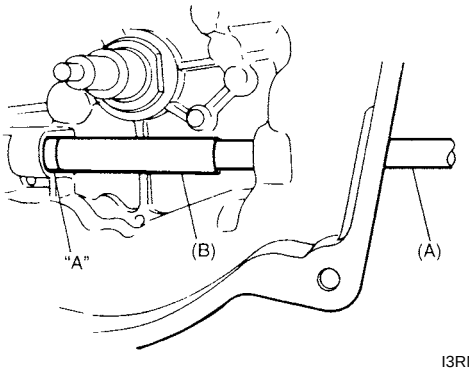
IYSY01531017-

Installation

1) Drive in a new No.1 bush using special tools and hammer, and then apply grease to bush inside.

Special tool
(A): 09943-88211
(B): 09923-46030

"A": Grease 99000–25010



I3RM0A530016-

2) Install release shaft.

3) Apply grease to No.2 bush (1) inside and press-fit it using the same special tool as in removal.

"A": Grease 99000–25010

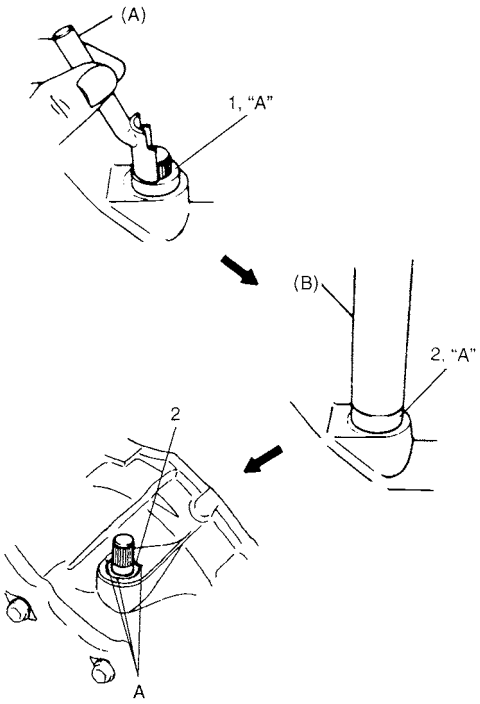
Special tool
(A): 09922-46010

4) Coat grease to release shaft seal (2) lip and then install it till it is flush with case surface. Use special tool for this installation and face seal lip downward (inside).

"A": Grease 99000–25010

Special tool
(B): 09925-98221

5) Caulk seal at A using caulking tool and hammer.



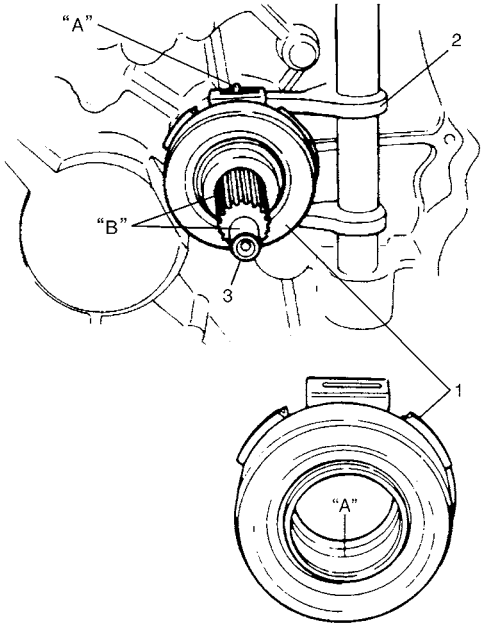
I3RM0A530017-

6) Apply grease to release bearing inside and release shaft (2), then set release bearing (1).

"A": Grease 99000–25010

7) Apply small amount of grease to input shaft (3) spline (0.3 g (0.01 oz)) and front end (0.15 g (0.005 oz)) as well.

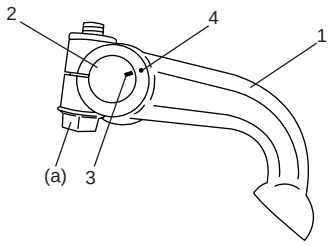
"B": Grease 99000–25210



I4RS0A530021-

8) Set release arm (1) to release shaft (2) aligning punch mark (4) of release arm and punch mark (3) of release shaft, then tighten bolt to specified torque.

Tightening torque
Release lever bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A530022-

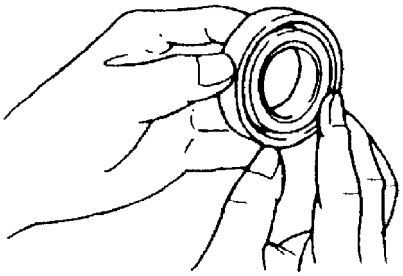
Clutch Release System Inspection

S4RS0A5306018

Clutch Release Bearing
Check clutch release bearing for smooth rotation. If abnormality is found, replace it.

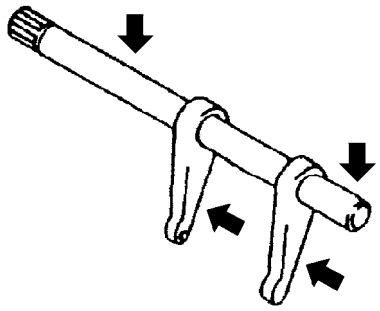
CAUTION:

Do not wash release bearing. Washing may cause grease leakage and consequential bearing damage.



I3RM0A530020-

Clutch Release Shaft
Check clutch release shaft and its pin for deflection or damage.
If abnormality is found, replace it.



I3RM0A530021-

Specifications

Tightening Torque Specifications

S4RS0A5307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Clutch operating cylinder bolt	23	2.3	17.0	☞
Flywheel bolt	70	7.0	51.0	☞
Clutch cover bolt	23	2.3	17.0	☞
Release lever belt	23	2.3	17.0	☞

NOTE:

The specified tightening torque is also described in the following.
"Clutch Fluid Pipe and Hose Components: "
"Clutch Pedal and Clutch Pedal Bracket Components: "
"Clutch Cover, Clutch Disc and Flywheel Components: "

Reference:
For the tightening torque of fastener not specified in this section, refer to "Fasteners Information: in Section 0A".

Special Tools and Equipment

Recommended Service Material

S4RS0A5308001

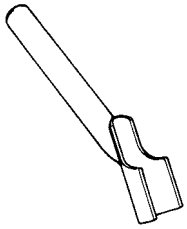
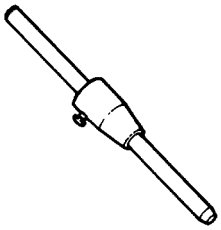
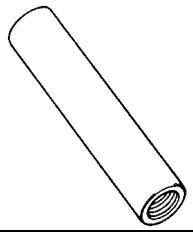
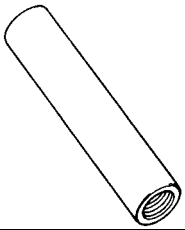
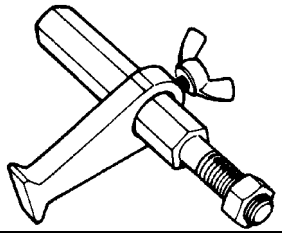
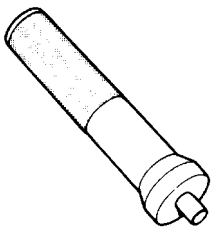
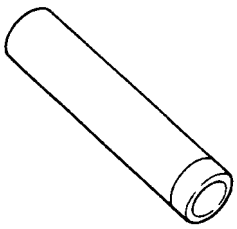
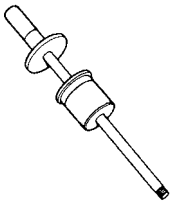
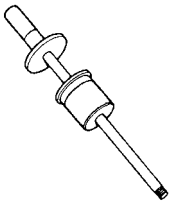
Material	SUZUKI recommended product or Specification		Note
Brake fluid	DOT 3	—	(DOT 3) ☞
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞ / ☞
	SUZUKI Silicone Grease	P/No.: 99000–25100	☞ / ☞
	SUZUKI Super Grease I	P/No.: 99000–25210	☞ / ☞

NOTE:

Required service material is also described in the following.
"Clutch Fluid Pipe and Hose Components: "
"Clutch Pedal and Clutch Pedal Bracket Components: "
"Clutch Cover, Clutch Disc and Flywheel Components: "

Special Tool

S4RS0A5308002

09921–26020 Bearing remover ☞	09922–46010 Clutch bush remover ☞ / ☞ 
09923–36320 Clutch center guide (15 mm) ☞ 	09923–46020 Joint pipe ☞ 
09923–46030 Joint pipe ☞ 	09924–17810 Flywheel holder (drive plate stopper) ☞ / ☞ / ☞ / ☞ 
09925–98210 Input shaft bearing installer ☞ 	09925–98221 Bearing installer ☞ 
09930–30104 Sliding shaft ☞ / ☞ 	09943–88211 Sliding shaft ☞ 

Section 6

Steering

CONTENTS

Precautions 6-1
Precautions 6-1
Precautions on Steering 6-1

Steering General Diagnosis 6A-1
Precautions 6A-1
Precautions for Steering Diagnosis 6A-1
Diagnostic Information and Procedures 6A-2
Steering Symptom Diagnosis 6A-2

Steering Wheel and Column 6B-1
Precautions 6B-1
Service Precautions of Steering Wheel and Column 6B-1
Diagnostic Information and Procedures 6B-1
Checking Steering Column for Accident Damage 6B-1
Repair Instructions 6B-2
Steering Wheel and Column Construction 6B-2
Steering Wheel Removal and Installation 6B-2
Contact Coil Cable Assembly Removal and Installation 6B-3
Centering Contact Coil Cable Assembly 6B-4
Contact Coil Cable Assembly Inspection 6B-5
Steering Column Removal and Installation 6B-5
Steering Column Inspection 6B-7
Steering Lower Shaft Removal and Installation 6B-7
Specifications 6B-8
Tightening Torque Specifications 6B-8
Special Tools and Equipment 6B-8
Special Tool 6B-8

Power Assisted Steering System 6C-1
Precautions 6C-1
Steering System Note 6C-1
Precautions in Diagnosing Troubles 6C-1
General Description 6C-1
P/S System Description 6C-1
EPS Diagnosis General Description 6C-2
On-Board Diagnostic System Description 6C-2
Schematic and Routing Diagram 6C-3
EPS System Wiring Circuit Diagram 6C-3
Diagnostic Information and Procedures 6C-4
EPS System Check 6C-4
"EPS" Warning Lamp Check 6C-5
DTC Check 6C-6
DTC Clearance 6C-6
DTC Table 6C-6
Scan Tool Data 6C-8
P/S System Symptom Diagnosis 6C-9
Serial Data Link Circuit Check 6C-9
"EPS" Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stop 6C-11
"EPS" Warning Lamp Come ON Steady and Engine Start 6C-13
DTC C1113 / C1117 /C1118: Torque Sensor Circuit Failure 6C-14
DTC C1114: Torque Sensor 5 V Power Supply Circuit Failure 6C-15
DTC C1119: Torque Sensor 12 V Power Supply Circuit Failure 6C-17
DTC C1121 / C1123 / C1124: VSS Circuit Failure 6C-19
DTC C1122: Engine Speed Signal Circuit Failure 6C-21
DTC C1141 / C1142 / C1143 / C1145: Motor Circuit Failure 6C-22
DTC C1153: P/S Control Module Power Supply Circuit Failure 6C-23
DTC C1155: P/S Control Module Failure 6C-25
Inspection of P/S Control Module and Its Circuits 6C-25
Steering Wheel Play Check 6C-28
Steering Force Check 6C-28
Repair Instructions 6C-29
Steering Gear Case Assembly Components 6C-29
Tie-Rod End Boot On-Vehicle Inspection 6C-30
Tie-Rod End Removal and Installation 6C-30
Tie-Rod End Inspection 6C-31
Steering Shaft Joint On-Vehicle Inspection 6C-31
Steering Gear Case Assembly Removal and Installation 6C-31
Steering Rack Boot Inspection 6C-33
Tie-Rod / Rack Boot Removal and Installation 6C-33
Steering Rack Plunger Removal and Installation 6C-35
Steering Rack Plunger Inspection 6C-35
P/S Control Module Removal and Installation 6C-35
Torque Sensor Inspection 6C-36
Motor Assembly Inspection 6C-36
Specifications 6C-37
Tightening Torque Specifications 6C-37
Special Tools and Equipment 6C-38
Recommended Service Material 6C-38

Special Tool 6C-38

Precautions

Precautions

Precautions on Steering

S4RS0A6000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Air Bag System Service Warning
Refer to “Air Bag System Service Warning: in Section 00”.

Precautions for Steering Diagnosis
Refer to “Precautions for Steering Diagnosis: in Section 6A”.

Service Precautions of Steering Wheel and Column
Refer to “Service Precautions of Steering Wheel and Column: in Section 6B”.

P/S System Note
Refer to “Steering System Note: in Section 6C”.

Steering General Diagnosis

Precautions

Precautions for Steering Diagnosis

S4RS0A6100001

Since the problems in steering involve several systems, they must all be considered when diagnosing a complaint. To avoid using the wrong symptom, always road test the vehicle first. Proceed with the following preliminary inspection and correct any defects which are found.

1) Inspect tires for proper pressure and uneven wear.
2) Raise vehicle on a hoist and inspect steering system for loose or damaged parts.
3) Spin front wheels. Inspect for out-of-round tires, out-of-balance tires, bent rims, loosen and/or rough wheel bearings.

Diagnostic Information and Procedures

Steering Symptom Diagnosis

S4RS0A6104001

Condition	Possible cause	Correction / Reference Item
Hard steering	Tire not adequately inflated	*Inflate tires to proper pressure.*
	Malfunction of power steering system	*Check and correct.*
	Bind in tie-rod end ball studs or lower ball joints	*Replace tie-rod end or front suspension arm.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment.*
	Bind in steering column	*Repair or replace steering column.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
Too much play in steering	Wheel bearings worn	*Replace wheel bearing.*
	Loose steering gear case bolts	*Tighten gear case bolts.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
	Worn steering shaft joints	*Replace joint.*
	Worn tie-rod ends or tie-rod inside ball joints	*Replace tie-rod end or tie-rod.*
	Worn lower ball joints	*Replace front suspension control arm.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
Poor returnability	Bind in tie-rod end ball studs	*Replace tie-rod end.*
	Bind in ball joints	*Replace front suspension arm.*
	Bind in steering column	*Repair or replace steering column.*
	Disturbed front end alignment	*Check and adjust front end alignment.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
	Tires not adequately inflated	*Adjust tire pressure.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
Rack and pinion noise (Rattle or chuckle)	Loose steering gear case bolts	*Tighten steering gear case bolts.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
Wander or poor steering stability	Mismatched or uneven tires	*Replace or inflate tires to proper pressure.*
	Loosen ball joints and tie-rod ends	*Replace suspension arm or tie-rod end.*
	Faulty struts or mountings	*Replace strut or repair mounting.*
	Loose stabilizer bar	*Tighten or replace stabilizer bar or bush.*
	Broken or sagging springs	*Replace spring.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
Erratic steering when braking	Worn wheel bearings	*Replace wheel bearing.*
	Broken or sagging springs	*Replace coil spring.*
	Wheel tires are inflated unequally	*Inflate tires to proper pressure.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment.*
	Brakes not working in unison	*Check and repair brake system.*
	Leaking wheel cylinder or caliper	*Repair or replace wheel cylinder or caliper.*
	Warped discs	*Replace brake disc.*
	Badly worn brake linings	*Replace brake shoe lining.*
	Drum is out of round in some brakes	*Replace brake drum.*
	Defective wheel cylinders	*Replace or repair wheel cylinder.*

Steering Wheel and Column

Precautions

Service Precautions of Steering Wheel and Column

S4RS0A6200001

For service precautions, refer to “Precautions on Service and Diagnosis of Air Bag System: in Section 8B”.

Service and Diagnosis

For diagnosis and servicing, refer to “Precautions on Service and Diagnosis of Air Bag System: in Section 8B”.

Disabling Air Bag System

For disabling air bag system, refer to “Disabling Air Bag System: in Section 8B”.

Enabling Air Bag System

For enabling air bag system, refer to “Enabling Air Bag System: in Section 8B”.

Handling and Storage

For handling and storage, refer to “Precautions on Handling and Storage of Air Bag System Components: in Section 8B”.

Disposal

For disposal, refer to “Precautions on Disposal of Air Bag and Seat Belt Pretensioner: in Section 8B”.

Diagnostic Information and Procedures

Checking Steering Column for Accident Damage

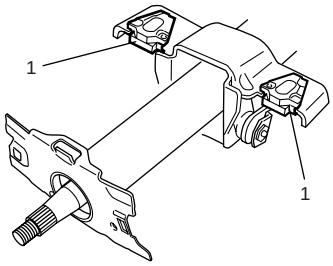
S4RS0A6204003

NOTE:

Vehicles involved in accidents resulting in body damage, where steering column has been impacted or air bag deployed may have a damaged or misaligned steering column.

Checking Procedure

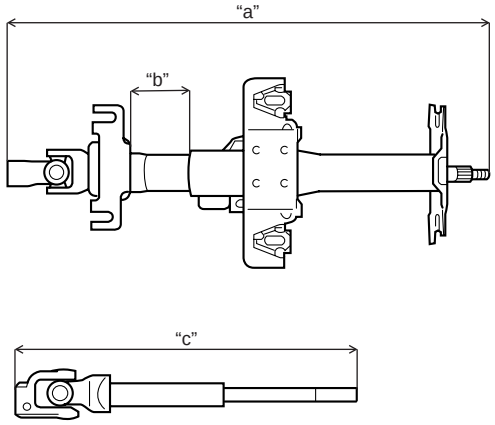
1) Check that two capsules (1) are attached to steering column bracket securely. If found loose, replace steering column assembly.



I4RS0A620001-

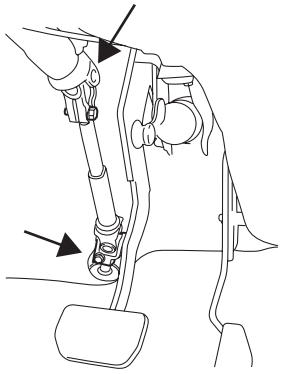
2) Take measurement “a”, “b” and “c” as shown.
If it is shorter than specified length, replace steering column assembly with new one.

Power steering column length
“a”: 454 ± 2 mm (17.8 ± 0.08 in.)
“b”: 64.1 ± 1 mm (2.5 ± 0.03 in.)
“c”: 306.7 ± 1 mm (12.0 ± 0.03 in.)



I4RS0A620002-

3) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play.
If anything is found faulty, replace as lower shaft assembly or steering column assembly.



I4RS0A620003-

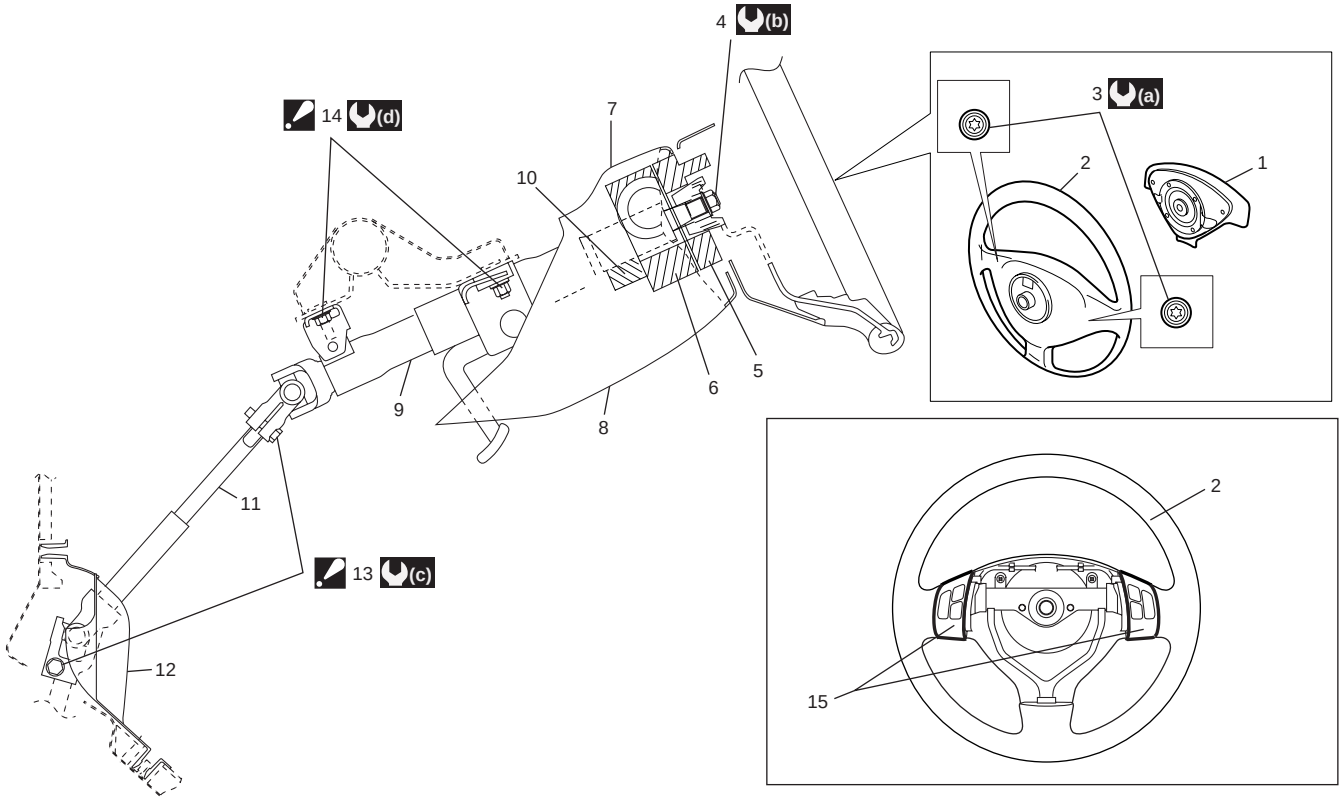
4) Check steering shaft for smooth rotation.
If found defective, replace as steering column assembly.

5) Check steering shaft and steering column for bend, cracks or deformation.
If found defective, replace.

Repair Instructions

Steering Wheel and Column Construction

S4RS0A6206009



I4RS0A620004-

1. Driver air bag (inflator) module	8. Steering column lower cover	15. Audio control switch (if equipped)
2. Steering wheel	9. Steering column	(a) : 9 N·m (0.9 kg-m, 6.5 lb-ft)
3. Driver air bag (inflator) module mounting bolt	10. Steering lock assembly (ignition switch)	(b) : 33 N·m (3.3 kg-m, 24 lb-ft)
4. Steering wheel nut	11. Steering lower shaft	(c) : 25 N·m (2.5 kg-m, 18 lb-ft)
5. Contact coil cable assembly	12. Steering joint cover	(d) : 14 N·m (1.4 kg-m, 10.5 lb-ft)
6. Wiper switch and lighting switch	13. Upper and lower joint bolt : After tightening lower joint bolt, tighten upper joint bolt.	
7. Steering column upper cover	14. Steering column mounting nut : After tightening lower nut, tighten upper nut.	

Steering Wheel Removal and Installation

S4RS0A6206001

CAUTION:

Do not turn the contact coil more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively) with steering wheel removed, or coil will break.

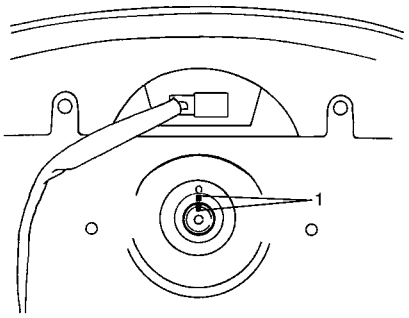
Removal

CAUTION:

Do not hammer the end of the shaft. Hammering it will loosen the plastic shear pins which maintain the column length and impair the collapsible design of the column.

1) Disconnect negative (–) battery cable at battery terminal.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.

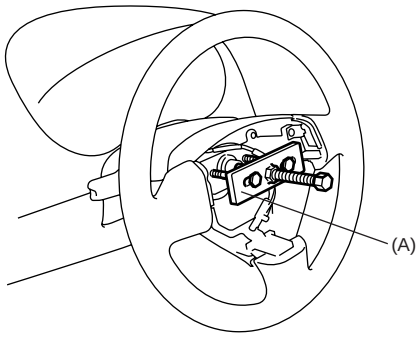
3) Remove driver air bag (inflator) module from steering wheel. Refer to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
4) Disconnect horn connector and audio control switch connector, if equipped.
5) Remove steering shaft nut and then make alignment marks (1) on steering wheel and shaft for a guide during reinstallation.



I4RS0A620005-

6) Remove steering wheel using special tool.

Special tool
(A): 09944-36011



I4RS0A620006-

Installation

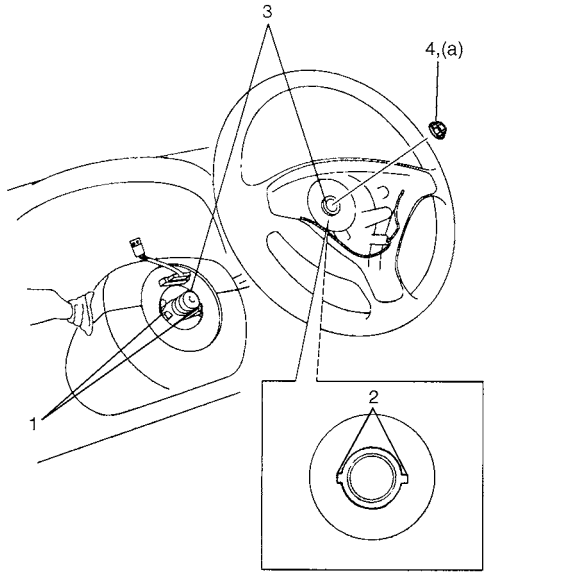
1) Check that vehicle’s front tires are at straight-ahead position and contact coil is centered. If contact coil is turned after removing steering wheel, center contact coil referring to “Centering Contact Coil Cable Assembly: ”.

CAUTION:

These two conditions are prerequisite for installation of steering wheel. If steering wheel has been installed without these conditions, contact coil will break when steering wheel is turned.

2) Install steering wheel to steering shaft with 2 grooves (1) on contact coil fitted in 2 lugs (2) in the back of steering wheel and also aligning marks (3) on steering wheel and steering shaft.
3) Tighten steering shaft nut (4) to specified torque.

Tightening torque
Steering shaft nut (a): 33 N·m (3.3 kg-m, 24.0 lb-ft)



I4RS0A620007-

4) Connect horn connector and audio control switch connector, if necessary.
5) Install driver air bag (inflator) module to steering wheel. Refer to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
6) Connect negative (–) battery cable.
7) Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Contact Coil Cable Assembly Removal and Installation

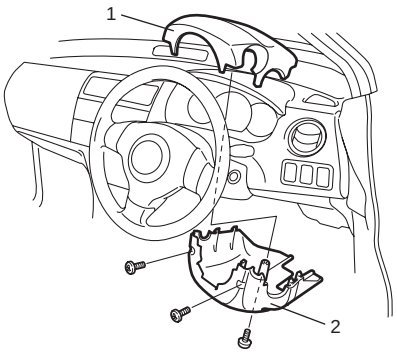
S4RS0A6206002

CAUTION:

Do not turn contact coil more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

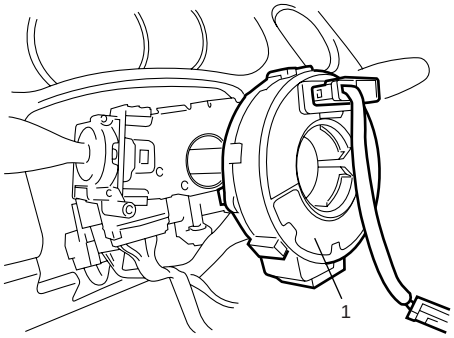
Removal

1) Disconnect negative (–) battery cable at battery terminal.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove steering wheel from steering column referring to “Steering Wheel Removal and Installation: ”.
4) Remove steering column lower cover (2) and upper cover (1).



I4RS0A620008-

5) Remove contact coil cable assembly (1) from steering column.



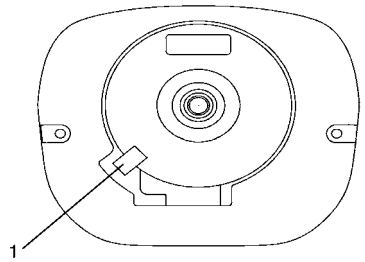
I4RS0A620009-

Installation

1) Check to make sure that vehicle's front tires are set at straight-ahead position and then ignition switch is at LOCK position.
2) Install contact coil cable assembly (1) to steering column securely.

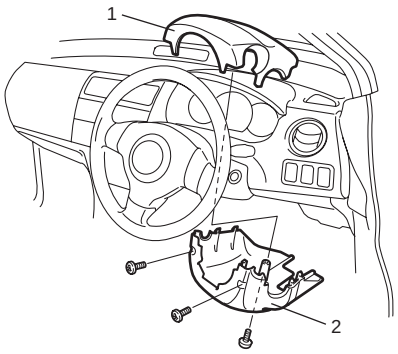
NOTE:

New contact coil cable assembly is supplied with contact coil set and held at its center position with a lock pin (1). Remove this lock pin after installing contact coil cable assembly to steering column.



I4RS0A620010-

3) Install steering column upper cover (1) and lower cover (2).



I4RS0A620011-

4) Install steering wheel to steering column. Refer to "Steering Wheel Removal and Installation: ".
5) Connect battery negative (–) cable.
6) Enable air bag system referring to "Enabling Air Bag System: in Section 8B".

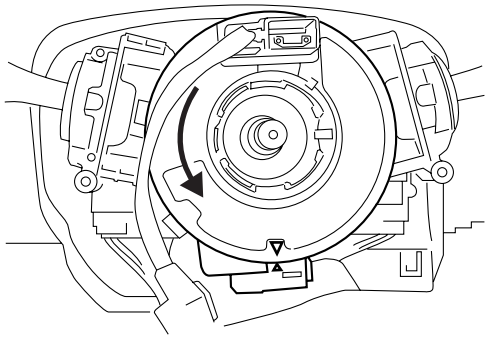
Centering Contact Coil Cable Assembly

S4RS0A6206003

1) Check that vehicle's wheels (front tires) are set at straight-ahead position.
2) Check that ignition switch is at LOCK position.
3) Turn contact coil counterclockwise slowly with a light force till contact coil will not turn any further.

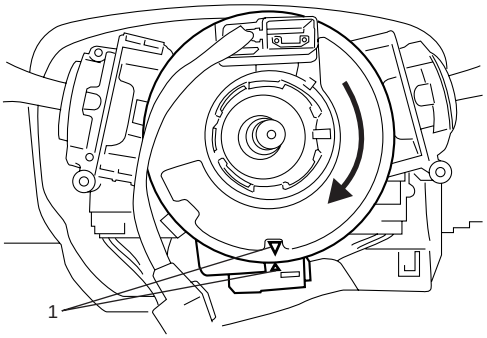
NOTE:

Contact coil can turn about 5 turns at the maximum, that is, if it is at the center position, can turn about two and a half turns both clockwise and counterclockwise.



I4RS0A620012-

4) From the position where contact coil became unable to turn any further (it stopped), turn it back clockwise about two and a half rotations and align center mark with alignment mark (1).

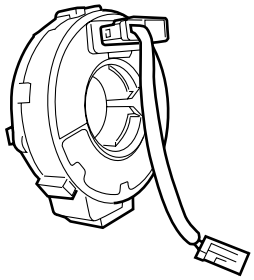


I4RS0A620013-

Contact Coil Cable Assembly Inspection

S4RS0A6206004

Check contact coil cable assembly wire harness for any signs of scorching, melting or other damage.
If it is damaged, replace.



I4RS0A620014-

Steering Column Removal and Installation

S4RS0A6206005

CAUTION:

Once the steering column is removed from the vehicle, the column is extremely susceptible to damage.

- **Dropping the column assembly on its end could collapse the steering shaft or loosen the plastic shear pins which maintain column length.**
- **Leaning on the column assembly could cause it to bend or deform.**

Any of the damage could impair the column's collapsible design.
Steering column mounting nuts should not be loosened with steering shaft joint upper side bolt tightened as this could cause damage to shaft joint bearing.

NOTE:

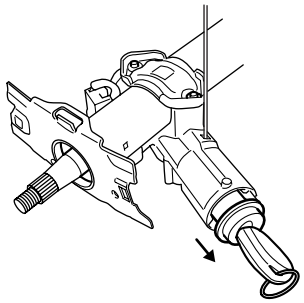
When servicing steering column or any column-mounted component, remove steering wheel. But when removing steering column simply to gain access to instrument panel components, leave steering wheel installed on steering column.

Removal

WARNING:

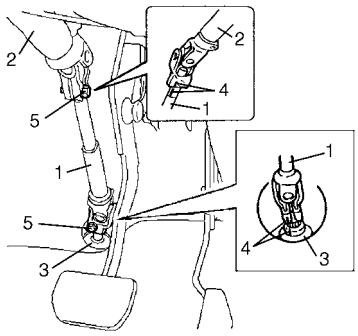
Never rest a steering column assembly on the steering wheel with the air bag (inflator) module face down and column vertical. Otherwise, personal injury may result.

1) Disconnect negative (–) battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System: in Section 8B".
3) Remove steering wheel and contact coil cable assembly referring to "Steering Wheel Removal and Installation: " and "Contact Coil Cable Assembly Removal and Installation: ".
4) Detach lighting switch and wiper switch from steering column.
5) Remove immobilizer control module (if equipped) from steering column.
6) Remove ignition switch cylinder assembly (1) as follows.
   a) Turn ignition switch key to ACC position.
   b) Insert 2 mm (0.078 in.) rod (2) through hole (3) and push ignition switch cylinder lock.



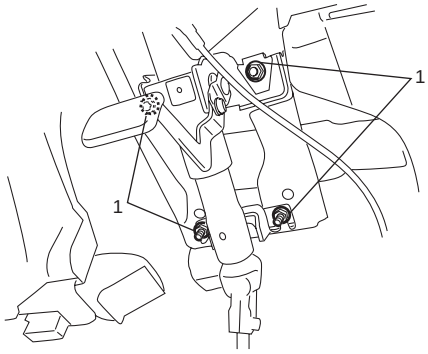
I4RS0A620015-

7) Detach ignition switch assembly from steering column.
8) Remove steering column hole cover.
9) Remove steering joint cover.
10) Make alignment marks (4) on lower shaft (1) and shaft joint of steering column (2) and lower shaft (1) and pinion shaft (3) for a guide during reinstallation.
11) Remove lower shaft joint bolts (5).
12) Remove steering lower shaft (1).



I4RS0A620016-

13) Remove steering column mounting nuts (1).



I4RS0A620017-

14) Remove steering column from vehicle.

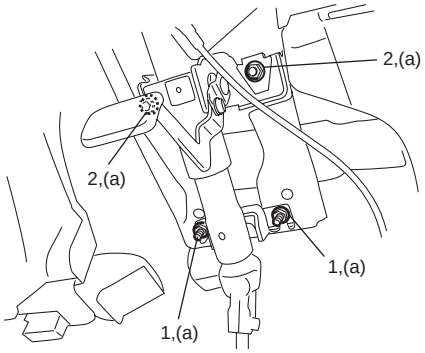
Installation

CAUTION:

After tightening steering column mounting nuts, shaft joint bolts should be tightened. Wrong tightening order could cause a damage to shaft joint.

1) Be sure that front wheels are in straight.
2) Install steering column assembly to lower and upper brackets. Tighten steering column lower nuts (1) first and then upper nuts (2) to specifications as given below.

Tightening torque
Steering column nut (a): 14 N·m (1.4 kg-m, 10.5 lb-ft)



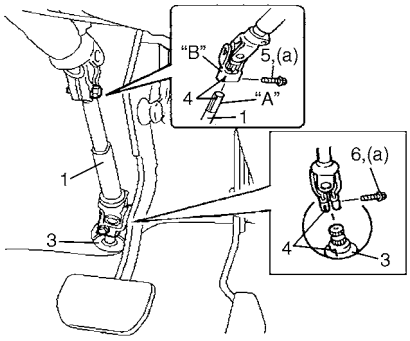
I4RS0A620018-

3) Align flat part “A” of steering lower shaft (1) with bolt hole “B” of shaft joint (2) of column as shown. Then insert lower shaft into shaft joint of steering column with matching marks (4).
4) Insert lower shaft (1) into pinion shaft (3) with matching marks (4).
5) Tighten joint bolt (pinion shaft side) (6) to specified torque first and then joint bolt (steering column side) (5) to specified torque.

CAUTION:

After tightening column nuts, tighten steering shaft upper joint bolt. Otherwise shaft joint bearing is damaged.

Tightening torque
Steering shaft joint bolt (a): 25 N·m (2.5 kg-m, 18.5 lb-ft)



I4RS0A620019-

6) Install steering joint cover.
7) Install ignition switch assembly to steering column.
8) Install ignition switch cylinder assembly as follows.
   a) Turn ignition key of ignition switch cylinder assembly to ACC position.
   b) In this state, push ignition switch cylinder assembly into steering column till it clicks.
9) Install immobilizer control module (if equipped) from steering column.
10) Install lighting switch, wiper switch to steering column.
11) Install contact coil cable assembly and steering wheel referring to “Contact Coil Cable Assembly Removal and Installation: ” and “Steering Wheel Removal and Installation: ”.
12) Install steering column hole cover.
13) Connect negative (–) battery cable.
14) Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Steering Column Inspection

S4RS0A6206006

Check steering column for damage and operation referring to “Checking Steering Column for Accident Damage: ”.

Steering Lower Shaft Removal and Installation

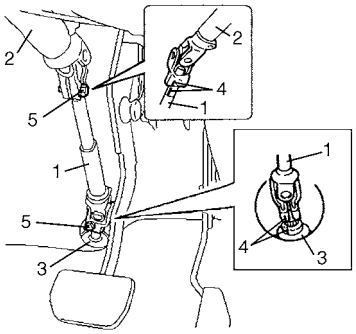
S4RS0A6206008

CAUTION:

Never turn steering wheel while steering lower shaft is removed.
Should it have been turned and contact coil have got out of its centered position, it needs to be centered again. Also, turning steering wheel more than about two and a half turns will break contact coil.

Removal

1) Turn steering wheel so that vehicle’s front tires are at straight-ahead position.
2) Turn ignition switch to LOCK position and remove key.
3) Remove steering joint cover.
4) Make alignment marks (4) on lower shaft (1) and shaft joint of steering column (2) and lower shaft (1) and pinion shaft (3) for a guide during reinstallation.
5) Remove lower shaft joint bolts (5).
6) Remove steering lower shaft (1).

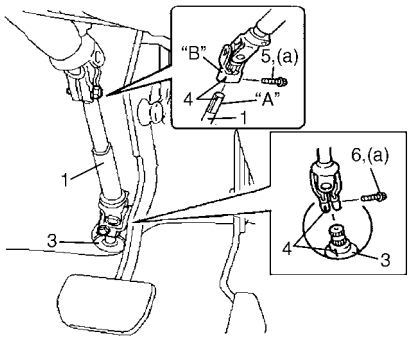


I4RS0A620020-

Installation

1) Be sure that front wheels are in straight forward state.
2) Align flat part “A” of steering lower shaft (1) with bolt hole “B” of shaft joint (2) of column as shown. Then insert lower shaft into shaft joint of steering column with matching marks (4).
3) Insert lower shaft (1) into pinion shaft (3) with matching marks (4).
4) Tighten joint bolt (pinion shaft side) (6) to specified torque first and then joint bolt (steering column side) (5) to specified torque.

Tightening torque
Steering shaft joint bolt (a): 25 N·m (2.5 kg-m, 18.5 lb-ft)



I4RS0A620021-

Specifications

Tightening Torque Specifications

S4RS0A6207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Steering shaft nut	33	3.3	24.0	☞
Steering column nut	14	1.4	10.5	☞
Steering shaft joint bolt	25	2.5	18.5	☞

NOTE:

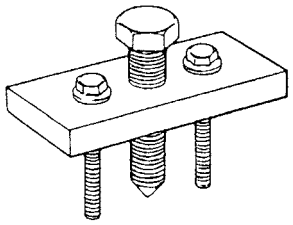
The specified tightening torque is also described in the following.
“Steering Wheel and Column Construction: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S4RS0A6208002

09944–36011 Steering wheel remover ☞		

Power Assisted Steering System

Precautions

Steering System Note

S4RS0A6300001

NOTE:

All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

Precautions in Diagnosing Troubles

S4RS0A6300002

- Take a note of DTC indicated on the SUZUKI scan tool.
- Before inspection, be sure to read “Precautions for Electrical Circuit Service: in Section 00” and understand what is written there.
- DTC C1122 (engine speed signal failure) is indicated when ignition switch is at ON position and engine is not running, but it means there is nothing abnormal if indication changes to a normal one when engine is started.
- As DTC is stored in memory of the P/S control module, be sure to clear memory after repair by performing the procedure described in “DTC Clearance: ”.

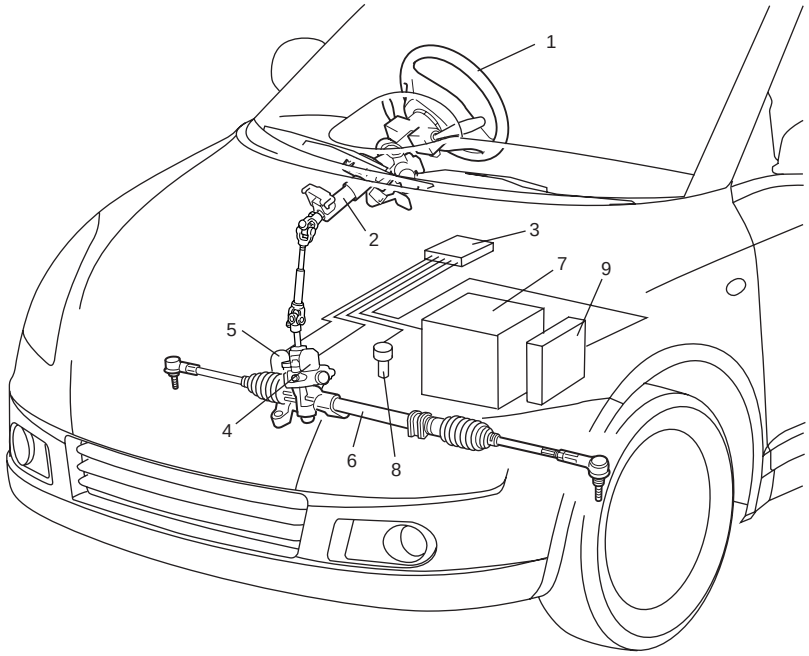
General Description

P/S System Description

S4RS0A6301001

This power steering (P/S) system consists of a P/S control module (3), a torque sensor (4), a motor (5). In this system, the P/S control module determines the level and direction of the assist force for the steering wheel (1) according to the signals from the torque sensor and the vehicle speed sensor (VSS) (8). The P/S control module runs the motor so as to assist the operation of the steering wheel.
The P/S control module diagnoses troubles which may occur in the area including the following components when the ignition switch is ON and the engine is running. When the P/S control module detects any malfunction, it stops the motor operation.

- Torque sensor
- Vehicle speed sensor (VSS) circuit
- Engine speed signal circuit
- Motor
- P/S control module.



I4RS0A630001-

2. Steering column	6. Steering gear case assembly	7. Battery	9. ECM

EPS Diagnosis General Description

S4RS0A6301003

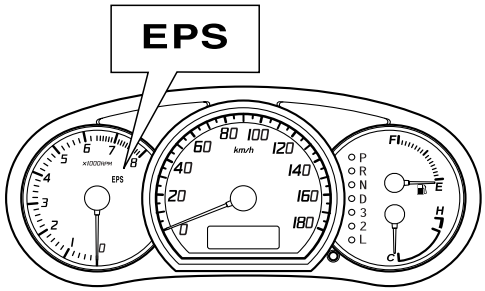
The P/S system in this vehicle is controlled by the P/S control module. The P/S control module has an on-board diagnostic system which detects a malfunction in this system. When diagnosing troubles, be sure to have full understanding of the outline of “On-Board Diagnostic System Description: ” and each item in “Precautions in Diagnosing Troubles: ”, and then execute diagnosis according to “EPS System Check: ”.

On-Board Diagnostic System Description

S4RS0A6301004

The P/S control module performs the on-board diagnosis (self-diagnosis) on the system and operates the “EPS” warning lamp (1) as follows.

- The “EPS” warning lamp lights when the ignition switch is turned to ON position (but the engine at stop) regardless of the condition of the P/S control system. This is only to check if the “EPS” warning lamp is operated properly.
- If the areas monitored by the P/S control module is free from any trouble after the engine start (while engine is running), the “EPS” warning lamp turns OFF.
- When the P/S control module detects a trouble which has occurred in the monitored areas the “EPS” warning lamp flashes ON and OFF while the engine is running to warn the driver of such occurrence of the trouble and at the same time it stores the exact trouble area in memory inside of the P/S control module.



I4RS0A630002-

Driving Cycle

A “Driving Cycle” consists of engine startup and engine shutoff.

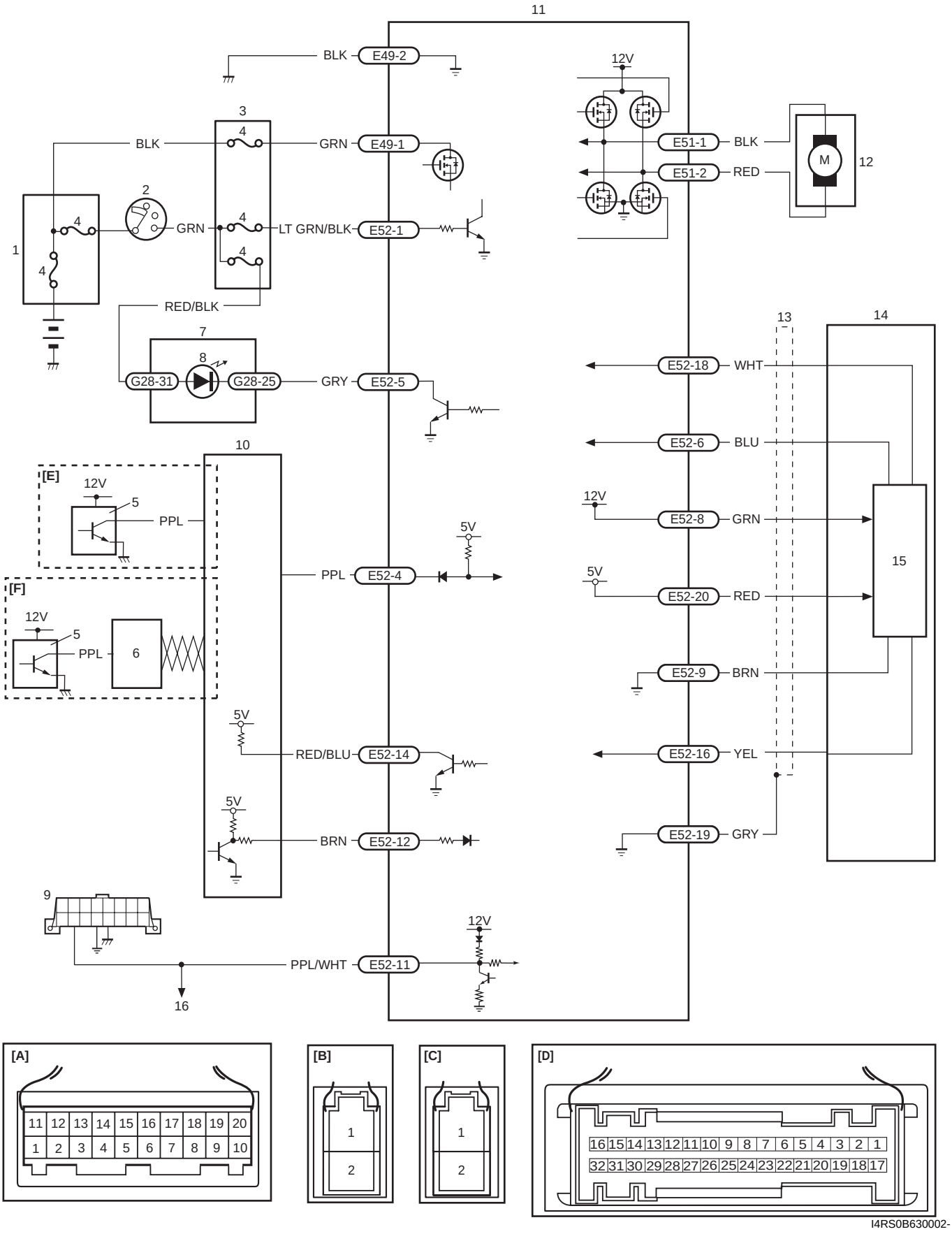
3 Driving Cycles Detection Logic

The malfunction detected in the first and second driving cycle is stored in P/S control module memory (in the form of pending DTC) but the “EPS” warning lamp does not light at these time. It lights up at the third detection of same malfunction also in the next driving cycle.

Schematic and Routing Diagram

EPS System Wiring Circuit Diagram

S4RS0A6302001



I4RS0B630002-

[A]: Connector “E52” (viewed from harness side)	3. Junction block assembly	11. P/S control module
[B]: Connector “E49” (viewed from harness side)	4. Fuse	12. P/S motor
[C]: Connector “E51” (viewed from harness side)	5. VSS	13. Shield
[D]: Connector “G28” (viewed from harness side)	6. TCM	14. Torque sensor
[E]: For M/T vehicle model	7. Combination meter	15. Torque sensor amplifier
[F]: For A/T vehicle model	8. “EPS” warning lamp	16. To ECM, BCM, Air bag SDM and ABS hydraulic unit/control module assembly
1. Main fuse	9. Date link connector (DLC)	
2. Ignition switch	10. ECM	

Diagnostic Information and Procedures

EPS System Check

S4RS0A6304006

WARNING:

Carry out test drive in light traffic area to prevent an accident.

Step	Action	Yes	No
1	1) Record details of the problem. For your record, use of a questionnaire form will facilitate collecting information for proper analysis and diagnosis. 2) Check if the problem described in “Customer questionnaire” actually occurs in the vehicle. (This step should be performed with the customer if possible.) 3) Check for operation of the “EPS” warning lamp referring to ““EPS” Warning Lamp Check: ”. 4) Check for DTC referring to “DTC Check: ”, and then record DTC(s). 5) Clear DTC if any DTC exists referring to “DTC Clearance: ”, and then recheck for DTC. *Is any DTC still detected?*	Go to Step 2.	Go to Step 3.
2	1) Inspect and repair referring to applicable “DTC Table: ”. 2) Clear DTC referring to “DTC Clearance: ”. *Does the trouble recur?*	Go to Step 3.	Go to Step 4.
3	1) Test drive the vehicle and turn the steering wheel fully to the right and left at the stop vehicle. Check if any trouble exists. See WARNING. 2) Inspect and repair basic parts referring to “Steering Symptom Diagnosis: in Section 6A”. 3) If the trouble cannot be repaired in Step 3-2), inspect and repair referring to “P/S System Symptom Diagnosis: ”. *Does the trouble recur?*	Go to Step 5.	Go to Step 4.
4	1) Confirm if the problem is solved and the P/S system is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once and perform the test drive in Step 3-1), and then confirm that no DTC is indicated. *Is any malfunction DTC detected?*	Go to Step 5.	END.
5	1) Check for DTC referring to “DTC Check: ”. *Is any DTC detected?*	Go to Step 2.	Go to Step 3.

NOTE:

- **As execution of "DTC Clearance: " will clear all DTCs, be sure to record all DTCs before service.**
- **DTC C1122 is indicated when ignition switch is at ON position and engine is not running, it means that nothing is abnormal.**
- **Current DTC and history DTC can be identified by condition of the "EPS" warning lamp. "EPS" warning lamp operates as follows.**

	Current DTC is set. (Abnormality exists at present.)	**Only history DTC is set. (Faulty condition occurred once in the past, but normal condition is detected at present.)**	**Current and history DTC exist.**
"EPS" warning lamp after engine started	Remains ON.	Turns OFF.	Remains ON.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

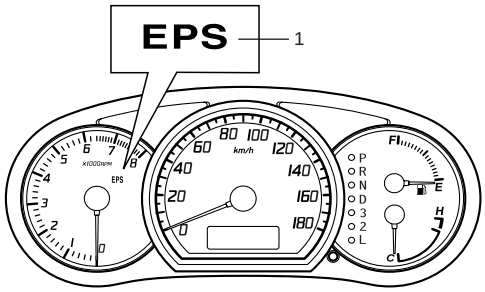
Problem Symptoms	• Steering wheel feels heavy • Vehicle pulls to one side during straight driving • Poor recovery from turns • Too much play in steering • Abnormal noise while vehicle is running: from motor, from rack and pinion, other _____ • Other _____
Frequency of Occurrence	• Continuous/Intermittent (times a day, a month)/other _____
Conditions for Occurrence of Problem	• Vehicle at stop & ignition switch ON: • When starting: at initial start only/at every start/Other _____ • Vehicle speed while: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other _____ • Road surface condition: Paved road/rough road/snow-covered road/other _____ • Chain equipment:
Environmental Condition	• Weather: fair/cloudy/rain/snow/other _____ • Temperature: ˚F (˚C)
DTC	• First check: Normal code/malfunction code ( ) • Second check after driving test: Normal code/malfunction code ( )

I3RM0A630005-

"EPS" Warning Lamp Check

S4RS0A6304007

1) Turn ignition switch to ON position (but without running engine) and check if the "EPS" warning lamp (1) lights up. If the lamp dose not light up, go to ""EPS" Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stop: " of the diagnostic flows.
2) Start engine and check if the "EPS" warning lamp turns OFF. If the lamp comes OFF, the P/S system is in good condition.



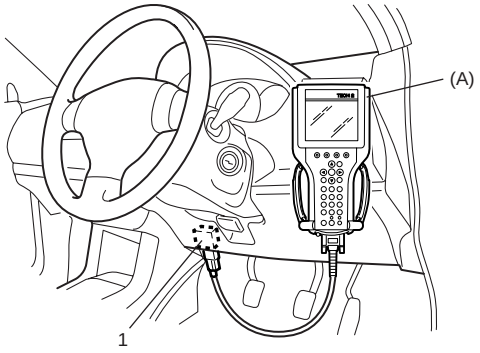
I4RS0A630004-

DTC Check

S4RS0A6304008

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0A630005-

3) Turn ignition switch to ON position.
4) Read DTC according to the instructions displayed on SUZUKI scan tool. For further details, refer to operator's manual for SUZUKI scan tool.

NOTE:

If communication between SUZUKI scan tool and the vehicle can not be established, perform "Serial Data Link Circuit Check: ".

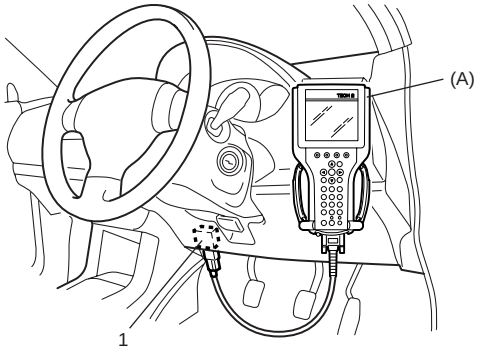
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Clearance

S4RS0A6304009

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0A630005-

3) Turn ignition switch to ON position.
4) Erase DTC according to the instructions displayed on SUZUKI scan tool. For further details, refer to operator's manual for SUZUKI scan tool.
5) After completing the clearance, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Table

S4RS0A6304010

CAUTION:

Be sure to perform the "EPS System Check: " before starting troubleshooting corresponding to each DTC.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
No CODES	Normal	—	—
☞ C1113	Torque sensor main and sub circuit voltage difference high	Difference between voltages from torque sensors at "E52-18" terminal and "E52-6" terminal exceeds specified voltage difference for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1114	Torque sensor 5 V power supply circuit failure	Voltage at "E52-20" terminal (5 V) differs from specified voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1117	Torque sensor failure (signal voltage high)	Voltage at "E52-16" terminal is lower than lower limit voltage for P/S control module diagnosis for specified period or longer after ignition SW is turned ON	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
☞ C1118	Torque sensor failure (signal voltage low)	Voltage at “E52-16” terminal is higher than upper limit voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1119	Torque sensor 12 V power supply circuit failure	Voltage at “E52-8” terminal (12 V) is lower than lower limit voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1121	VSS circuit signal not input (60 seconds or more)	No vehicle speed signal is inputted to P/S control module in either one of the following two conditions 1. More than 60 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 60 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start	1 driving cycle
☞ C1122	Engine speed signal circuit failure	P/S control module detects all the following conditions for 20 seconds or more • Vehicle speed signal 60 km/h (37 mph) or more • Engine speed signal 220 rpm or less	1 driving cycle
☞ C1123	VSS circuit signal not input (30 seconds or more)	No vehicle speed signal is inputted to P/S control module in either one of the following two conditions 1. More than 30 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 30 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start	3 driving cycles
☞ C1124	VSS circuit failure (abnormal deceleration)	Vehicle speed is inputted to P/S control module as having decelerated by more than specified deceleration and lower than 5 km/h vehicle speed continued for 5 seconds after deceleration	1 driving cycle
☞ C1141	Motor circuit voltage abnormal	Voltage at “E51-1” terminal or “E51-2” terminal differs from specified voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1142	Motor circuit current high command with P/S control module target current	Measured value of motor circuit current is 10 A or more higher than specified value of motor circuit current from P/S control module	1 driving cycle
☞ C1143	Motor circuit current excessive	Measured value of motor circuit current is 50 A or more	1 driving cycle
☞ C1145	Motor circuit current low command with P/S control module target current	Measured value of motor circuit current is lower than specified value of motor circuit current from P/S control module	1 driving cycle
☞ C1153	P/S control module power supply circuit failure	Battery voltage is lower than lower limit voltage for P/S control module diagnosis	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
☞ C1155	P/S control module failure	Battery voltage is higher than upper limit voltage for P/S control module diagnosis or internal failure of controller	1 driving cycle

Scan Tool Data

S4RS0A6304011

Scan tool data	Normal condition
☞ BATTERY VOLT	10 – 14 V
☞ TQS POWER SUPPL	7.5 – 10 V
☞ MOTOR VOLT	1.5 – 2 V
☞ TQS MAIN TORQUE	0 N·m
☞ TQS SUB TORQUE	0 N·m
☞ ASSIST TORQUE	0 N·m
☞ MOTOR (CON)	0 A
☞ MOTOR (MON)	0 A
☞ VEHICLE SPEED	0 km/h
☞ ENGINE SPEED	700 ± 50 rpm
☞ IGNITION SWITCH	ON

Scan Tool Data Definitions

BATTERY VOLT
Battery voltage is an analog input signal read by the ECU.

TQS (Torque sensor) POWER SUPPL
This parameter indicates the power supply voltage which the EPS controller supplies to the torque sensor.

MOTOR VOLT
This parameter indicates the voltage between motor terminals.

TQS (Torque sensor) MAIN TORQUE
The torque sensor is installed to detect the steering force and the steering direction. It consists of two potentiometers and the main torque sensor is one of these.

TQS (Torque sensor) SUB TORQUE
The torque sensor is installed to detect the steering force and the steering direction. It consists of two potentiometers and the sub-torque sensor is one of these. Its output characteristics are compared with those of the main torque sensor.

ASSIST TORQUE
This parameter is an internal parameter of the EPS controller. It is obtained by computing the torque sensor input signal.

MOTOR (CON)
Based on the input signal, the EPS controller determines the assist amount and controls the current to the motor suitable for that assist amount. This parameter indicates that control value.

MOTOR (MON)
This parameter indicates the actually measured value of the current flowing to the motor. The motor circuit condition is diagnosed by comparing this parameter with “MOTOR (CON)” parameter described previously.

VEHICLE SPEED
The AC voltage signal produced by the vehicle speed sensor (VSS) is divided and adjusted by the speedometer and thus the vehicle speed signal is obtained. The EPS controller determines the amount of power assist based on this vehicle speed signal and the torque sensor signal.

ENGINE SPEED
Engine speed signal is fed from the ECM so that it can be used for trouble diagnosis of the electric power steering system.

IGNITION SWITCH
This parameter indicates the condition of the power supply through the ignition switch.

P/S System Symptom Diagnosis

S4RS0A6304001

This section describes trouble diagnosis of the P/S system parts whose trouble is not indicated by the on-board diagnostic system (self-diagnostic function). When no malfunction is indicated by the on-board diagnostic system (self-diagnosis function) and assuredly those steering basic parts as described in “Steering Symptom Diagnosis: in Section 6A” are all in good condition, check the following power steering system parts which may be a possible cause for each symptom of the steering.

Condition	Possible cause	Correction / Reference Item
Steering wheel feels heavy (Perform “Steering Force Check: ” before diagnosis.)	Steering wheel installed improperly (twisted)	*Install steering wheel correctly.*
	Poor performance of torque sensor	*Check torque sensor referring to “Torque Sensor Inspection: ”.*
	Poor performance of motor	*Check motor referring to “Motor Assembly Inspection: ”.*
	Steering gear case assembly faulty	*Replace.*
	Poor performance of VSS	*Check VSS referring to “DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: in Section 1A”.*
Vehicle pulls to one side during straight driving	Poor performance of torque sensor	*Check torque sensor referring to “Torque Sensor Inspection: ”.*
Poor recovery after turns	Poor performance of torque sensor	*Check torque sensor referring to “Torque Sensor Inspection: ”.*
	Steering column faulty	*Replace.*

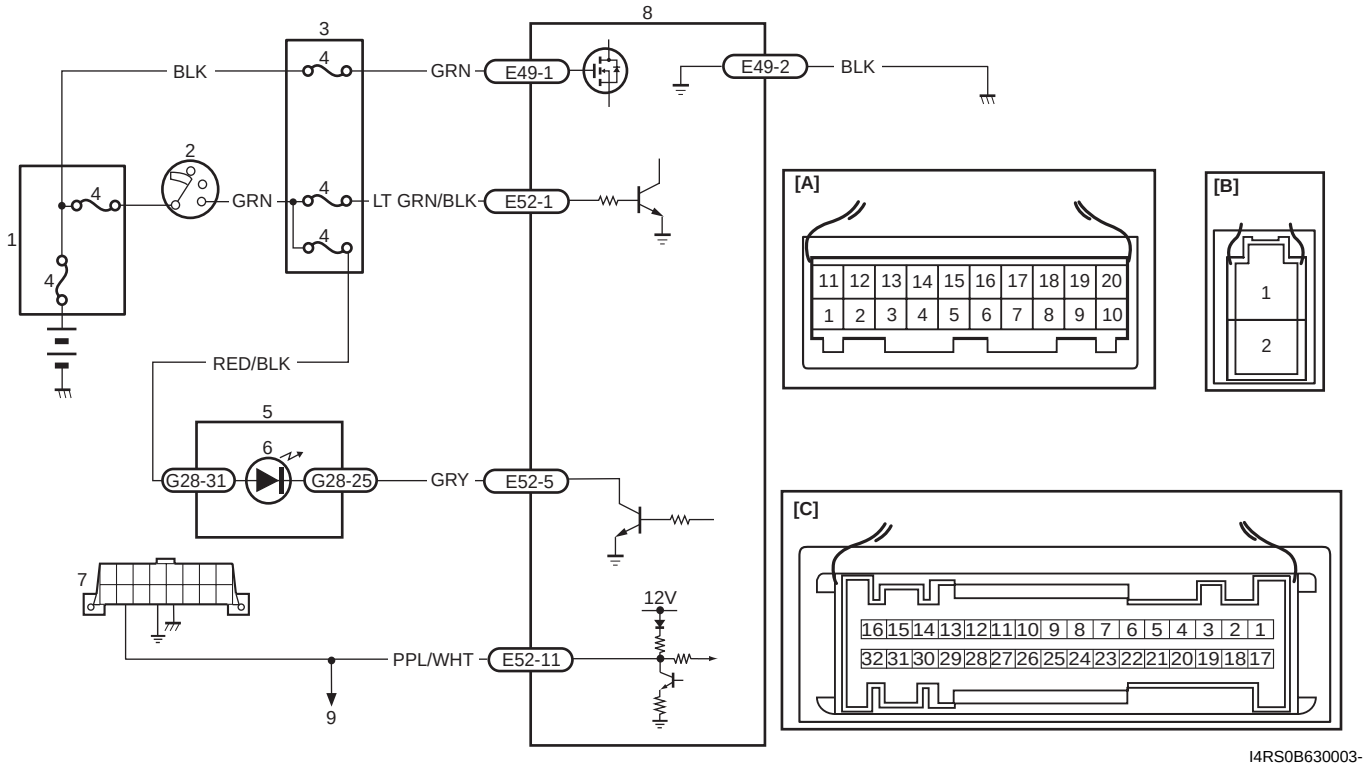
Serial Data Link Circuit Check

S4RS0A6304012

CAUTION:

Be sure to perform “EPS System Check: ” before starting “Troubleshooting”.

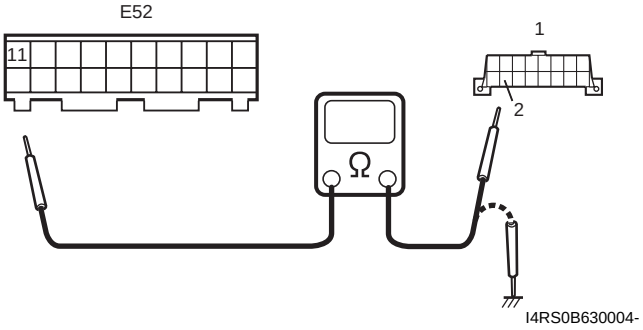
Wiring Diagram



I4RS0B630003-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	6. “EPS” warning lamp
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	7. Date link connector (DLC)
[C]: Connector “G28” (viewed from harness side)	4. Fuse	8. P/S control module
1. Main fuse	5. Combination meter	9. To ECM, BCM, Air bag SDM and ABS hydraulic unit/control module assembly

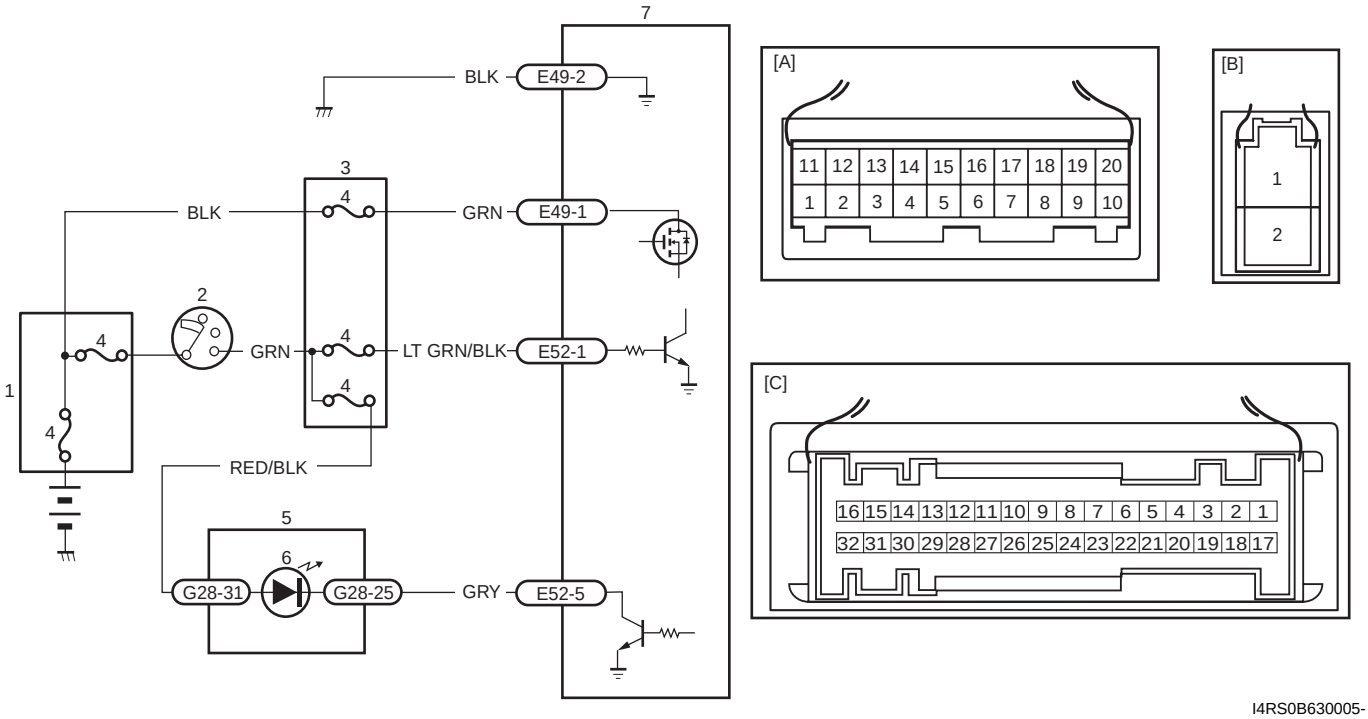
Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check: ".
2	1) Make sure that SUZUKI scan tool is free from malfunction and that correct program card (software) for P/S system is used. 2) Turn ignition switch to OFF position. 3) Check proper connection of SUZUKI scan tool to DLC. *Is connection in good condition?*	Go to Step 3.	Connect SUZUKI scan tool to DLC properly.
3	1) Check if communication is possible by making communication with other controllers (ECM, ABS hydraulic unit/control module assembly (if equipped) or SDM) or other vehicles. *Is it possible to communicate with the other controllers?*	Go to Step 4.	Repair open in common section of serial data circuit ("PPL/WHT" wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit ("PPL/WHT" wire circuit).
4	1) With ignition switch at OFF position, disconnect "E52" connector from P/S control module. 2) Check proper connection at "E52-11" ("PPL/WHT" wire) terminal (2) for serial data circuit. 3) If OK, then check for high resistance, open or short to power circuit or ground in "PPL/WHT" wire circuit for P/S system.  *Is check result in good condition?*	Substitute a known-good P/S control module and recheck.	Repair "PPL/WHT" wire circuit for P/S system.

“EPS” Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stop

S4RS0A6304013

Wiring Diagram



I4RS0B630005-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	6. “EPS” warning lamp
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	7. P/S control module
[C]: Connector “G28” (viewed from harness side)	4. Fuse	
1. Main fuse	5. Combination meter	

Circuit Description

Operation (ON/OFF) of “EPS” warning lamp is controlled by P/S control module through combination meter.
If the P/S system is in good condition, P/S control module turns “EPS” warning lamp ON at the ignition switch ON, and then turns it OFF at the engine start. If an abnormality in the system is detected, “EPS” warning lamp is turned ON continuously by P/S control module. If P/S control module is disconnected, “EPS” warning lamp is not turned ON.

Troubleshooting

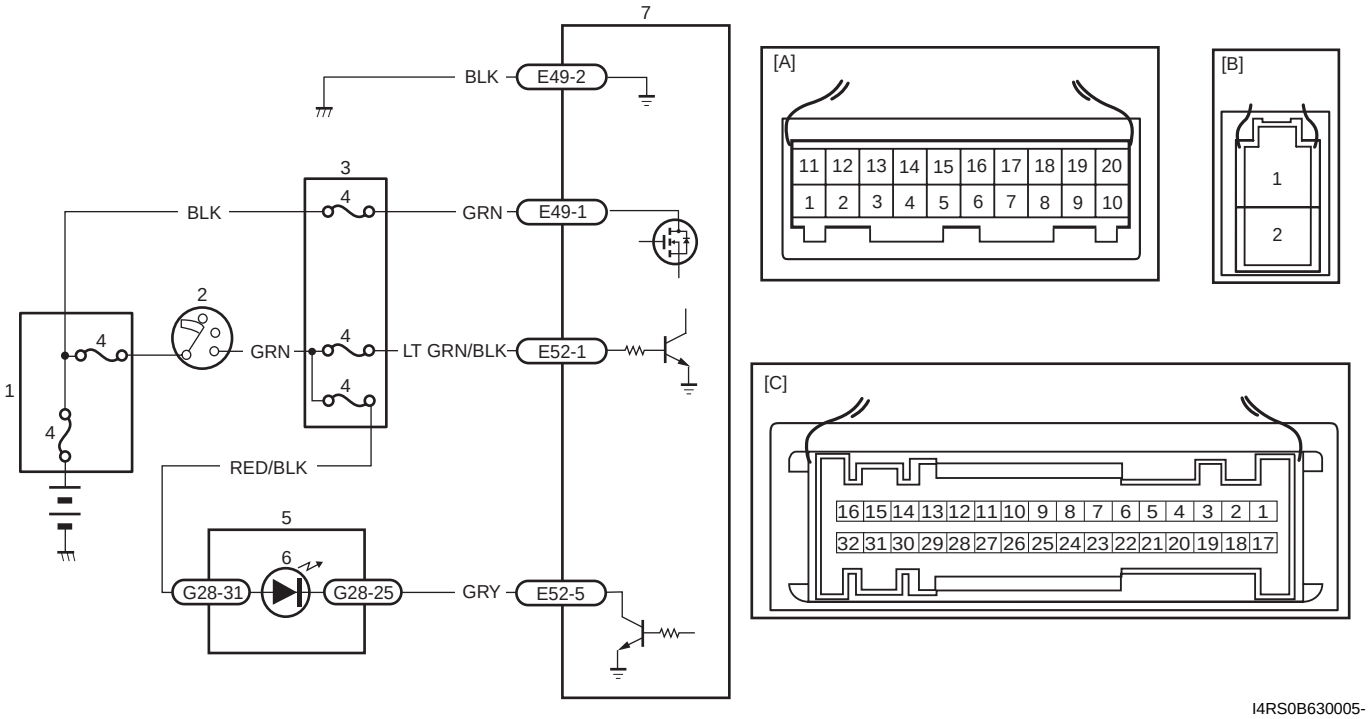
Step	Action	Yes	No
1	1) Turn ignition switch ON. *Do the other warning lamps come on?*	Go to Step 2.	“GRN”, “RED/BLK” wire circuit or ciruit fuse for combination meter open or short to ground.
2	1) Turn ignition switch OFF. 2) Remove and inspect the circuit fuse for P/S control module. *Is fuse in good condition?*	Reinstall fuse, and then go to Step 3.	Check “GRN” wire circuit for short to ground. If OK, replace fuse.
3	1) With ignition switch OFF, disconnect P/S control module connector (“E49”). 2) Check for proper connection to the P/S control module at “E49-2” terminal. 3) Measure resistance between “E49-2” (“BLK” wire) terminal and body ground. *Is it infinite (∞)?*	“BLK” wire circuit open.	Go to Step 4.

Step	Action	Yes	No
4	1) Check for proper connection to P/S control module at "E49-1" terminal. 2) If OK, check for voltage between "E49-1" ("GRN" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 5.	"BLK" or "GRN" wire circuit open or short to ground.
5	1) Check for proper connection to the P/S control module at "E52-1" terminal. 2) If OK, check voltage between "E52-1" ("LT GRN/BLK" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 6.	"LT GRN/BLK" wire circuit open or short to ground.
6	1) Remove combination meter and disconnect combination meter connector ("G28") with ignition switch turned OFF. 2) Check for proper connection to the combination meter at "G28-31" terminal. 3) If OK, check voltage between "G28-31" ("RED/BLK" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 7.	"RED/BLK" wire circuit open or short to ground.
7	1) Check for proper connection to the combination meter at "G28-25" terminal and P/S control module at "E52-5" terminal. 2) Measure resistance between the combination meter at "G28-25" terminal and the P/S control module at "E52-5" terminal. *Is it infinite (∞)?*	"GRY" wire circuit open.	Connect combination meter connector ("G28") with ignition switch turned OFF. Go to Step 8.
8	1) Check for voltage between "E52-5" ("GRY" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Replace the P/S control module.	Replace the combination meter.

“EPS” Warning Lamp Come ON Steady and Engine Start

S4RS0A6304014

Wiring Diagram



I4RS0B630005-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	6. “EPS” warning lamp
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	7. P/S control module
[C]: Connector “G28” (viewed from harness side)	4. Fuse	
1. Main fuse	5. Combination meter	

Circuit Description

Operation (ON/OFF) of “EPS” warning lamp is controlled by P/S control module through combination meter.
If the P/S system is in good condition, P/S control module turns “EPS” warning lamp ON at the ignition switch ON, and then turns it OFF at the engine start. If an abnormality in the system is detected, “EPS” warning lamp is turned ON continuously by P/S control module. If P/S control module is disconnected, “EPS” warning lamp is not turned ON.

Troubleshooting

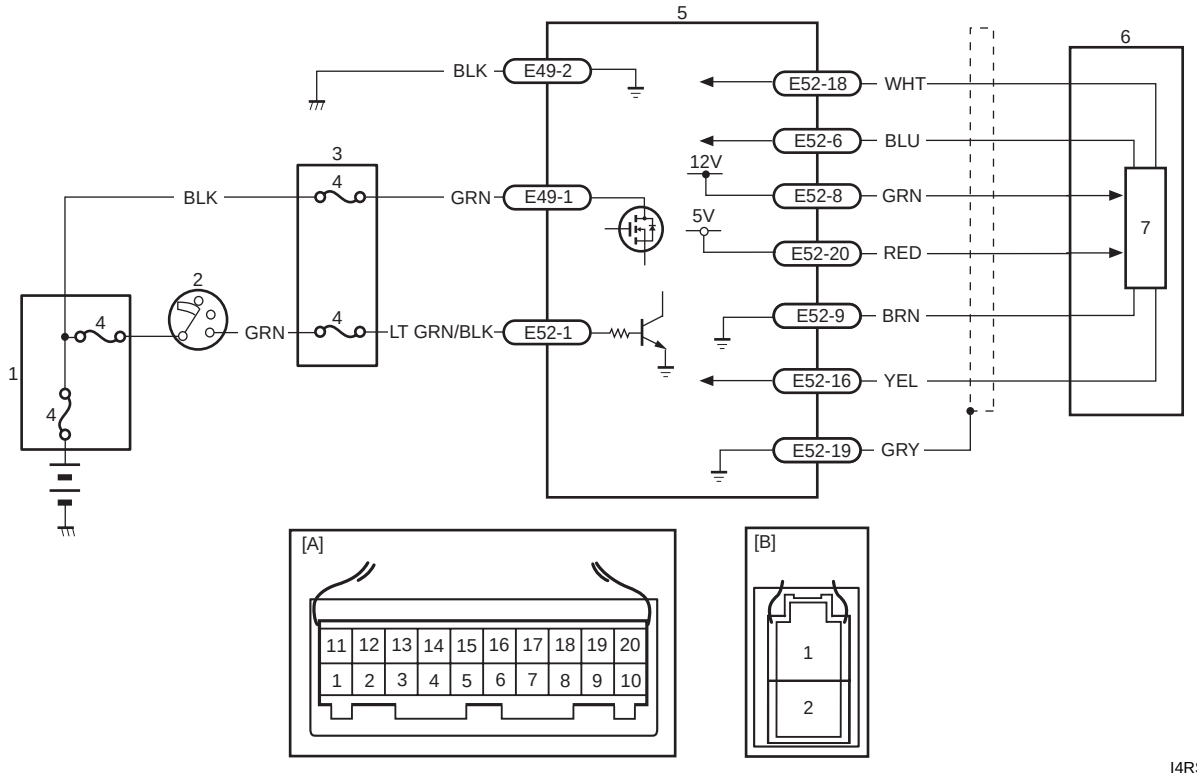
Step	Action	Yes	No
1	1) Perform DTC check. *Is there any DTC (NO CODES on SUZUKI scan tool)?*	Go to Step 5 of “EPS System Check: ”.	Go to Step 2.
2	1) With ignition switch OFF, disconnect P/S control module connector (“E52”). 2) Check for proper connection to the P/S control module at “E52-5” terminal. 3) If OK then ignition switch ON. *Does EPS warning lamp turn on?*	Connect P/S control module connector (“E52”) with ignition switch turned OFF. Go to Step 3.	Replace the P/S control module.
3	1) Remove combination meter and disconnect combination meter connector (“G28”). 2) Check for proper connection to combination meter at “G28-25” terminal. 3) If OK then ignition switch ON. *Does EPS warning lamp turn on?*	Replace the combination meter.	“GRY” wire circuit short to ground.

DTC C1113 / C1117 /C1118: Torque Sensor Circuit Failure

S4RS0A6304015

DTC C1113: Torque Sensor Main and Sub Circuit Voltage Difference High
DTC C1117: Torque Sensor Failure (Signal Voltage High)
DTC C1118: Torque Sensor Failure (Signal Voltage Low)

Wiring Diagram



I4RS0B630006-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	6. Torque sensor
1. Main fuse	4. Fuse	7. Torque sensor amplifier

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1113: Difference between voltages from torque sensors at “E52-18” terminal and “E52-6” terminal exceeds specified voltage difference for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic) **DTC C1117:** Voltage at “E52-16” terminal is lower than lower limit voltage for P/S control module diagnosis for specified period or longer after ignition SW is turned ON (1 driving cycle detection logic) **DTC C1118:** Voltage at “E52-16” terminal is higher than upper limit voltage for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic)	• Torque sensor • P/S control module

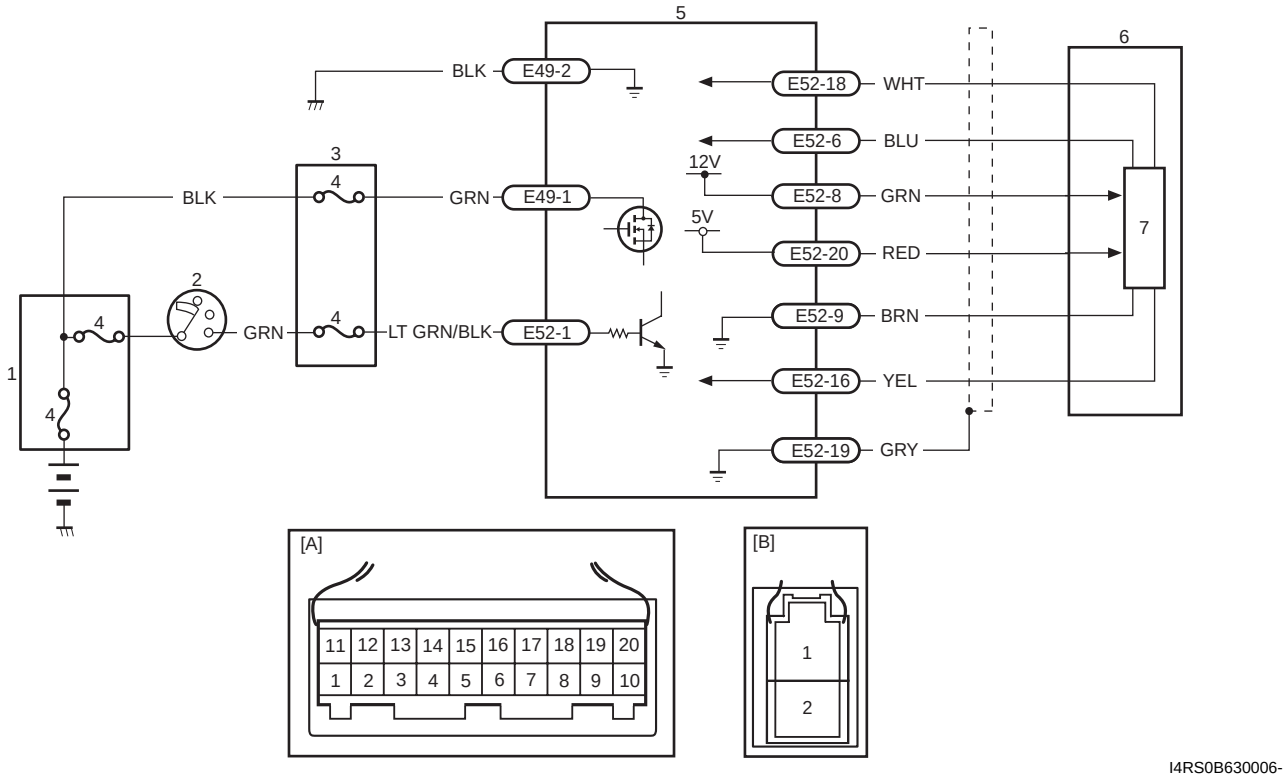
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	*Is DTC C1114 and/or DTC C1119 indicated, too?*	Go to “DTC C1114: Torque Sensor 5 V Power Supply Circuit Failure: ” and/or “DTC C1119: Torque Sensor 12 V Power Supply Circuit Failure: ”.	Go to Step 3.
3	1) Check P/S control module connector (“E52”) for proper connection. 2) If OK, then check for high resistance, open or short to power circuit or ground in “WHT”, “BLU” and “YEL” wire circuit for P/S control module to torque sensor. *Is check result in good condition?*	Go to Step 4.	Repair “WHT”, “BLU” and/or “YEL” wire circuit for P/S control module to torque sensor.
4	1) Check torque sensor and its circuit referring to “Torque Sensor Inspection: ”. *Is torque sensor in good condition?*	Substitute the original P/S control module with a known-good P/S control module, and then recheck.	Replace the steering gear case assembly, and then recheck.

DTC C1114: Torque Sensor 5 V Power Supply Circuit Failure

S4RS0A6304016

Wiring Diagram



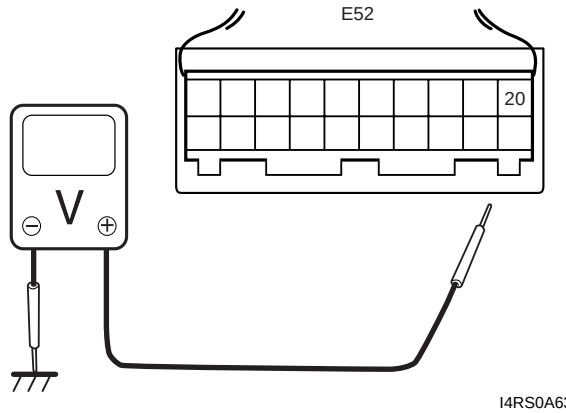
I4RS0B630006-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	6. Torque sensor
1. Main fuse	4. Fuse	7. Torque sensor amplifier

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage at “E52-20” terminal (5 V) differs from specified voltage for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic)	• High resistance, open or short in torque sensor circuit • Torque sensor • P/S control module

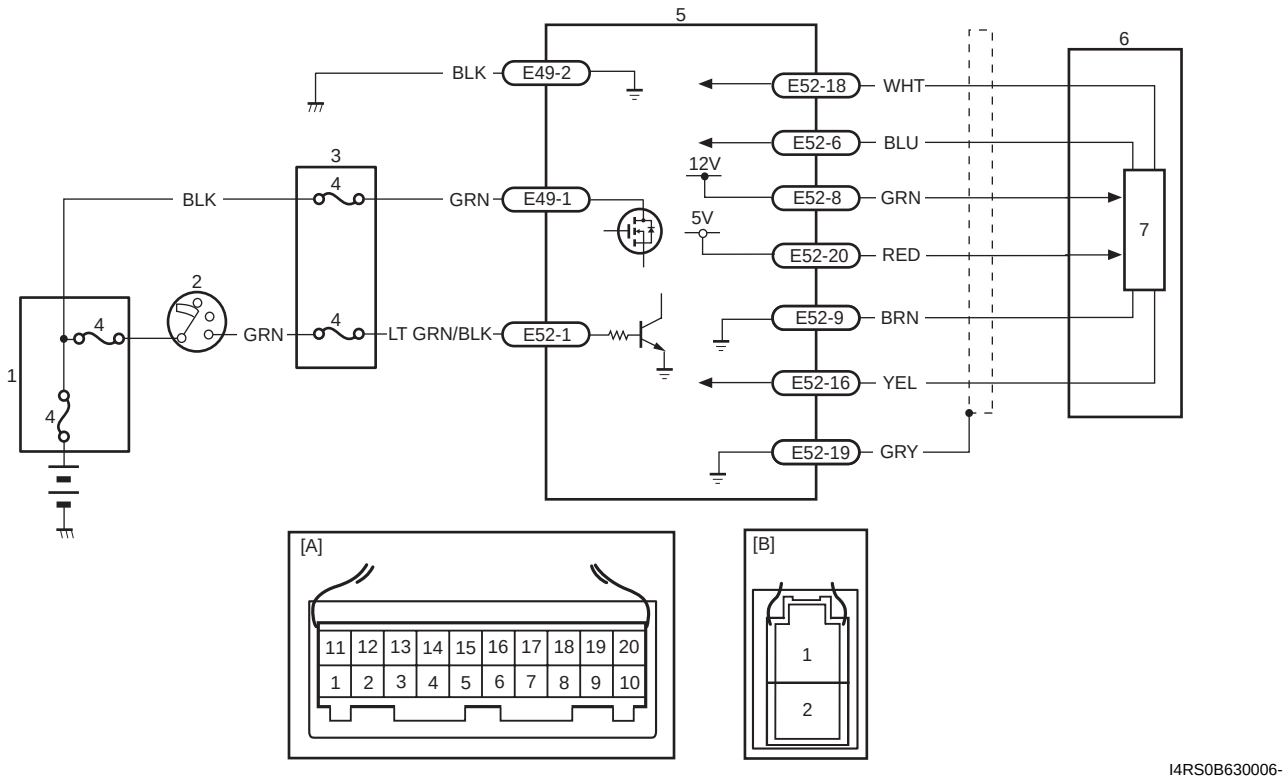
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	*Is DTC C1153 and/or DTC C1155 indicated, too?*	Go to “DTC C1153: P/S Control Module Power Supply Circuit Failure: ” and/or “DTC C1155: P/S Control Module Failure: ”.	Go to Step 3.
3	1) Remove console box. 2) Check P/S control module connector (“E52”) for proper connection. 3) If OK, turn ignition switch ON. 4) Check for voltage between “E52-20” (“RED” wire) terminal and body ground with connector (“E52”) connected to the P/S control module (1).  *Is it about 5 V?*	Go to Step 4.	Repair high resistance, open or short to power circuit or ground in 5 V power supply (“RED” wire) circuit.
4	1) Check torque sensor and its circuit referring to “Torque Sensor Inspection: ”. *Is torque sensor in good condition?*	Check P/S control module power and ground circuit. If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Replace the steering gear case assembly, and then recheck.

DTC C1119: Torque Sensor 12 V Power Supply Circuit Failure

S4RS0A6304020

Wiring Diagram



I4RS0B630006-

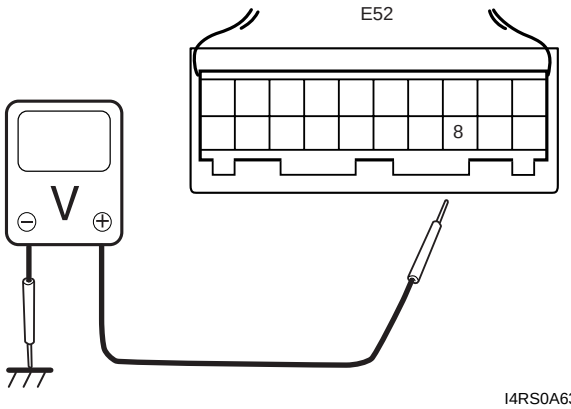
[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	6. Torque sensor
1. Main fuse	4. Fuse	7. Torque sensor amplifier

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage at “E52-8” terminal (12 V) is lower than lower limit voltage for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic)	• High resistance, open or short in torque sensor circuit • Torque sensor • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	*Is DTC C1153, too?*	Go to “DTC C1153: P/S Control Module Power Supply Circuit Failure: ”.	Go to Step 3.

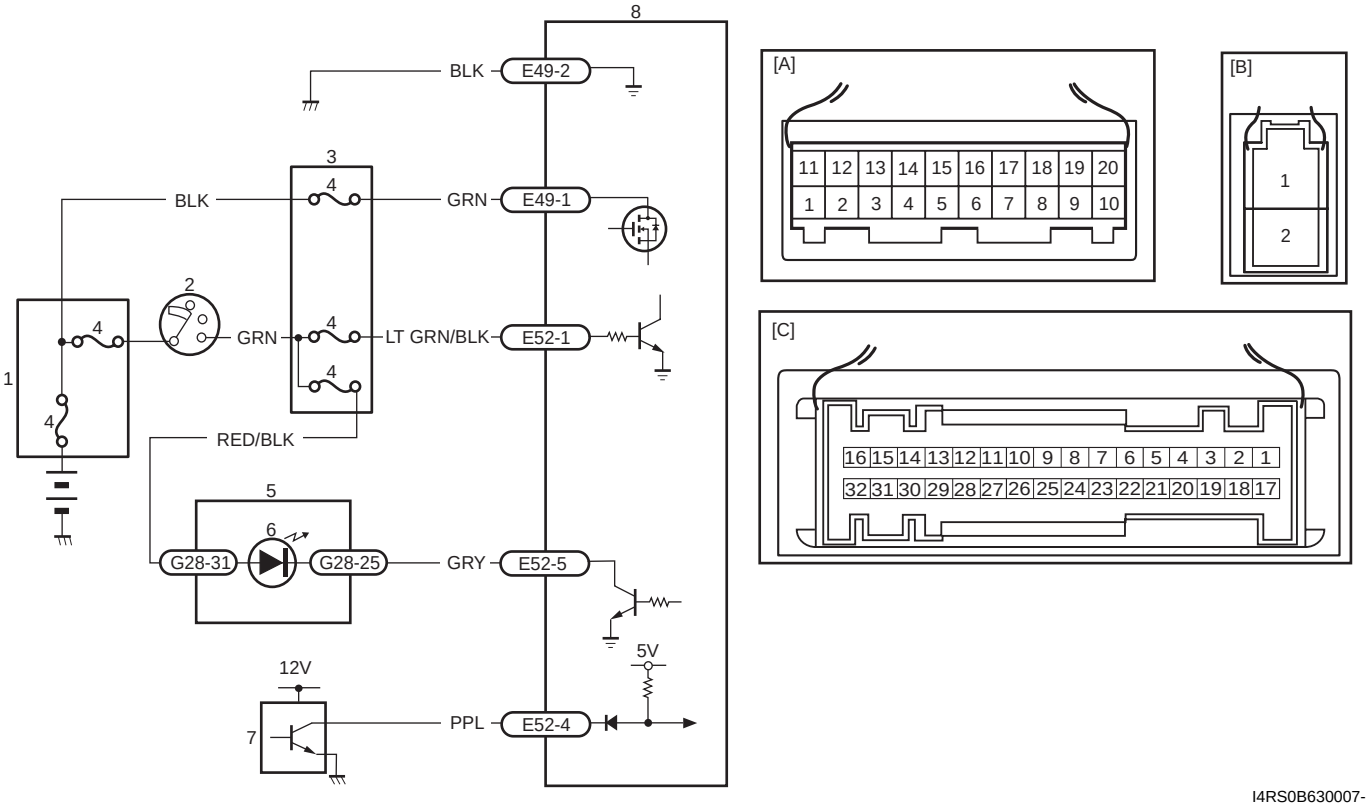
Step	Action	Yes	No
3	1) Remove console box. 2) Check P/S control module connector (“E52”) for proper connection. 3) If OK, turn ignition switch ON. 4) Check for voltage between “E52-8” (“GRN” wire) terminal and body ground with connector (“E52”) connected to the P/S control module.  I4RS0A630021- *Is it about 12 V?*	Go to Step 4.	Repair high resistance, open or short to power circuit or ground in 12 V power supply (“GRN” wire) circuit.
4	1) Check torque sensor and its circuit referring to “Torque Sensor Inspection: ”. *Is torque sensor in good condition?*	Substitute the original P/S control module with a known-good P/S control module, and then recheck.	Replace the steering gear case assembly, and then recheck.

DTC C1121 / C1123 / C1124: VSS Circuit Failure

S4RS0A6304017

DTC C1121: VSS Circuit Signal Not Input (60 Seconds or More)
DTC C1123: VSS Circuit Signal Not Input (30 Seconds or More)
DTC C1124: VSS Circuit Failure (Abnormal Deceleration)

Wiring Diagram



I4RS0B630007-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	6. “EPS” warning lamp
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	7. VSS
[C]: Connector “G28” (viewed from harness side)	4. Fuse	8. P/S control module
1. Main fuse	5. Combination meter	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1121: No vehicle speed signal is inputted to P/S control module in either one of the following two conditions (1 driving cycle detection logic) 1. More than 60 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 60 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start **DTC C1123:** No vehicle speed signal is inputted to P/S control module in either one of the following two conditions (3 driving cycle detection logic) 1. More than 30 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 30 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start **DTC C1124:** Vehicle speed is inputted to P/S control module as having decelerated by more than specified deceleration and lower than 5 km/h vehicle speed continued for 5 seconds after deceleration (1 driving cycle detection logic)	• High resistance, open or short in VSS circuit • VSS • ECM • P/S control module

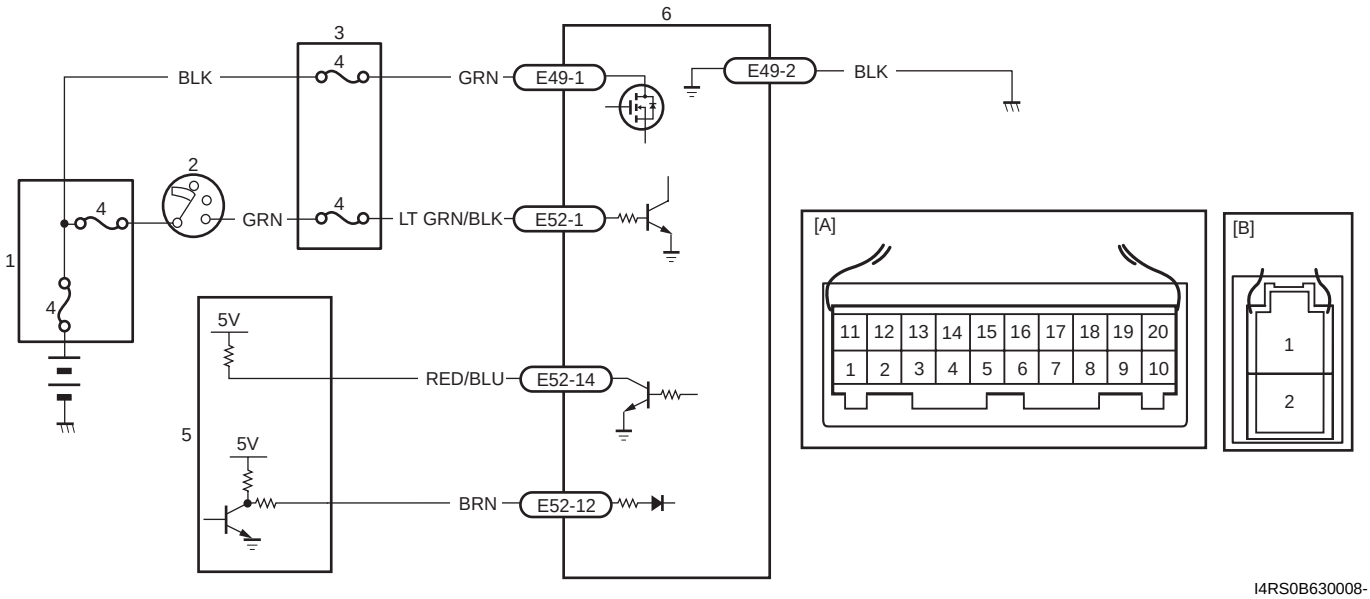
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check: ".
2	DTC Check for ECM referring to "DTC Check: in Section 1A". *Is DTC P0500 detected?*	Go to "DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: in Section 1A".	Go to Step 3.
3	1) Check for proper connection to the P/S control module and ECM at each "PPL" wire terminal (P/S control module side: "E52-4" terminal, ECM side: Refer to "ECM Input / Output Circuit diagram" under "Electronic Control System Description: in Section 1A"). 2) If they are OK, check for high resistance, open or short to power circuit or ground in "BRN" wire circuit. *Is check result in good condition?*	Check P/S control module power and ground circuit. If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Repair "PPL" wire circuit.

DTC C1122: Engine Speed Signal Circuit Failure

S4RS0A6304018

Wiring Diagram



I4RS0B630008-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. ECM
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	6. P/S control module
1. Main fuse	4. Fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P/S control module detects all the following conditions for 20 seconds or more (1 driving cycle detection logic) • Vehicle speed signal 60 km/h (37 rpm) or more • Engine speed signal 220 rpm or more	• High resistance, open or short in engine speed circuit • ECM • P/S control module

DTC Troubleshooting

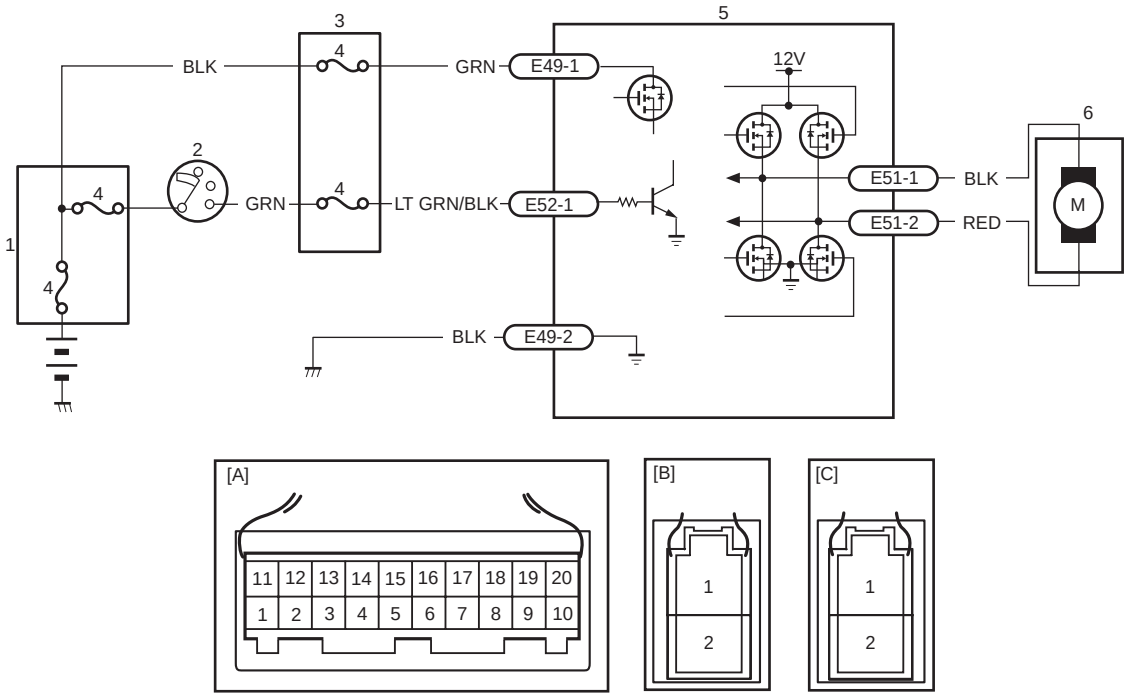
Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	1) Clear DTC(s) referring to “DTC Clearance: ”. 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to “DTC Check: ”. *Is DTC C1122 still detected?*	Go to Step 3.	Check intermittent trouble referring to “Intermittent and Poor Connection Inspection: in Section 00”.
3	DTC Check for ECM referring to “DTC Check: in Section 1A”. *Is DTC P0340 detected?*	Go to “DTC P0340: Camshaft Position (CMP) Sensor Circuit: in Section 1A”.	Go to Step 3.
4	1) Check for proper connection to the P/S control module and ECM at each “BRN” wire terminal (P/S control module side: “E52-12” terminal, ECM side: Refer to “ECM Input / Output Circuit diagram” under “Electronic Control System Description: in Section 1A”. 2) If they are OK, check for high resistance, open or short to power circuit or ground in “BRN” wire circuit. *Is check result in good condition?*	Check P/S control module power and ground circuit. If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Repair “BRN” wire circuit.

DTC C1141 / C1142 / C1143 / C1145: Motor Circuit Failure

S4RS0A6304019

DTC C1141: Motor Circuit Voltage Abnormal
DTC C1142: Motor Circuit Current High Command with P/S Control Module Target Current
DTC C1143: Motor Circuit Current Excessive
DTC C1145: Motor Circuit Current Low Command with P/S Control Module Target Current

Wiring Diagram



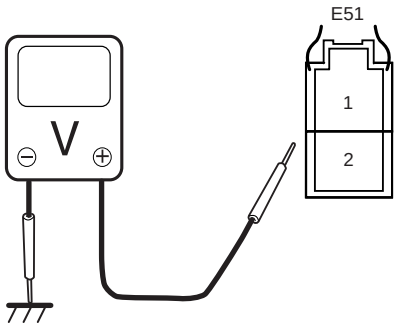
I4RS0B630009-

[A]: Connector “E52” (viewed from harness side)	1. Main fuse	4. Fuse
[B]: Connector “E49” (viewed from harness side)	2. Ignition switch	5. P/S control module
[C]: Connector “E51” (viewed from harness side)	3. Junction block assembly	6. P/S motor

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1141: Voltage at “E51-1” terminal or “E51-2” terminal differs from specified voltage for P/S control module diagnosis for specified period or longer (1 driving cycle detection logic) **DTC C1142:** Measured value of motor circuit current is 10 A or more higher than specified value of motor circuit current from P/S control module (1 driving cycle detection logic) **DTC C1143:** Measured value of motor circuit current is 50 A or more (1 driving cycle detection logic) **DTC C1145:** Measured value of motor circuit current is lower than specified value of motor circuit current from P/S control module (1 driving cycle detection logic)	• High resistance, open or short in P/S motor circuit • P/S motor • P/S control module

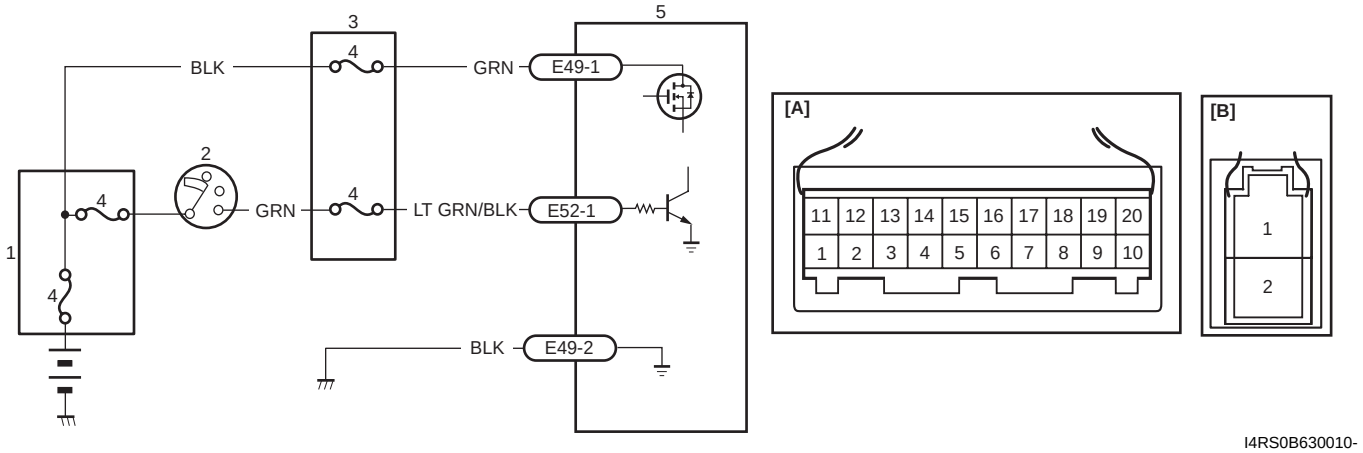
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check: ".
2	*Is DTC C1153 and/or DTC C1155 indicated, too?*	Go to "DTC C1153: P/S Control Module Power Supply Circuit Failure: " and/or "DTC C1155: P/S Control Module Failure: ".	Go to Step 3.
3	1) Remove console box. 2) Check P/S control module connector ("E51") for proper connection. 3) If OK, start engine. 4) Check for voltage between "E51-1" ("BLK" wire) terminal and body ground and "E51-2" ("RED" wire) terminal and body ground with connector ("E51") connected to the P/S control module.  I4RS0A630019- *Are they 5 – 7 V with steering wheel at straight position?*	Go to Step 4.	Repair poor connection, high resistance, open or short to power circuit or ground in "E51-1" ("BLK" wire) or "E51-2" ("RED" wire) circuit and recheck.
4	1) Check motor and its circuit referring to "Motor Assembly Inspection: ". *Is motor in good condition?*	Substitute the original P/S control module with a known-good P/S control module, and then recheck.	Replace the steering gear case assembly, and then recheck.

DTC C1153: P/S Control Module Power Supply Circuit Failure

S4RS0A6304021

Wiring Diagram



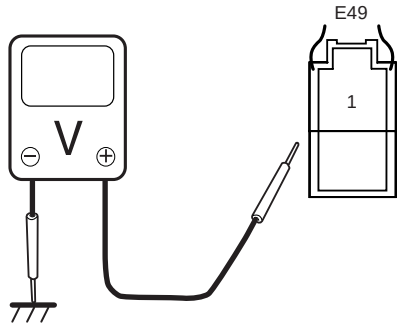
I4RS0B630010-

[A]: Connector "E52" (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector "E49" (viewed from harness side)	3. Junction block assembly	
1. Main fuse	4. Fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Battery voltage is lower than lower limit voltage for P/S control module diagnosis (1 driving cycle detection logic)	• High resistance, open or short in P/S control module power supply circuit • Undercharged Battery • P/S control module

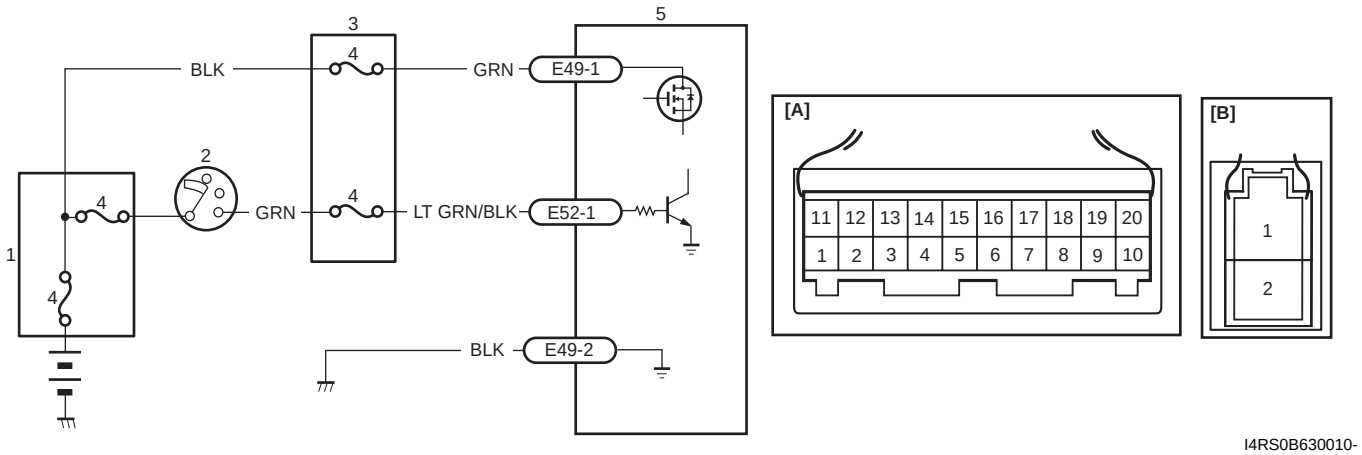
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check: ".
2	1) Check circuit fuse for P/S control module. 2) If OK, measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 10 V or more?*	Go to Step 3.	Check charging system referring to "Generator Test (Undercharged Battery Check): in Section 1J".
3	1) With ignition switch OFF, disconnect P/S control module connector ("E49"). 2) Check for proper connection to the P/S control module at "E49-2" ("BLK" wire) terminal. 3) If OK, then check for high resistance, open or short to power circuit in "BLK" wire circuit. *Is check result in good condition?*	Go to Step 4.	Repair "BLK" wire circuit.
4	1) Remove steering column hole cover with turn ignition switch OFF. 2) Check for proper connection to the P/S control module at "E49-1" ("GRN" wire) terminal. 3) Connect P/S control module connector. 4) If OK, check voltage between "E49-1" terminal and body ground with engine running.  I4RS0A630023- *Is voltage 10 V or more?*	Check for intermittent trouble referring to "Intermittent and Poor Connection Inspection: in Section 00". If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Repair poor connection or high resistance in "E49-1" ("GRN" wire) circuit.

DTC C1155: P/S Control Module Failure

S4RS0A6304022

Wiring Diagram



I4RS0B630010-

[A]: Connector “E52” (viewed from harness side)	2. Ignition switch	5. P/S control module
[B]: Connector “E49” (viewed from harness side)	3. Junction block assembly	
1. Main fuse	4. Fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Battery voltage is higher than upper limit voltage for P/S control module diagnosis or internal failure of controller (1 driving cycle detection logic)	• Overcharged Battery • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check: ”.
2	Measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 15.5 V or less?*	Substitute the original P/S control module with a known-good P/S control module, and then recheck.	Check charging system referring to “Generator Test (Overcharged Battery Check): in Section 1J”.

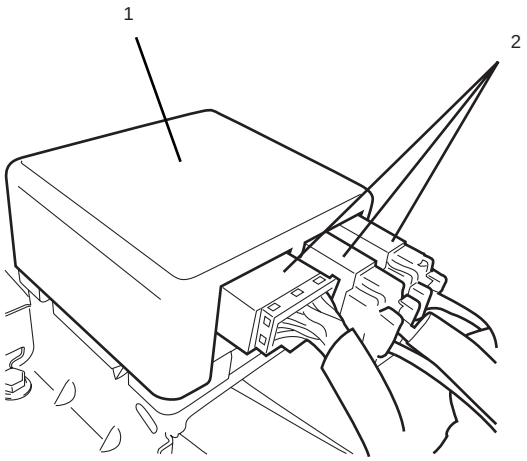
Inspection of P/S Control Module and Its Circuits

S4RS0A6304023

The P/S control module (1) and its circuits can be checked at the P/S control module wiring couplers (2) by measuring voltage and resistance.

CAUTION:

P/S control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to the P/S control module with connectors disconnected from the P/S control module.



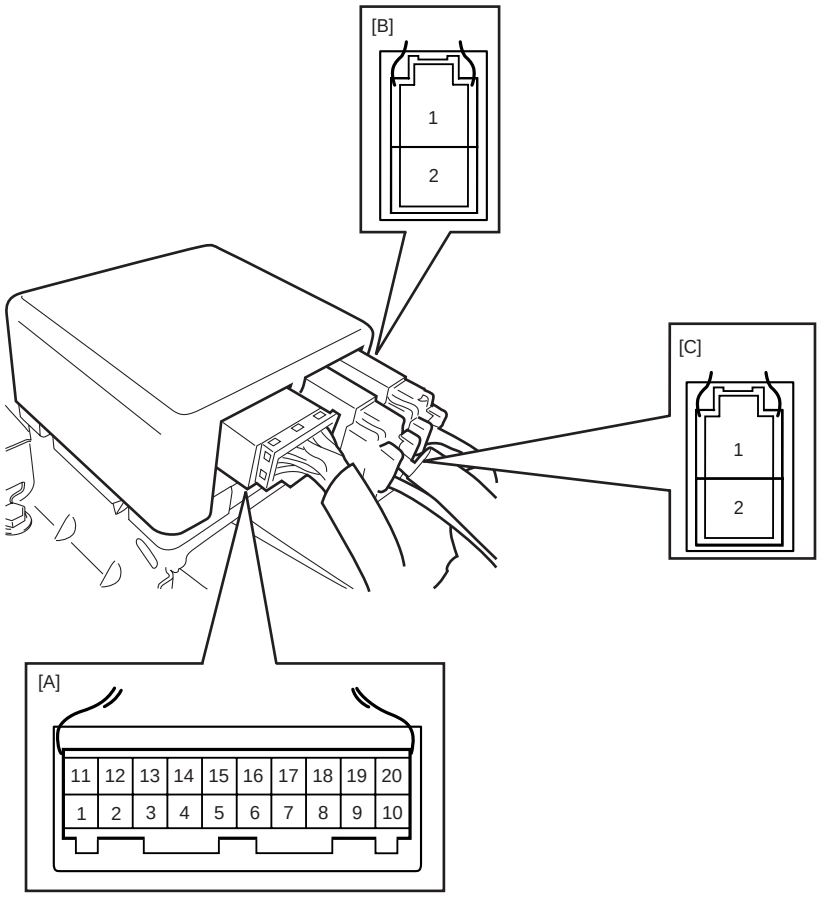
I4RS0A630008-

Voltage Check

1) Remove console box.
2) Check for voltage at each terminal with connectors connected to the P/S control module.

NOTE:

As each terminal voltage is affected by the battery voltage, confirm if the battery voltage is 11 V or more when ignition switch is ON.



I4RS0A630024-

[A]: Connector “E52” (viewed from harness side)
[B]: Connector “E51” (viewed from harness side)
[C]: Connector “E49” (viewed from harness side)

Terminal	Wire color	Circuit	Normal voltage	Condition
E49-1	GRN	P/S control module power supply from battery	10 – 14 V	—
E49-2	BLK	Ground	—	—
E51-1	BLK	Motor output 1	5 – 7 V	Engine idling and steering wheel at straight position
E51-2	RED	Motor output 2	5 – 7 V	Engine idling and steering wheel at straight position
E52-1	LT GRN/BLK	P/S control module power supply from ignition switch	10 – 14 V	Ignition switch ON
E52-2	—	—	—	—
E52-3	—	—	—	—
E52-4	PPL	VSS	*Indicator deflection repeated 0 – 1 V and 10 – 14 V	• Ignition switch ON • Front left tire turned quickly with right tire locked
E52-5	GRY	“EPS” Light	0 V	“EPS” warning lamp ON

Terminal	Wire color	Circuit	Normal voltage	Condition
E52-6	BLU	Torque sensor (Sub)	About 2.5 V	• Ignition switch ON and steering wheel at straight position • Check voltage between “E52-6” and “E52-9” terminals
E52-7	—	—	—	—
E52-8	GRN	12 V power supply for torque sensor	About 12 V	• Ignition switch ON • Check voltage between “E52-8” and “E52-9” terminals
E52-9	BRN	Torque sensor (GND)	0 V	—
E52-10	—	—	—	—
E52-11	PPL/WHT	Data link connector	—	—
E52-12	BRN	Engine speed signal	*Indicator deflection repeated 0 – 1 V and 6 – 10 V	Engine idling
E52-13	—	—	—	—
E52-14	RED/BLU	P/S signal	About 5 V	• Ignition switch ON • Engine idling and turning steering wheel to the right or left as far as it stops
E52-15	—	—	—	—
E52-16	YEL	Torque sensor failure signal	0 V	—
E52-17	—	—	—	—
E52-18	WHT	Torque sensor (Main)	About 2.5 V	• Ignition switch ON and steering wheel at straight position • Check voltage between “E52-18” and “E52-9” terminals
E52-19	GRY	Shield (GND)	—	—
E52-20	RED	5 V power supply for torque sensor	About 5 V	• Ignition switch ON • Check voltage between “E52-20” and “E52-9” terminals

NOTE:

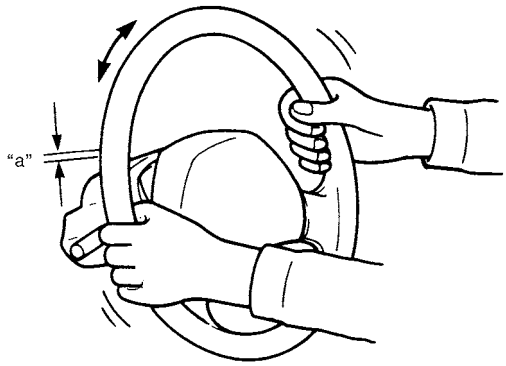
***: The voltage of this circuit may not be checked by voltmeter. If so, use oscilloscope.**

Steering Wheel Play Check

S4RS0A6304002

- Check steering wheel for looseness or rattle by moving it in its shaft direction and lateral direction. If found defective, repair or replace.
- Check steering wheel for play, holding vehicle in straight forward condition on the ground with engine stopped.
  If steering wheel play is not within specification, inspect as follows and replace if found defective.
- Tie-rod end ball stud for wear (Ball stud should move when more than 0.2 N·m (2 kg-cm, 0.44 lb-ft) torque is applied.)
- Lower ball joint for wear
- Steering shaft joint for wear
- Steering pinion or rack gear for wear or breakage
- Each part for looseness

Steering wheel play
"a": 0 – 30 mm (0 – 1.18 in.)



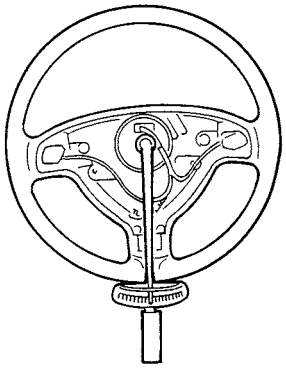
I3RM0A630021-

Steering Force Check

S4RS0A6304003

1) Place vehicle on level road and set steering wheel at straight-ahead position.
2) Check if tire inflation pressure is as specified referring to the tire placard.
3) Remove driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B".
4) Start engine.
5) With engine idling, measure steering force by turning torque wrench.

   Steering force
   Less than 6.4 N·m (0.64 kg-m, 4.6 lb-ft)



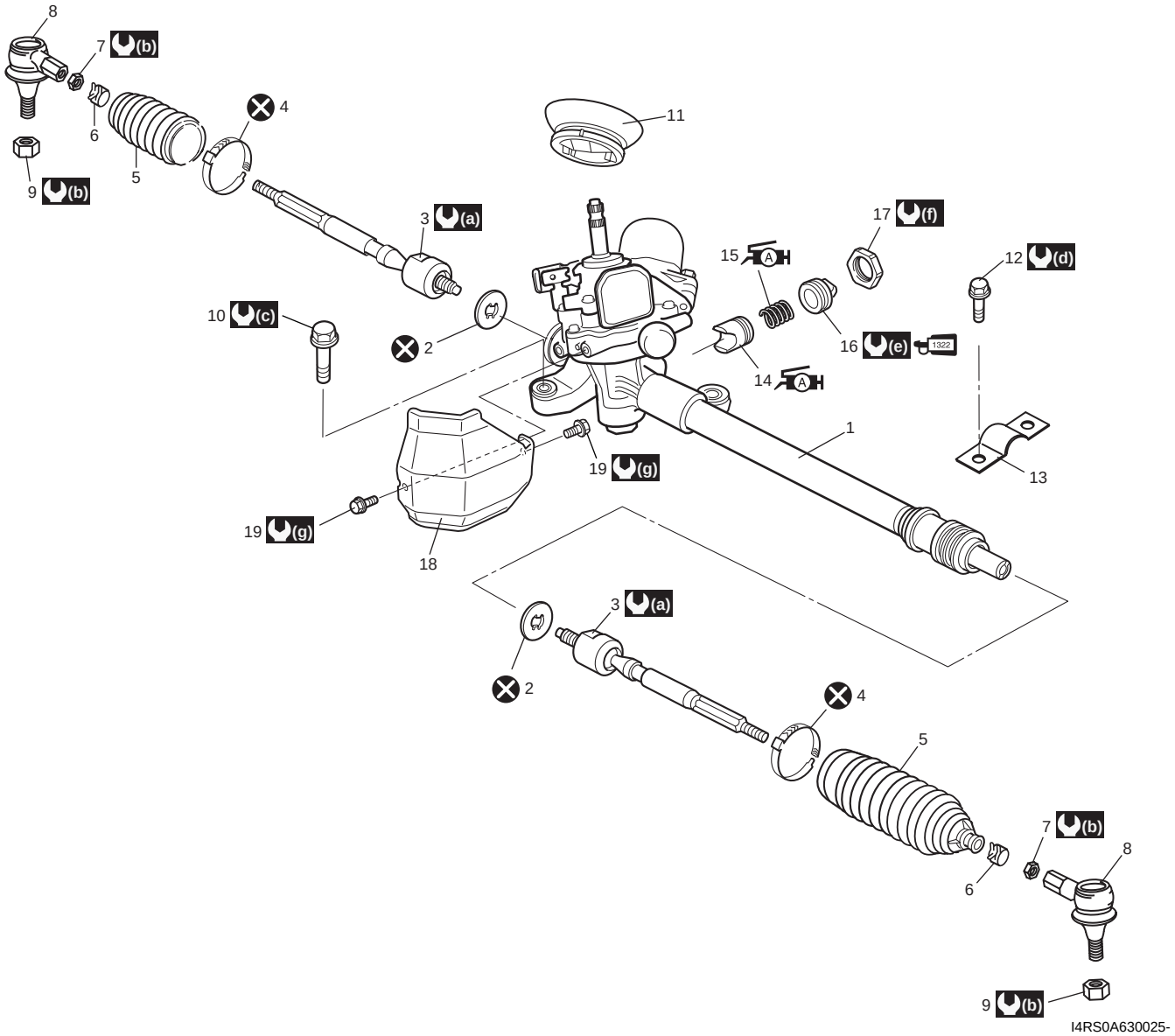
I3RM0A630022-

6) Install driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B".

Repair Instructions

Steering Gear Case Assembly Components

S4RS0A6306020



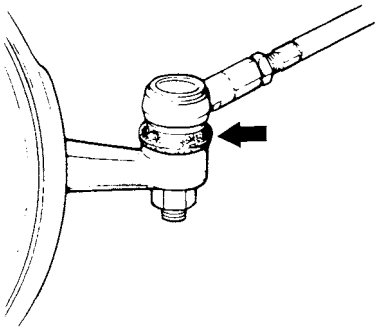
I4RS0A630025-

1. Steering gear case	10. Steering gear case mounting No.1 bolt	19. Heat insulator bolt
2. Tie-rod lock washer	11. Steering gear case grommet	(a) : 93 N·m (9.3 kg-m, 67.5 lb-ft)
3. Tie-rod	12. Steering gear case mounting No.3 bolt	(b) : 45 N·m (4.5 kg-m, 32.5 lb-ft)
4. Band	13. Steering gear case mounting bracket	(c) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
5. Boot	14. Steering rack plunger : Apply grease 99000-25010 to rack plunger.	(d) : 40 N·m (4.0 kg-m, 29.0 lb-ft)
6. Rack boot clip	15. Steering rack plunger spring : Apply grease 99000-25010 to spring end.	(e) : Refer to “Steering Rack Plunger Removal and Installation: ”.
7. Tie-rod end lock nut	16. Steering rack damper screw : Apply thread lock 99000-32110 to all around thread part of rack damper screw.	(f) : 64 N·m (6.4 kg-m, 46.5 lb-ft)
8. Tie-rod end	17. Steering rack damper lock nut	(g) : 9.5 N·m (0.95 kg-m, 7.0 lb-ft)
9. Tie-rod end lock nut	18. Heat insulator	: Do not reuse.

Tie-Rod End Boot On-Vehicle Inspection

S4RS0A6306008

Inspect each boot for tear. If evan a small tear is noted, replace it with a new one.



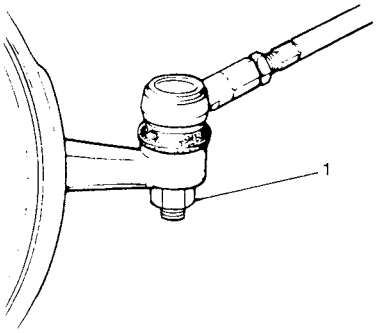
I3RM0A630024-

Tie-Rod End Removal and Installation

S4RS0A6306009

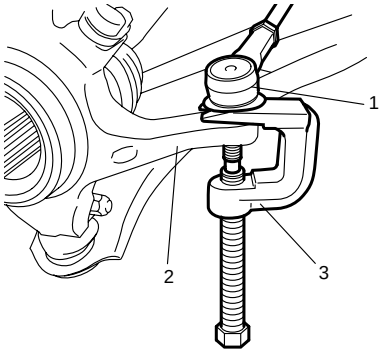
Removal

1) Hoist vehicle, and then remove wheel referring to “Wheel Removal and Installation: in Section 2D”.
2) Remove tie-rod end nut (1) from steering knuckle.



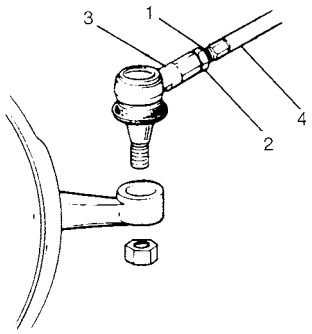
I3RM0A630025-

3) Disconnect tie-rod end (1) from knuckle (2) using puller (3).



I4RS0A630040-

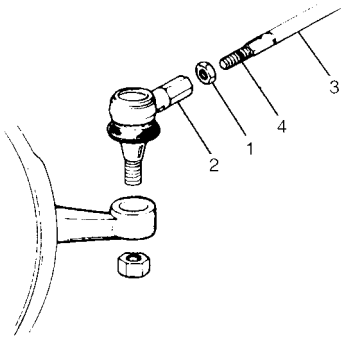
4) For ease of adjustment after installation, make marking (1) of tie-rod end lock nut (2) position on tie-rod end thread. Then, loosen lock nut and remove tie-rod end (3) from tie-rod (4).



I4RS0A630041-

Installation

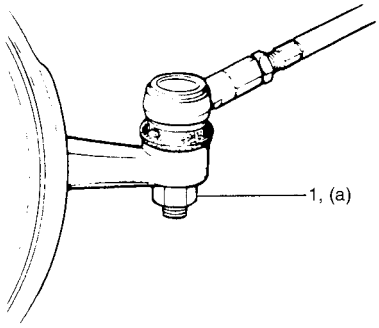
1) Install tie-rod end lock nut (1) and tie-rod end (2) to tie-rod (3). Align lock nut with mark (4) on tie-rod thread.



I4RS0A630042-

2) Connect tie-rod end to knuckle. Tighten tie-rod end nut (1) to specified torque.

Tightening torque
Tie-rod end nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

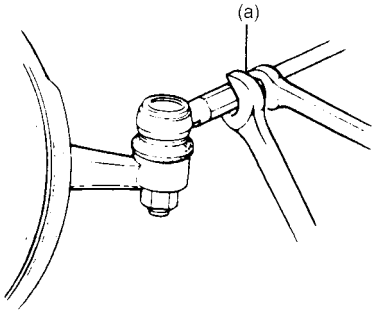


I3RM0A630029-

3) Inspect for proper toe referring to “Front Wheel Alignment Inspection and Adjustment: in Section 2B”.

4) After confirming proper toe, tighten tie-rod end lock nut to specified torque.

Tightening torque
Tie-rod end lock nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)



I3RM0A630030-

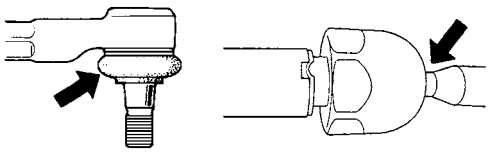
5) Tighten wheel bolts to specified torque and lower hoist.

Tightening torque
Wheel bolt: 85 N·m (8.5 kg-m, 61.5 lb-ft)

Tie-Rod End Inspection

S4RS0A6306010

- Inspect for play in ball joint.
- Inspect for play in rack end ball joint.
  In either case, if found defective, replace.

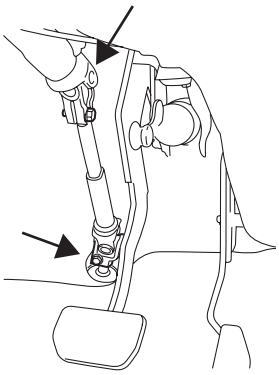


I4RS0A630043-

Steering Shaft Joint On-Vehicle Inspection

S4RS0A6306012

Check shaft joint for wear, breakage and any other damage and replace if any defect exists.



I4RS0A630026-

Steering Gear Case Assembly Removal and Installation

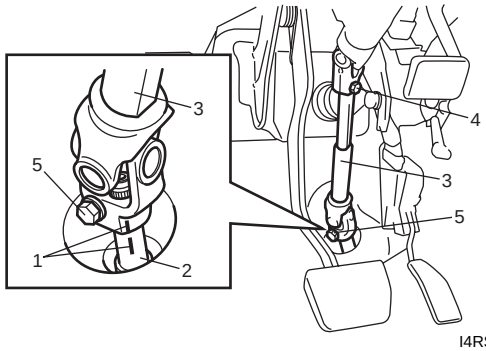
S4RS0A6306013

Removal

CAUTION:

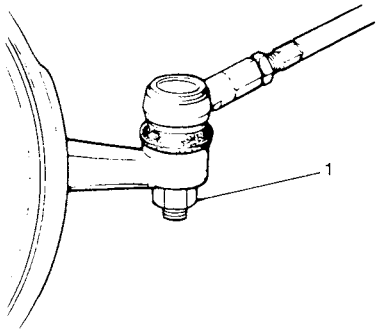
Be sure to set front wheels (tires) in straight direction and remove ignition key from key cylinder before performing the following steps; otherwise, contact coil of air bag system may get damaged.

1) Remove steering joint cover.
2) Make alignment marks (1) on pinion shaft (2) and joint of steering lower shaft (3) for a guide during reinstallation.
3) Loosen joint bolt (steering column side) (4) and remove joint bolt (pinion shaft side) (5) and disconnect steering lower shaft (3) from pinion shaft (2).



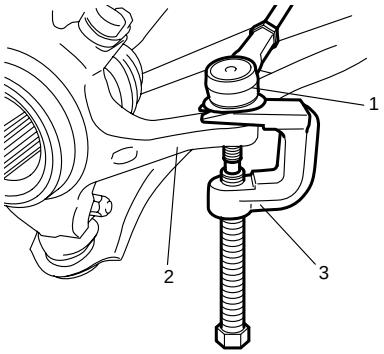
I4RS0B630013-

4) Hoist vehicle and remove both wheels referring to “Wheel Removal and Installation: in Section 2D”.
5) Remove tie-rod nuts (1) from both steering knuckles.



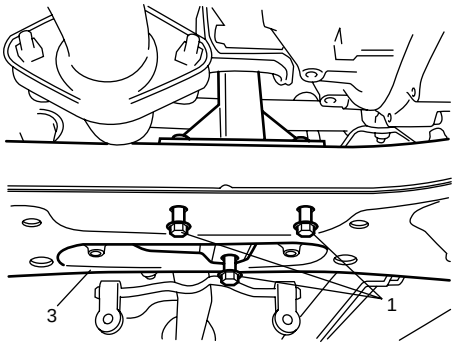
I3RM0A630025-

6) Disconnect both tie-rod ends (1) from knuckles (2), using puler (3).



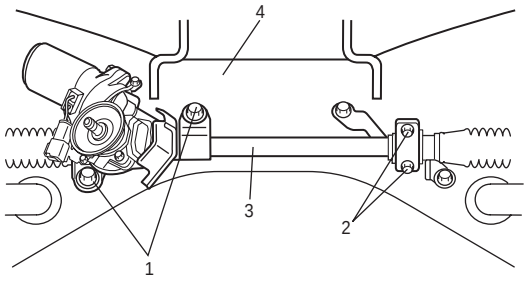
I4RS0A630040-

7) To remove the steering gear case assembly easily, lower the engine with transmission, but don't remove.
8) Support engine with transaxle by supporting device and then remove engine rear mounting bolt (1).



I4RS0A630028-

9) Remove front suspension frame with steering gear case assembly referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
10) Remove steering gear case mounting No.1 bolts (1), No.3 bolts (2) and gear case bracket, then remove gear case (3) from front suspension frame (4).

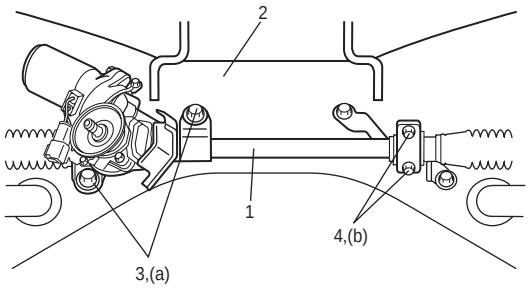


I4RS0A630029-

Installation

1) Mount steering gear case (1) to front suspension frame (2) and tighten gear case mounting No.1 bolts (3) and No.3 bolts (4) to specified torque.

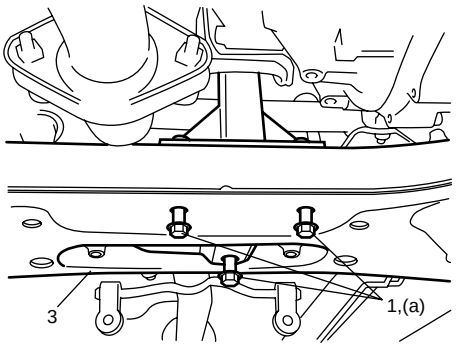
Tightening torque
Steering gear case mounting No.1 bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
Steering gear case mounting No.3 bolt (b): 40 N·m (4.0 kg-m, 29.0 lb-ft)



I4RS0A630030-

2) Install front suspension frame with steering gear case assembly referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
3) Install engine rear mounting bolt (1).

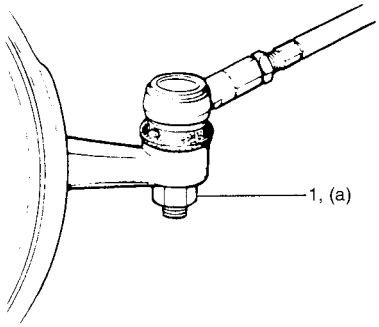
Tightening torque
Engine rear mounting bracket bolt (a): 55 N·m (5.5 kg-m, 40 lb-ft)



I4RS0A630031-

4) Remove supporting device.
5) Install tie-rod ends to knuckles (right & left). Tighten each tie-rod end nut (1) to specified torque.

Tightening torque
Tie-rod end nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

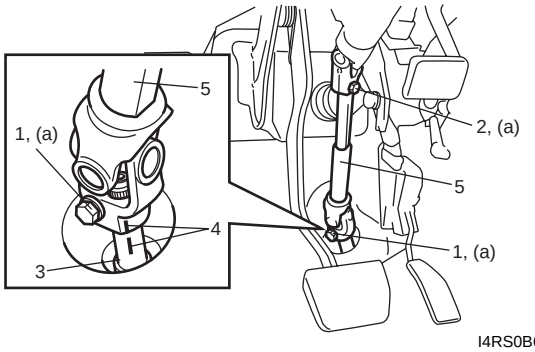


I3RM0A630029-

6) Be sure that steering wheel and brake discs (right & left) are all straight-ahead position and then insert steering lower shaft (5) into steering pinion shaft (3) with matching marks (4).

7) Tighten steering shaft joint lower bolt (1) and upper bolt (2) to specified torque (Lower side first and then upper side).

Tightening torque
Steering shaft joint bolt (a): 25 N·m (2.5 kg-m, 18.5 lb-ft)



I4RS0B630016-

8) Install both wheels and tighten wheel bolts to specified torque.

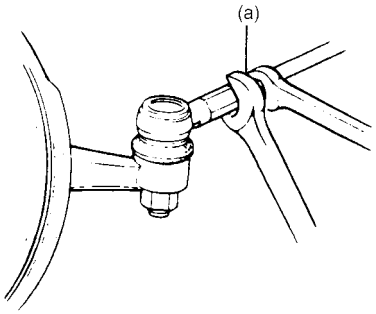
Tightening torque
Wheel bolt: 85 N·m (8.5 kg-m, 61.5 lb-ft)

9) Lower hoist.

10) Check toe setting. Adjust as required refer to “Front Wheel Alignment Inspection and Adjustment: in Section 2B”.

11) Tighten both tie-rod end lock nuts to specified torque.

Tightening torque
Tie-rod end lock nut (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

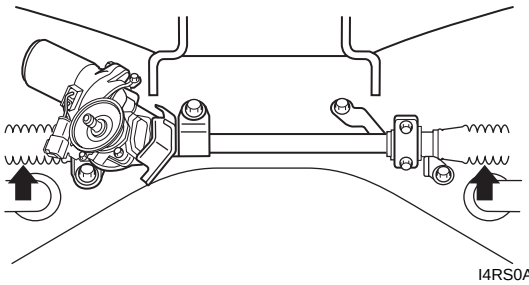


I3RM0A630030-

Steering Rack Boot Inspection

S4RS0A6306014

Hoist vehicle.
Inspect each boot for tear. A torn boot allows entry of dust and water which can cause wear to steering rack and pinion to produce noise as well as rust to result in malfunction of steering system.
If even a small tear is noted, replace with new one.
Also, check each boot for dent. If there is a dent, keep boot in most compressed state for some seconds to correct dent.
Boots should be visually inspected for any damage, dent and tear during every periodical inspection at specified intervals and whenever vehicle is hoisted for any other purpose.



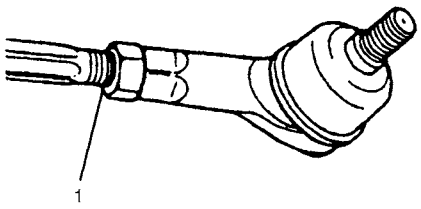
I4RS0A630034-

Tie-Rod / Rack Boot Removal and Installation

S4RS0A6306015

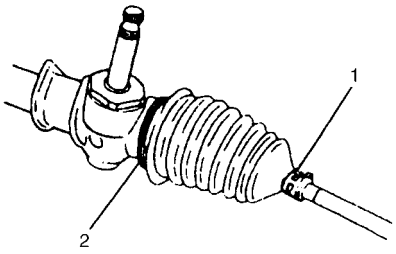
Removal

1) Remove steering gear case assembly referring to “Steering Gear Case Assembly Removal and Installation: ”.
2) For ease of adjustment after installation, make marking (1) of tie-rod end lock nut position of tie-rod thread.



I4RS0A630044-

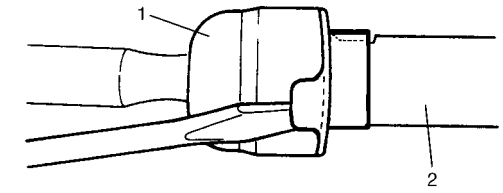
3) Loosen tie-rod end lock nut and remove tie-rod end.
4) Remove boot band (2) and clip (1).
5) Remove boot from tie-rod.

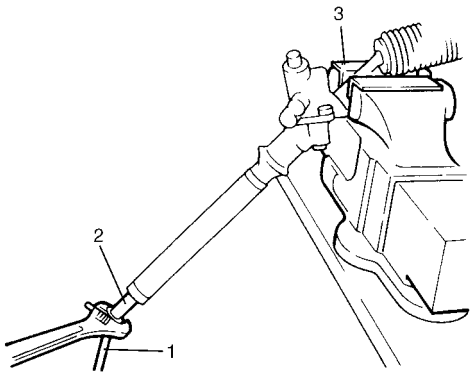


IYSQ01630034-

6) Unbend bent part of tie-rod (1).

7) Hold rack with soft jawed vise (3) and remove tie-rod from rack (2).



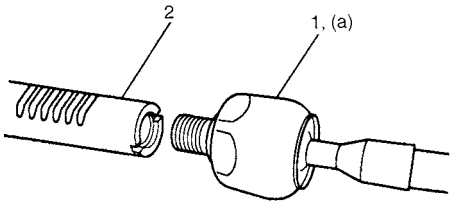


I4RS0A630033-

Installation

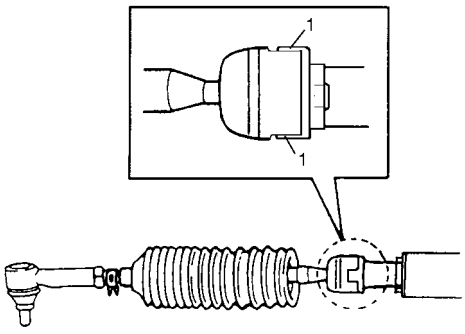
1) Install tie-rod (1) to rack (2).
2) Hold rack with soft jawed vise and tighten tie-rod to specified torque.

Tightening torque
Tie-rod (a): 93 N·m (9.3 kg-m, 67.5 lb-ft)



I3RM0A630048-

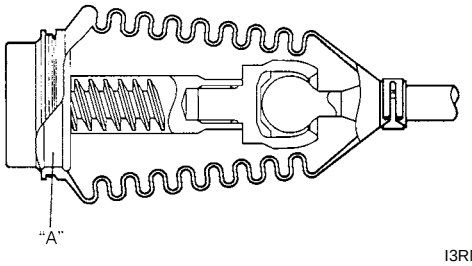
3) Bend lock washer at 2 places (1) as shown in figure.



I4RS0A630035-

4) Apply sealant to gear case groove “A” indicated in the figure. Position boot properly in grooves of gear case (or rack side mount) and tie-rod.
After this, check to ensure that boot is free from twist and dent.

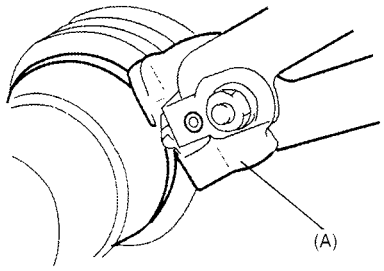
“A”: Sealant 99000–31120



I3RM0A630050-

5) Fasten boot with new band and clip securely.

Special tool
(A): 09943–55010

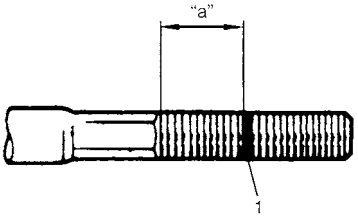


I3RM0A630051-

6) Install tie-rod end lock nut and tie-rod end to tie-rod. Position lock nut to marking (1) made in removal.

NOTE:

When tie-rod was replaced, measure length “a” on removed tie-rod and use it on new replacement tie-rod so as to position lock nut properly.



I3RM0A630052-

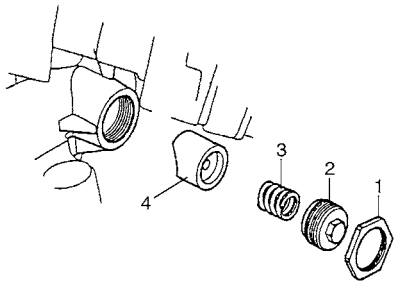
7) Install steering gear case assembly referring to “Steering Gear Case Assembly Removal and Installation: ”.

Steering Rack Plunger Removal and Installation

S4RS0A6306030

Removal

1) Remove gear case assembly referring to “Steering Gear Case Assembly Removal and Installation: ”.
2) Loosen lock nut (1) with holding damper screw (2).
3) Remove lock nut (1), rack damper screw (2), rack plunger spring (3) and rack plunger (4).



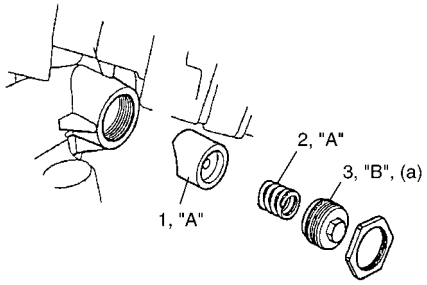
I4RS0A630045-

Installation

1) Apply grease lightly to sliding part of plunger (1) against rack.
2) Install plunger and spring (2) as shown.
3) Apply thread lock cement to rack damper screw (3) and tighten them as follows.
   a) Tighten damper screw to 25 N·m (2.5 kg-m, 18.0 lb-ft).
   b) Loosen damper screw until 180°.
   c) Retighten damper screw to 3.9 N·m (0.39 kg-m, 3.0 lb-ft).
   d) After tightening rack damper screw to specified torque, turn it back by 10° or less.

   “A”: Grease 99000–25050
   “B”: Thread lock cement 99000–32110

   Tightening torque
   Rack damper screw (a): Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft) and loosen 180° and then tighten 3.9 N·m (0.39 kg-m, 3.0 lb-ft) and turn it back by 10° or less by the specified procedure.

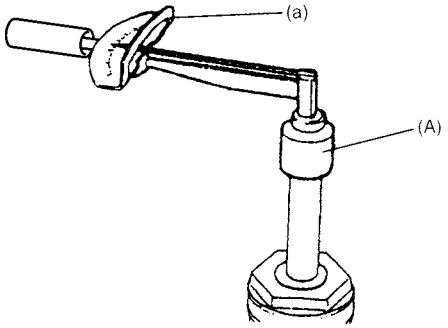


I4RS0A630046-

4) Pinion rotation torque should be checked with rack position centered.
   Also, check if rack as a whole moves smoothly.

   Special tool
   (A): 09944–18310

   Tightening torque
   Rotation torquer of pinion (a): 2.0 N·m (0.2 kg-m, 1.5 lb-ft)



I3RM0A630055-

5) After adjustment, tighten lock nut to specified torque with holding damper screw at the position.

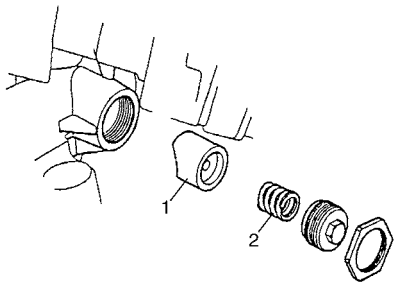
   Tightening torque
   Rack damper screw lock nut (a): 64 N·m (6.4 kg-m, 46.5 lb-ft)

   Install gear case assembly referring to “Steering Gear Case Assembly Removal and Installation: ”.

Steering Rack Plunger Inspection

S4RS0A6306031

- Inspect rack plunger (1) for wear or damage.
- Inspect rack plunger spring (2) for deterioration.



I4RS0A630047-

P/S Control Module Removal and Installation

S4RS0A6306027

Removal

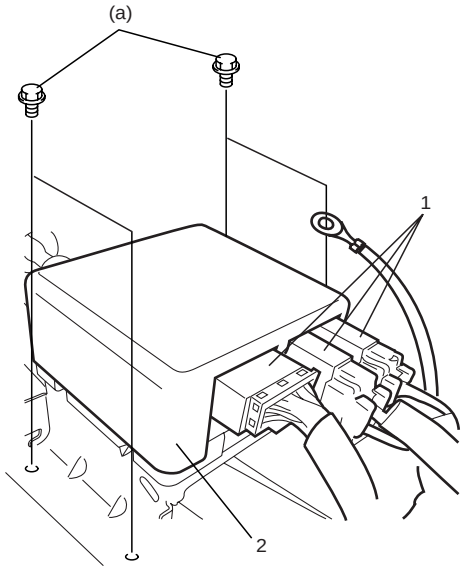
1) Disconnect negative cable at battery.
2) Remove console box.
3) Disconnect connectors (1) from P/S control module.
4) Remove P/S control module (2) from floor panel.

Installation

Reverse removal procedure for installation noting the following.

- Tighten P/S control module screw to the specified torque.

  Tightening torque
  P/S control module mounting bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



I4RS0A630036-

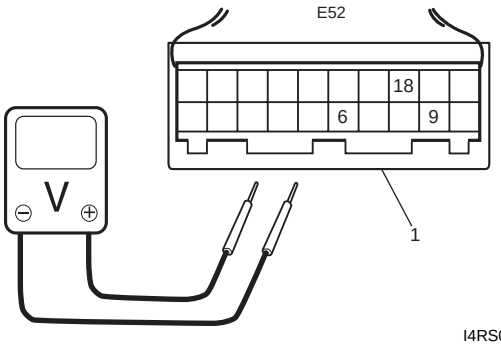
Torque Sensor Inspection

S4RS0A6306028

1) Remove console box.
2) Turn ignition switch to ON position.
3) Check for voltage between terminals of connector (“E52”) with connecting it to P/S control module and not running engine. If check result is not satisfactory, replace steering gear case assembly.

Torque sensor specification

	Steering wheel fully turned right	Steering wheel held at position for run straight	Steering wheel fully turned left
Main sensor (“E52-18” – “E52-9”)	**Approx 5.0 V**	**Approx 2.5 V**	**Approx 0.4 V**
Sub sensor (“E52-6” – “E52-9”)	**Approx 5.0 V**	**Approx 2.5 V**	**Approx 0.4 V**



I4RS0A630037-

1. Connector “E52” (viewed from harness side)

Motor Assembly Inspection

S4RS0A6306029

1) Remove console box.
2) Disconnect motor connector (“E51”) from P/S control module with ignition switch OFF.
3) Check for resistance between terminals of motor connector (“E51”).
   If check result is not as specified, replace steering gear case assembly.

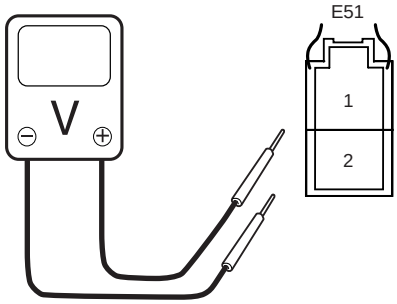
Motor circuit resistance

“E51-1” and “E51-2” (For motor)	**About 1 Ω**

4) Check for continuity between terminal of motor connector (“E51”) and body ground.
   If check result is not as specified, replace steering gear case assembly.

Motor circuit resistance

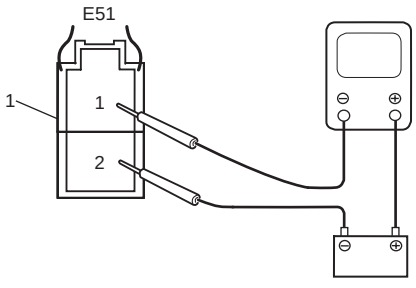
“E51-2” and body ground	**No continuity**



I4RS0A630038-

5) Connect battery (1) between “E51-1” and “E51-2”. Check if motor rotates smoothly, and then measure current between “E51-1” and “E51-2” using ammeter (2) as shown in the figure. If check result is not satisfactory, replace steering gear case assembly.

Motor circuit current (reference value)
Standard: About 0.65 A



I4RS0A630039-

Specifications

Tightening Torque Specifications

S4RS0A6307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Tie-rod end nut	45	4.5	32.5	☞ / ☞
Tie-rod end lock nut	45	4.5	32.5	☞ / ☞
Wheel bolt	85	8.5	61.5	☞ / ☞
Steering gear case mounting No.1 bolt	55	5.5	40.0	☞
Steering gear case mounting No.3 bolt	40	4.0	29.0	☞
Engine rear mounting bracket bolt	55	5.5	40	☞
Steering shaft joint bolt	25	2.5	18.5	☞
Tie-rod	93	9.3	67.5	☞
Rack damper screw	Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft) and loosen 180° and then tighten 3.9 N·m (0.39 kg-m, 3.0 lb-ft) and turn it back by 10° or less by the specified procedure.			☞
Rotation torquer of pinion	2.0	0.2	1.5	☞
Rack damper screw lock nut	64	6.4	46.5	☞
P/S control module mounting bolt	9	0.9	6.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Steering Gear Case Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A6308001

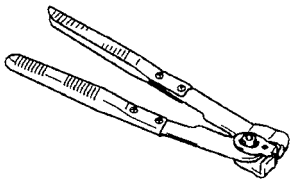
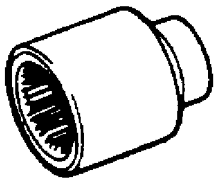
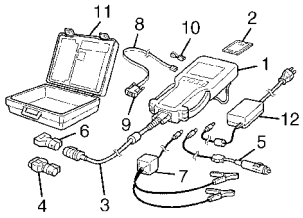
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease E	P/No.: 99000–25050	☞
Sealant	Silicone Sealant	P/No.: 99000–31120	☞
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞

NOTE:

Required service material is also described in the following.
“Steering Gear Case Assembly Components: ”

Special Tool

S4RS0A6308002

09943–55010 Boot clamp plier ☞ 	09944–18310 Pinion torque checking socket ☞ 
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞ 	

Section 7

HVAC

CONTENTS

Precautions 7-1
Precautions 7-1
Precautions on HVAC 7-1

Heater and Ventilation 7A-1
General Description 7A-1
Heater and Ventilation Construction 7A-1
Schematic and Routing Diagram 7A-2
Heater and Ventilation Wiring Circuit Diagram 7A-2
Diagnostic Information and Procedures 7A-3
Heater and Ventilation Symptom Diagnosis 7A-3
Repair Instructions 7A-4
HVAC Unit Components 7A-4
HVAC Unit Removal and Installation 7A-5
Blower Motor Removal and Installation 7A-5
Blower Motor Inspection 7A-5
Blower Motor Resistor Removal and Installation 7A-6
Blower Motor Resistor Inspection 7A-6
HVAC Control Unit Components 7A-7
HVAC Control Unit Removal and Installation 7A-7
Blower Speed Selector Inspection 7A-8
Air Intake Switch Inspection 7A-9
Air Intake Control Actuator Removal and Installation 7A-9
Air Intake Control Actuator Inspection 7A-9
Center Ventilation Louver Removal and Installation 7A-10
Side Ventilation Louver Removal and Installation 7A-10
Air Filter Removal and Installation 7A-11
Air Filter Cleaning 7A-11

Air Conditioning System 7B-1
Precautions 7B-1
A/C System Caution 7B-1
Precautions on Servicing A/C System 7B-1
General Description 7B-3
Refrigerant Type Construction 7B-3
Sub-Cool A/C System Description 7B-3
Schematic and Routing Diagram 7B-5
Major Components of A/C System 7B-5
A/C System Wiring Diagram 7B-6
Diagnostic Information and Procedures 7B-7
A/C System Symptom Diagnosis 7B-7
Abnormal Noise Symptom Diagnosis of A/C System 7B-9
A/C System Performance Inspection 7B-10
A/C System Inspection at ECM 7B-15
Repair Instructions 7B-17
Operation Procedure for Refrigerant Charge 7B-17
Condenser Assembly On-Vehicle Inspection 7B-22
Condenser Assembly Removal and Installation 7B-22
Desiccant Removal and Installation 7B-23
HVAC Unit Components 7B-24
HVAC Unit Removal and Installation 7B-25
Evaporator Inspection 7B-25
Evaporator Thermistor (Evaporator Temperature Sensor) Removal and Installation 7B-25
Evaporator Thermistor (Evaporator Temperature Sensor) Inspection 7B-26
Expansion Valve Removal and Installation 7B-26
Expansion Valve Inspection 7B-27
A/C Refrigerant Pressure Sensor and Its Circuit Inspection 7B-27
A/C Refrigerant Pressure Sensor Removal and Installation 7B-27
A/C Switch Inspection 7B-27
Compressor Relay Inspection 7B-28
Compressor Drive Belt Inspection and Adjustment 7B-28
Compressor Drive Belt Removal and Installation 7B-29
Compressor Assembly Removal and Installation 7B-29
Compressor Assembly Components 7B-30
Magnet Clutch Inspection 7B-30
Magnet Clutch Removal and Installation 7B-30
Relief Valve Inspection 7B-32
Relief Valve Removal and Installation 7B-32
Specifications 7B-33
Tightening Torque Specifications 7B-33
Special Tools and Equipment 7B-34
Recommended Service Material 7B-34
Special Tool 7B-34

Precautions

Precautions

Precautions on HVAC

S4RS0A7000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

A/C System Caution
Refer to “A/C System Caution: in Section 7B”.

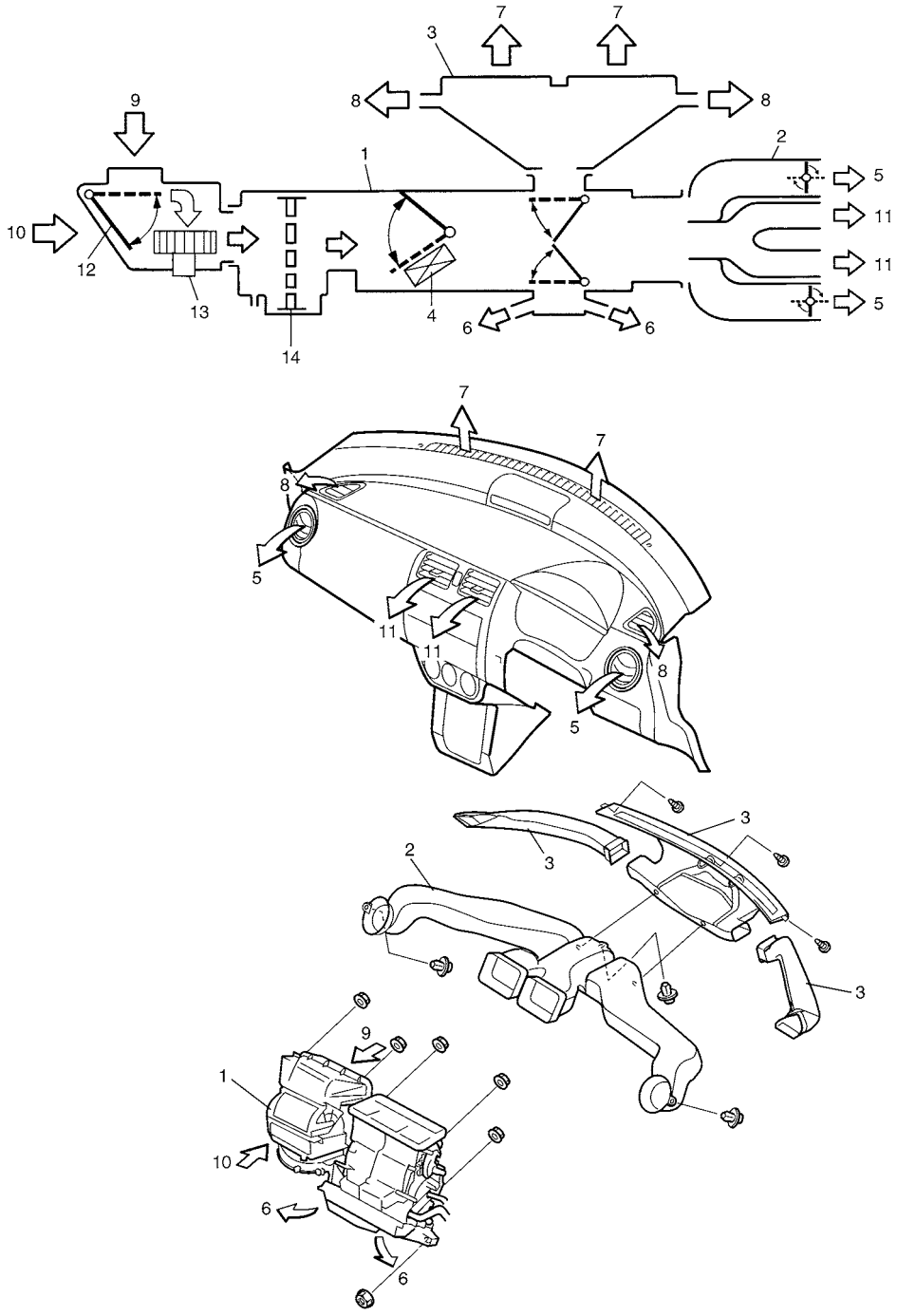
Precautions on Servicing A/C System
Refer to “Precautions on Servicing A/C System: in Section 7B”.

Heater and Ventilation

General Description

Heater and Ventilation Construction

S4RS0A7101001



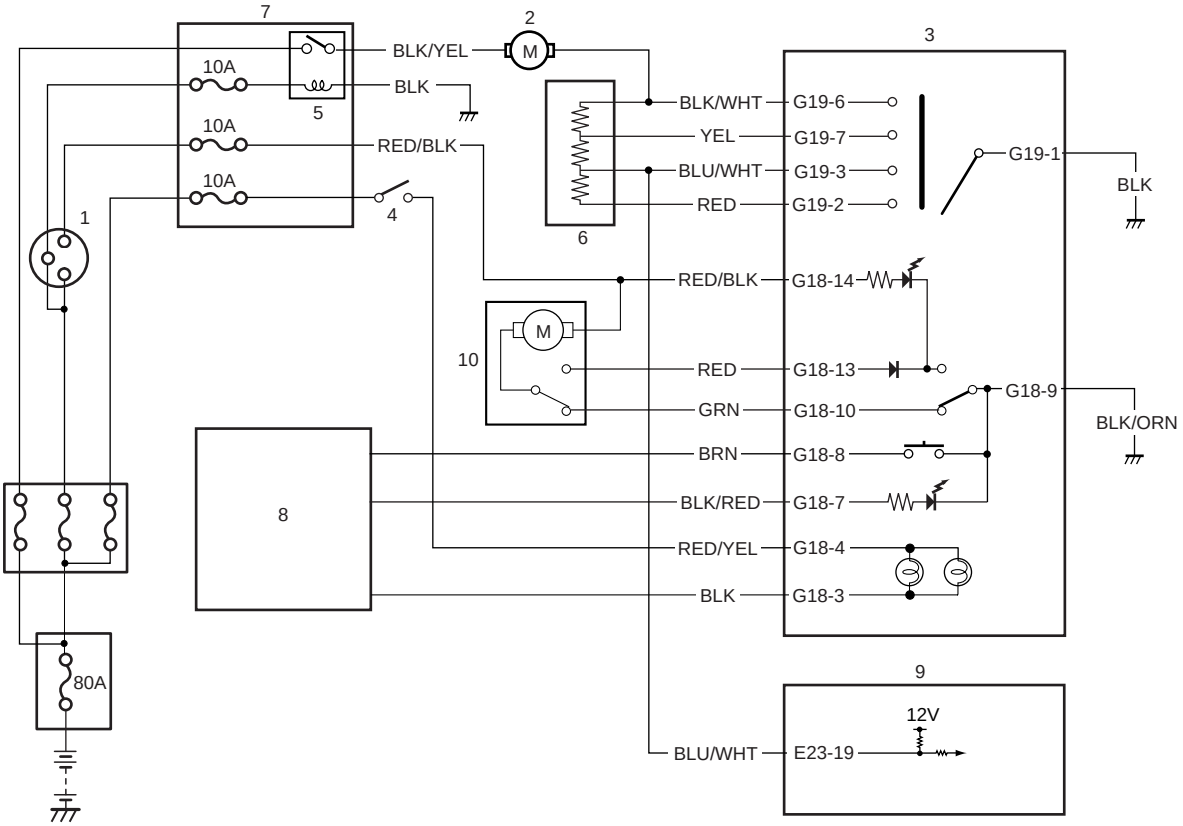
I4RS0A710001-

1. HVAC unit	6. Foot air	11. Center ventilation air
2. Ventilator duct	7. Front defroster air	12. Air intake door
3. Defroster nozzle	8. Side defroster air	13. Blower motor
4. Heater core	9. Fresh air	14. Resistance board
5. Side ventilation air	10. Recirculation air	

Schematic and Routing Diagram

Heater and Ventilation Wiring Circuit Diagram

S4RS0A7102001



I4RS0A710002-

1. Ignition switch	4. Lighting switch	7. Junction block assembly	10. Air intake control actuator
2. Blower motor	5. Blower motor relay	8. BCM	
3. HVAC control unit	6. Blower motor resistor	9. ECM	

Diagnostic Information and Procedures

Heater and Ventilation Symptom Diagnosis

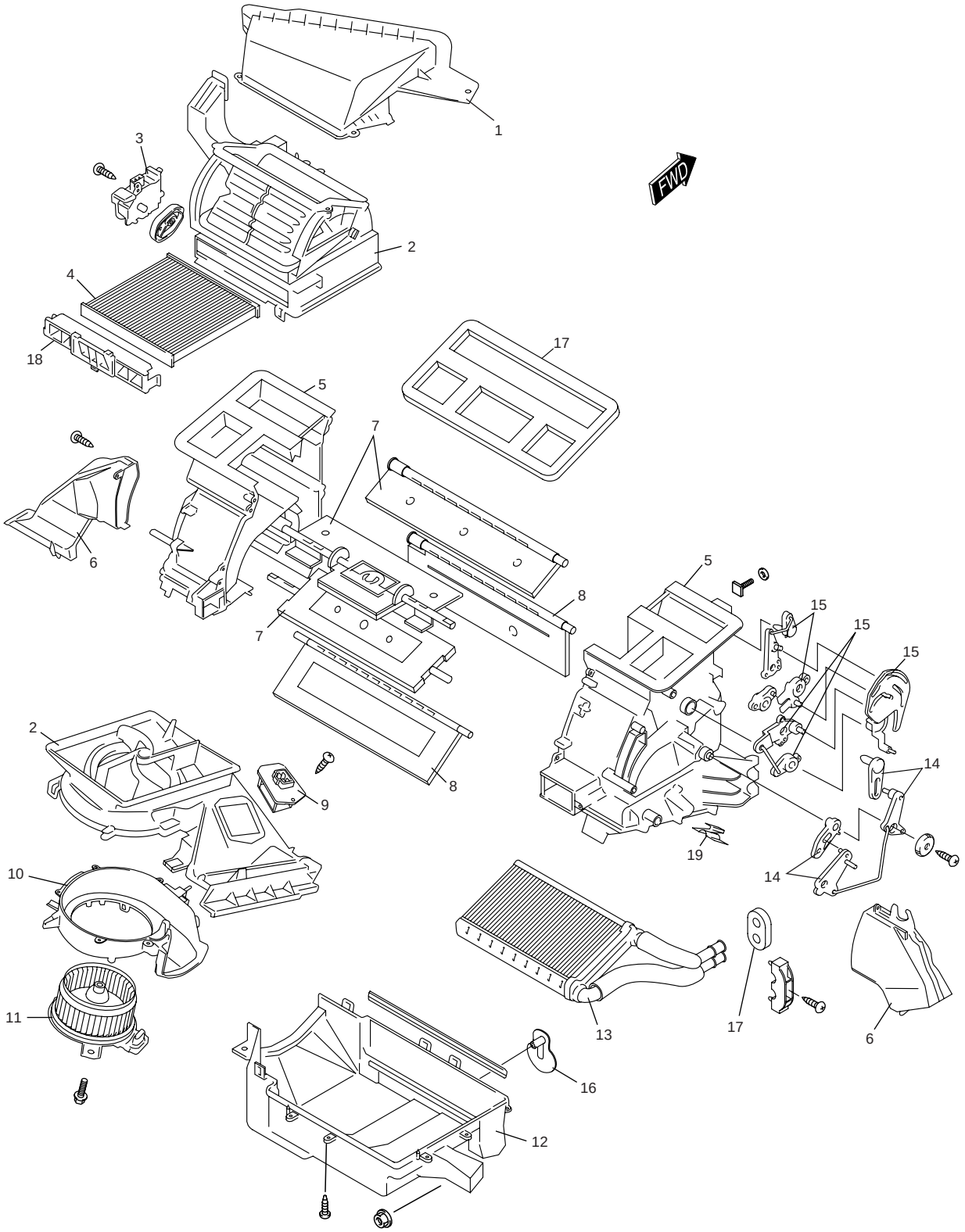
S4RS0A7104001

Condition	Possible cause	Correction / Reference Item
Blower motor does not operate with blower speed selector ON.	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Blower motor resistor faulty	*Check blower motor resistor referring to "Blower Motor Resistor Inspection: ".*
	Blower speed selector faulty	*Check blower speed selector referring to "Blower Speed Selector Inspection: ".*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: ".*
	Wiring or grounding faulty	*Repair as necessary.*
Incorrect temperature output	Temperature control cable broken or bent	*Check temperature control cable.*
	Temperature control lever faulty	*Check temperature control lever.*
	Incorrect installation of temperature control cable	*Check position and adjust it as necessary.*
	Temperature control door assembly broken	*Repair temperature control door assembly.*
	Air ducts clogged	*Repair air ducts.*
	Heater core leaked or clogged	*Replace heater core.*
	Heater hoses leaked or clogged	*Replace heater hoses.*
	Thermostat faulty	*Check thermostat referring to "Thermostat Inspection: in Section 1F".*
Air outlet port does not change or does not agree with airflow selector's position even if airflow selector is changed.	Airflow control cable broken or bent	*Check airflow control cable.*
	Airflow control lever faulty	*Check airflow control lever.*
	Incorrect installation of temperature control cable	*Check position and adjust it as necessary.*
	Airflow control door assembly broken	*Repair airflow control door assembly.*
	Air ducts leaked or clogged	*Repair air ducts.*
Air intake door does not change even if air intake mode is changed.	Air intake door broken	*Repair air intake door.*
	Air intake control actuator faulty	*Check air intake control actuator referring to "Air Intake Control Actuator Inspection: ".*
	Air intake switch faulty	*Check air intake switch referring to "Air Intake Switch Inspection: ".*
	Wiring or grounding faulty	*Repair as necessary.*

Repair Instructions

HVAC Unit Components

S4RS0A7106001



I4RS0A710003-

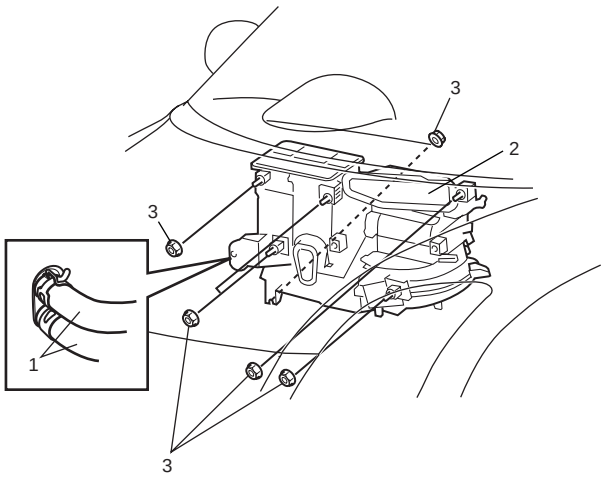
1. Fresh air inlet duct	6. Foot duct	11. Blower motor	16. Drain hose
2. Blower upper case	7. Airflow control door assembly	12. Heater unit lower case	17. Packing
3. Air intake control actuator	8. Temperature control door assembly	13. Heater core	18. Filter cover
4. Air filter	9. Blower motor resistor	14. Temperature control lever	19. Cable lock clamp
5. Heater unit upper case	10. Blower lower case	15. Airflow control lever	

HVAC Unit Removal and Installation

S4RS0A7106002

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove cowl top panel from vehicle body referring to “Cowl Top Components: in Section 9K”.
4) Drain engine coolant, and then disconnect heater hoses (1) from HVAC unit (2).
5) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation: in Section 9C”.
6) Remove nuts (3).
7) Remove HVAC unit from vehicle body.



I4RS0A710004-

Installation

Reverse removal procedure noting the following instructions.

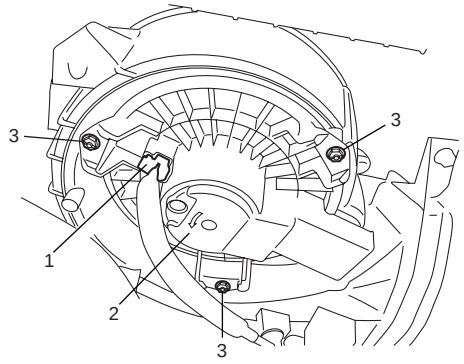
- Be careful not to catch any cable and wiring harness in inappropriate position.
- Adjust control cables of HVAC control unit referring to “HVAC Control Unit Removal and Installation: ”.
- Fill engine coolant to radiator.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Blower Motor Removal and Installation

S4RS0A7106003

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Disconnect connector (1) from blower motor (2).
4) Remove blower motor from HVAC unit by removing screws (3).



I4RS0A710005-

Installation

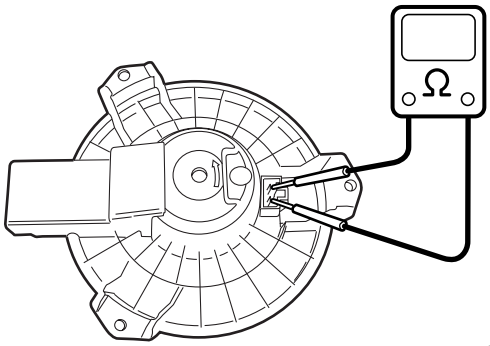
Reverse removal procedure noting the following instruction.

- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Blower Motor Inspection

S4RS0A7106004

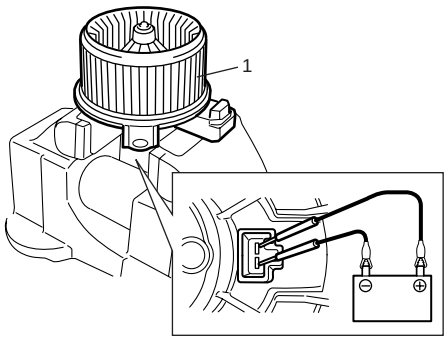
- Check for continuity between two terminals as shown. If there is no continuity, replace blower motor.



I4RS0A710006-

- Check for operation and current.
  a. Put blower motor (1) in a soft-jawed vise.
  b. Connect battery to blower motor as shown.
  c. Check if blower motor operates smoothly without noise.
  d. Check if ammeter indicates the specified current. If measured current is out of specification, replace blower motor.

  Blower motor specified current at 12 V
  16 A maximum



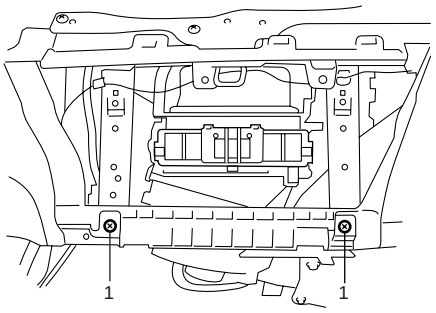
I4RS0A710007-

Blower Motor Resistor Removal and Installation

S4RS0A7106005

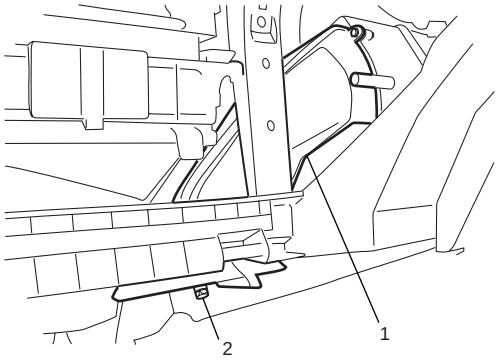
Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove glove box from instrument panel.
4) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
5) Remove bolts (1) from instrument panel.



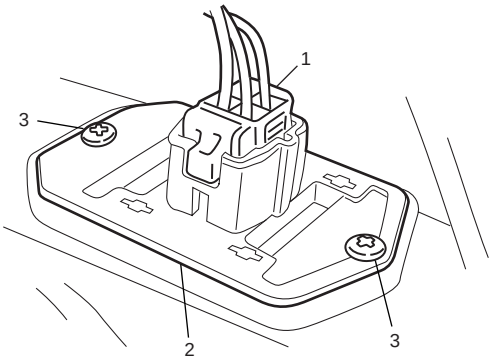
I4RS0A710008-

6) Remove foot duct (1) from HVAC unit by removing screw (2).



I4RS0A710009-

7) Remove connector (1) from blower motor resistor (2), and then remove blower motor resistor from HVAC unit by removing screws (3).



I4RS0A710010-

Installation

Reverse removal procedure noting the following instruction.

- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

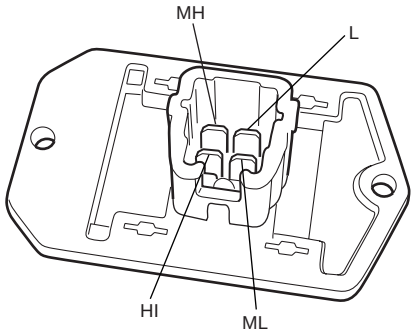
Blower Motor Resistor Inspection

S4RS0A7106006

Measure each terminal-to-terminal resistance. If measured resistance is out of specification, replace blower motor resistor.

Blower motor resistor resistance

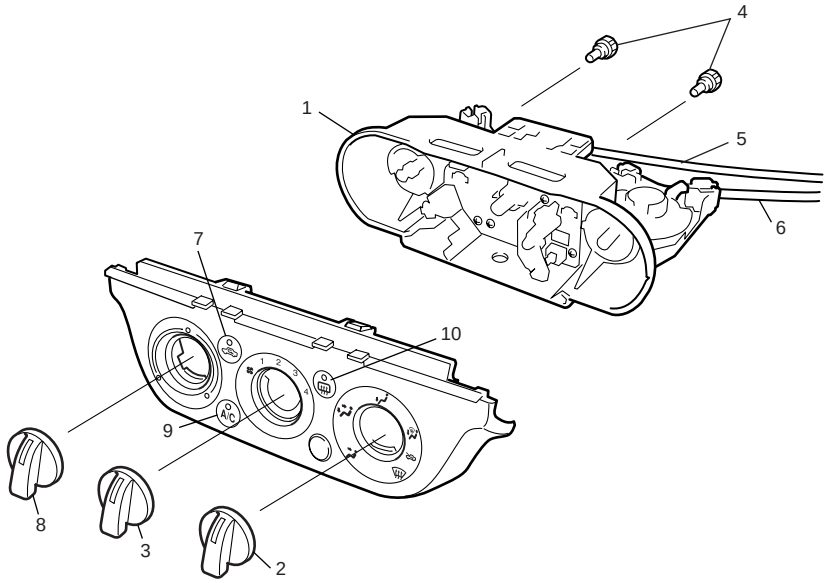
“H” – “MH”: Approximately 0.6 Ω at 20 – 25 °C (68 – 77 °F)
“MH” – “ML”: Approximately 1.6 Ω at 20 – 25 °C (68 – 77 °F)
“ML” – “L”: Approximately 3.4 Ω at 20 – 25 °C (68 – 77 °F)



I4RS0A710011-

HVAC Control Unit Components

S4RS0A7106008



I4RS0A710012-

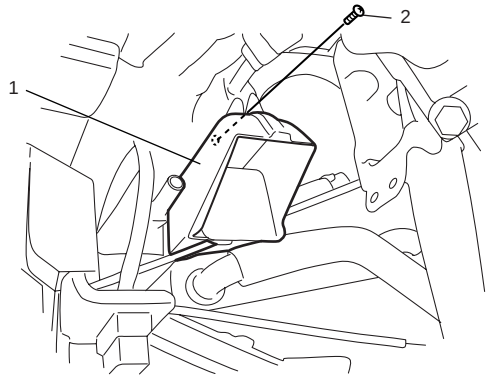
1. Heater control body assembly	4. Bulb	7. Air intake switch	10. Rear defogger switch
2. Airflow selector	5. Temperature control cable	8. Temperature selector	
3. Blower speed selector	6. Airflow control cable	9. A/C switch	

HVAC Control Unit Removal and Installation

S4RS0A7106010

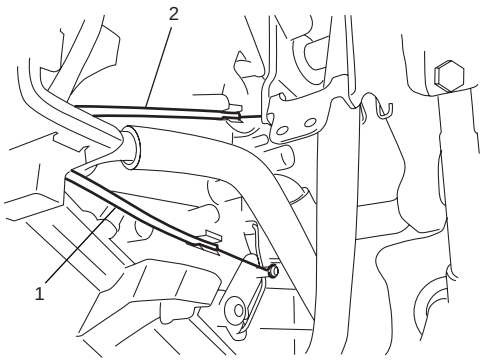
Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
4) Remove radio assembly from instrument panel referring to “Radio Assembly Removal and Installation: in Section 9C”.
5) Remove foot duct (1) from HVAC unit by removing screw (2).



I4RS0A710013-

6) Disconnect temperature control cable (1) and airflow control cable (2) from HVAC unit.

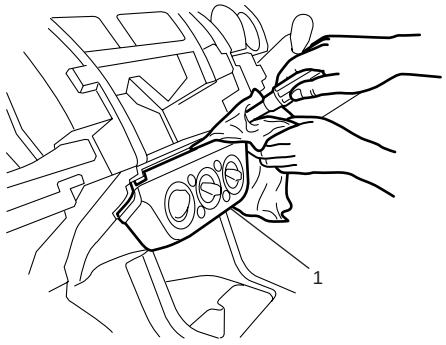


I4RS0A710014-

7) Remove two connectors from HVAC control unit.
8) Remove HVAC control unit (1) from instrument panel.

NOTE:

Be careful not to damage HVAC control unit and instrument panel by using rag.

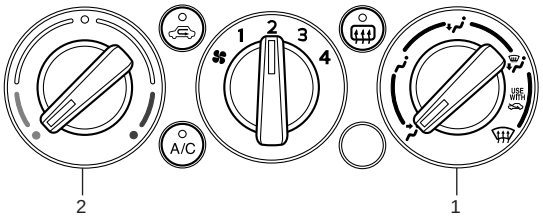


I4RS0A710015-

Installation

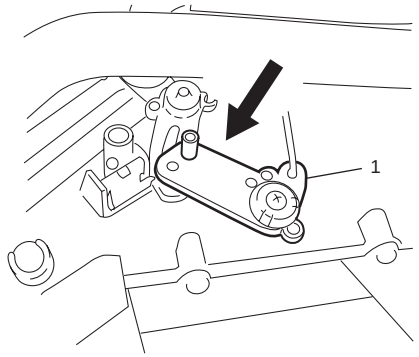
Reverse removal procedure noting the following instructions.

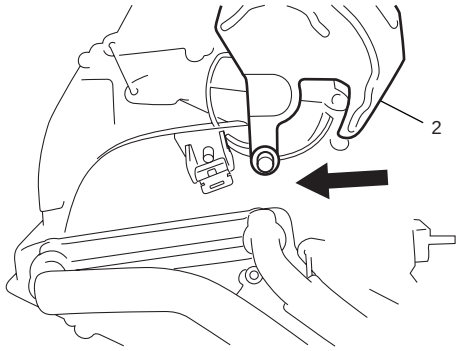
- Connect temperature control cable and airflow control cable of HVAC control unit to links of HVAC unit.
  a. Set airflow selector (1) to “VENT” position and temperature selector (2) to “MAX COOL” position.



I4RS0A710016-

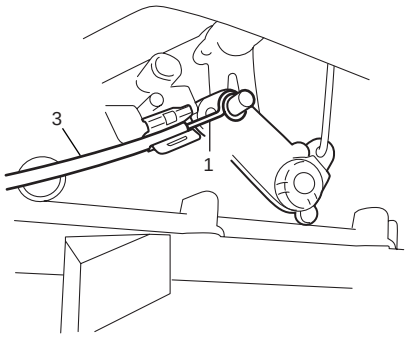
  b. Move temperature control lever (1) and airflow control plate (2) fully to the arrow direction.

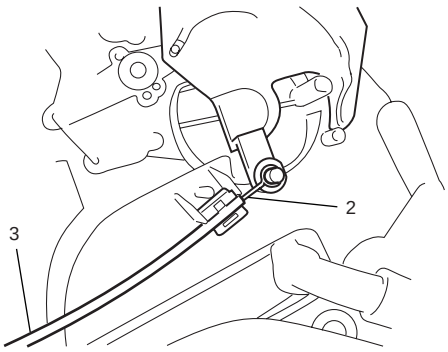




I4RS0A710017-

  c. Fix temperature control inner cable (1) to pin of temperature control lever and air flow control inner cable (2) to pin of airflow control plate, and then fix each outer cable (3) to each cable lock clamp.





I4RS0A710018-

NOTE:

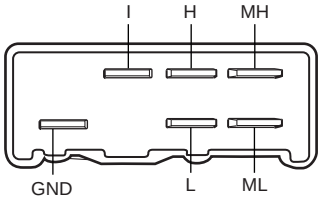
After installing control cables, make sure that control lever and plate move smoothly and stop at proper position.

- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.
- Make sure that airflow outlet changes correctly as airflow selector is changed.

Blower Speed Selector Inspection

S4RS0A7106011

Check blower speed selector for each terminal to terminal continuity. If check result does not meet the following conditions, replace HVAC control unit.



Terminal / Position	GND	I	L	ML	MH	H
OFF	○					
1	○	○	○			
2	○	○		○		
3	○	○			○	
4	○	○				○

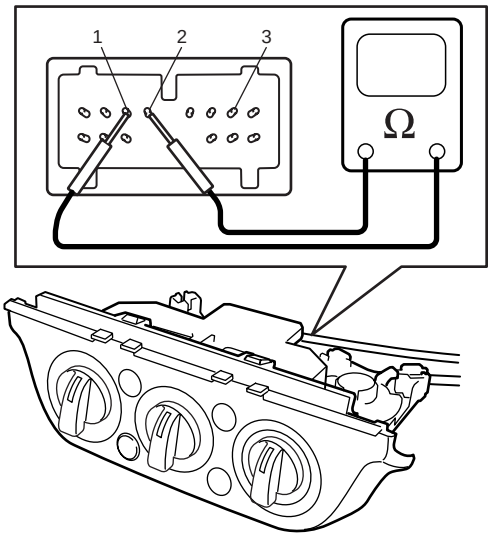
I4RS0A710019-

Air Intake Switch Inspection

S4RS0A7106018

- Check that there is continuity between terminal (1) and terminal (2) when air intake switch is at fresh position.
- Check that there is no continuity between terminal (1) and terminal (2) and there is continuity between terminal (1) and terminal (3) when air intake switch is at recirculation position.

If check result does not meet the above conditions, replace HVAC control unit.



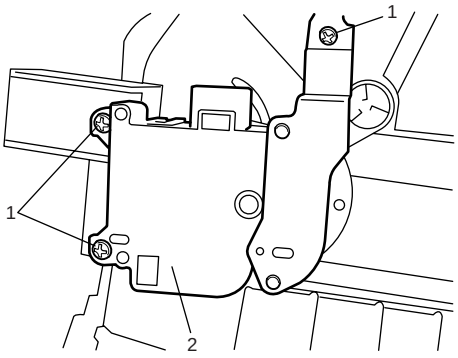
I4RS0A710020-

Air Intake Control Actuator Removal and Installation

S4RS0A7106020

Removal

1) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation: in Section 9C”.
2) Remove screws (1).
3) Remove air intake control actuator (2) from HVAC unit.

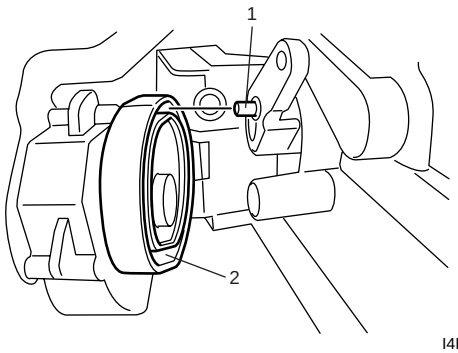


I4RS0A710021-

Installation

Reverse removal procedure noting the following instruction.

- Be sure to insert the linkage pin (1) into the groove (2) of air intake control actuator.



I4RS0A710022-

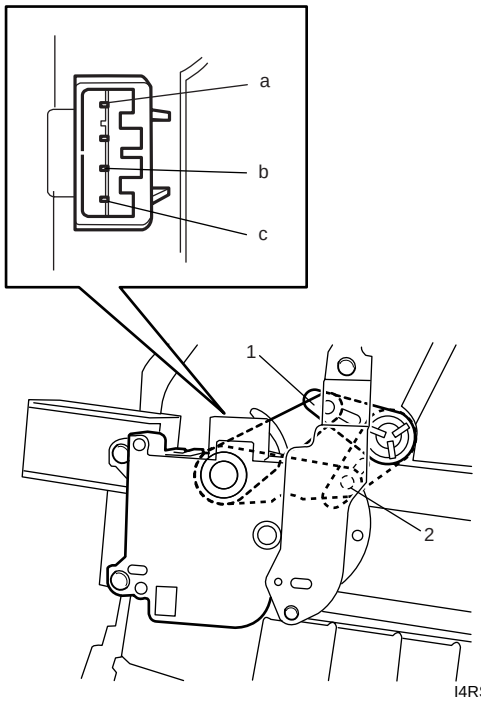
Air Intake Control Actuator Inspection

S4RS0A7106019

Check air intake control actuator as follows:

1) Using service wire, connect battery positive terminal to “a” terminal and battery negative terminal to terminal “b”. And, check if air intake selector link operates smoothly and it stops at fresh position (1).
2) Using service wire, connect battery positive terminal to “a” terminal and battery negative terminal to terminal “c”. And, check if air intake selector link operates smoothly and it stops at recirculation position (2).

If malfunction is found, replace air intake control actuator.



I4RS0A710023-

Center Ventilation Louver Removal and Installation

S4RS0A7106014

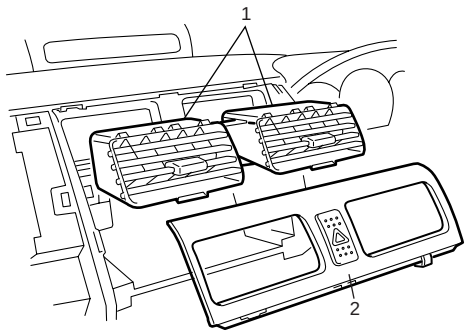
Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
4) Remove radio assembly from instrument panel referring to “Radio Assembly Removal and Installation: in Section 9C”.
5) Remove center ventilation louver (1) with garnish (2) from instrument panel, and then disconnect connector from hazard switch.

NOTE:

Garnish is fitted to instrument panel with six clips. When removing garnish from instrument panel, be careful not to break them.

6) Separate center ventilation louver and garnish.



I4RS0A710024-

Installation

Reverse removal procedure.

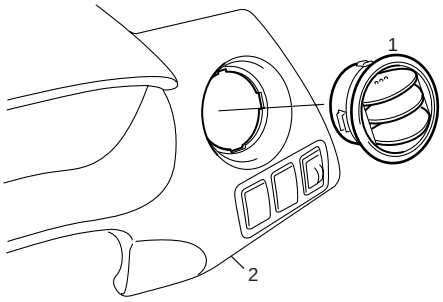
Side Ventilation Louver Removal and Installation

S4RS0A7106015

Right side ventilation louver

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove steering column hole cover from instrument panel.
4) Remove combination meter cluster panel from instrument panel, and then disconnect connector from front fog lamp switch of combination meter cluster panel.
5) Separate right side ventilation louver (1) and combination meter cluster (2).

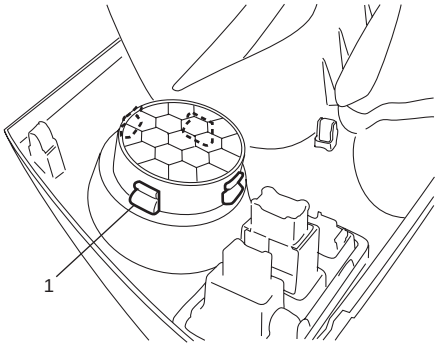


I4RS0A710025-

Installation

Reverse removal procedure noting the following instruction.

- Right side ventilation louver is fitted to combination meter cluster panel with four clips (1). When installing right side ventilation louver to combination meter cluster panel, position the smallest clip to the top.



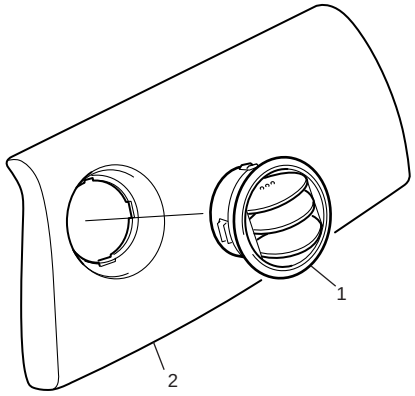
I4RS0A710026-

Left side ventilation louver

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove glove box from instrument panel.

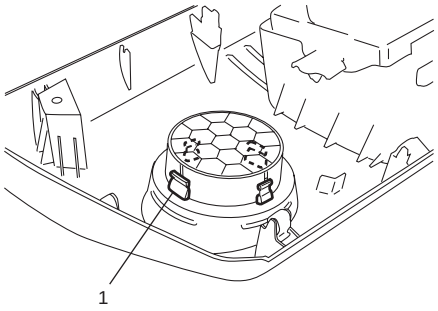
4) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
5) Separate left side ventilation louver (1) and passenger air bag module (2).



I4RS0A710027-

Installation
Reverse removal procedure noting the following instruction.

- Left side ventilation louver is fitted to passenger air bag module with four clips (1). When installing left side ventilation louver to passenger air bag module, position the smallest clip to the top.

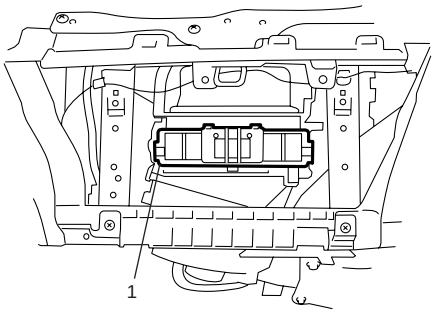


I4RS0A710028-

Air Filter Removal and Installation

S4RS0A7106023

Removal
1) Remove glove box from instrument panel.
2) Remove air filter cover (1) from HVAC unit.

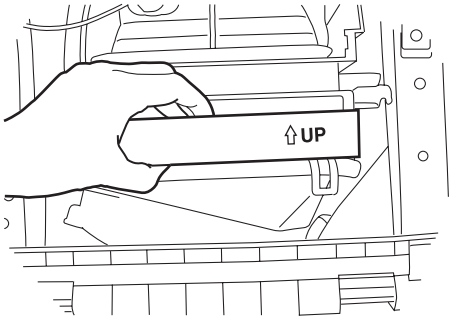


I4RS0A710029-

3) Pull out air filter from HVAC unit.

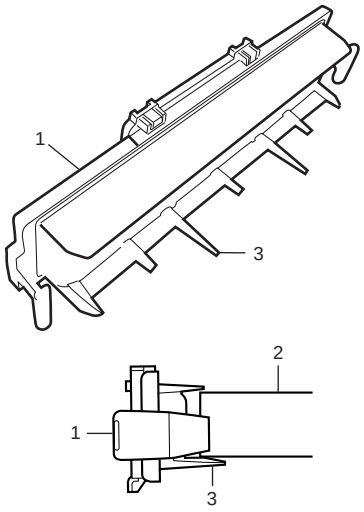
Installation
Reverse removal procedure noting the following instructions.

- Position air filter by directing its arrow mark to the upward.



I4RS0A710030-

- Fit air filter cover (1) to HVAC unit so as not to stick air filter (2) by air filter cover’s claw (3). Otherwise, air filter is deformed and loses its functionality.

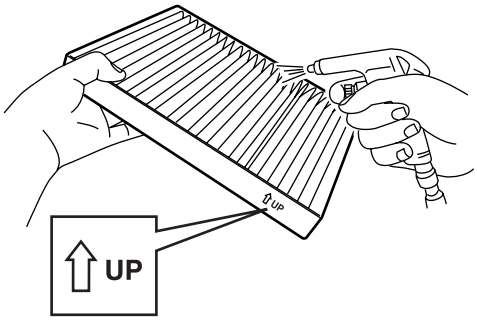


I4RS0A710031-

Air Filter Cleaning

S4RS0A7106022

Blow compressed air to the air outlet side of air filter.



I4RS0A710032-

Air Conditioning System

Precautions

A/C System Caution

S4RS0A7200001

CAUTION:

The air conditioning system of this vehicle uses refrigerant HFC-134a (R-134a).
None of refrigerant, compressor oil and component parts is interchangeable between two types of A/C: one using refrigerant HFC-134a (R-134a) and the other using refrigerant CFC-12 (R-12).
Be sure to check which refrigerant is used before any service work including inspection and maintenance. For identification between these two types, refer to "Refrigerant Type Construction: ".
When replenishing or changing refrigerant and compressor oil and when replacing parts, make sure that the material or the part to be used is appropriate to the A/C installed in the vehicle being serviced.
Use of incorrect one will result in leakage of refrigerant, damage in parts or other faulty condition.

Precautions on Servicing A/C System

S4RS0A7200004

WARNING:

Should refrigerant HFC-134a (R-134a) is exposed to your eye(s), consult a doctor immediately.

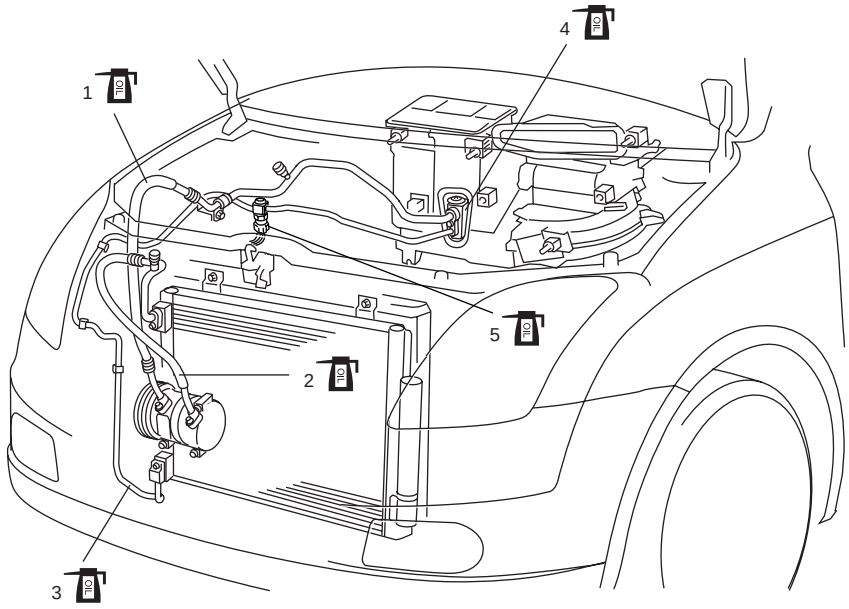
- **Do not use your hand to rub affected eye(s). Instead, use fresh cold water to splash it over affected area to thus gradually raise its temperature above the freezing point.**
- **Obtain proper treatment as soon as possible from a doctor or eye specialist. Should liquid refrigerant HFC-134a (R-134a) is exposed to your skin, such affected part should be treated in the same manner as when skin is frostbitten or frozen.**

Handling Refrigerant HFC-134a (R-134a)

- Always wear goggles to protect your eyes.
- Avoid direct contact to liquid refrigerant.
- Do not heat refrigerant container higher than 40 °C (104 °F).
- Do not discharge refrigerant into atmosphere.
- Do not expose bright metals to liquid refrigerant. Refrigerant combined with moisture is corrosive and tarnishes surfaces of bright metals including chrome.

Refrigerant Line

: Compressor oil 99000–99015–00A



I4RS0A720001-

1. Suction hose : Apply compressor oil (refrigerant oil) to O-ring.	4. Expansion valve : Apply compressor oil (refrigerant oil) to O-ring.
2. Discharge hose : Apply compressor oil (refrigerant oil) to O-ring.	5. A/C refrigerant pressure sensor : Apply compressor oil (refrigerant oil) to O-ring.
3. Liquid pipe : Apply compressor oil (refrigerant oil) to O-ring.	

- Never use heat for bending pipes. When bending a pipe, try to make its bending angle as smooth as possible.
- Keep internal parts of air conditioning free from moisture and dirt. When disconnecting any line from system, install a blind plug or cap to the fitting immediately.
- When connecting hoses and pipes, apply a few drops of compressor oil (refrigerant oil) to O-ring.
- When tightening or loosening a fitting, use two wrenches, one for turning and the other for support.
- Route drain hose so that drained water does not make any contact to vehicle components.
- If pipes or hoses are replaced, replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.

Refrigerant Recovery

When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment because discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environments.

Refrigerant Charge

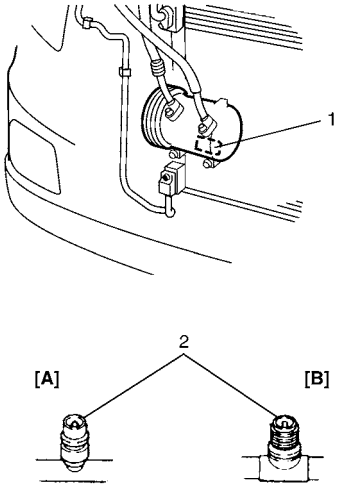
After performing compressor oil replenishment and evacuation, charge a proper amount of refrigerant to A/C system referring to “Charge” in “Operation Procedure for Refrigerant Charge: ”.

General Description

Refrigerant Type Construction

S4RS0A7201002

Whether the A/C system in the vehicle uses HFC-134a (R-134a) or CFC-12 (R-12) is indicated on label (1) on the compressor. Also, it can be checked by the shape of the service (charge) valve (2).



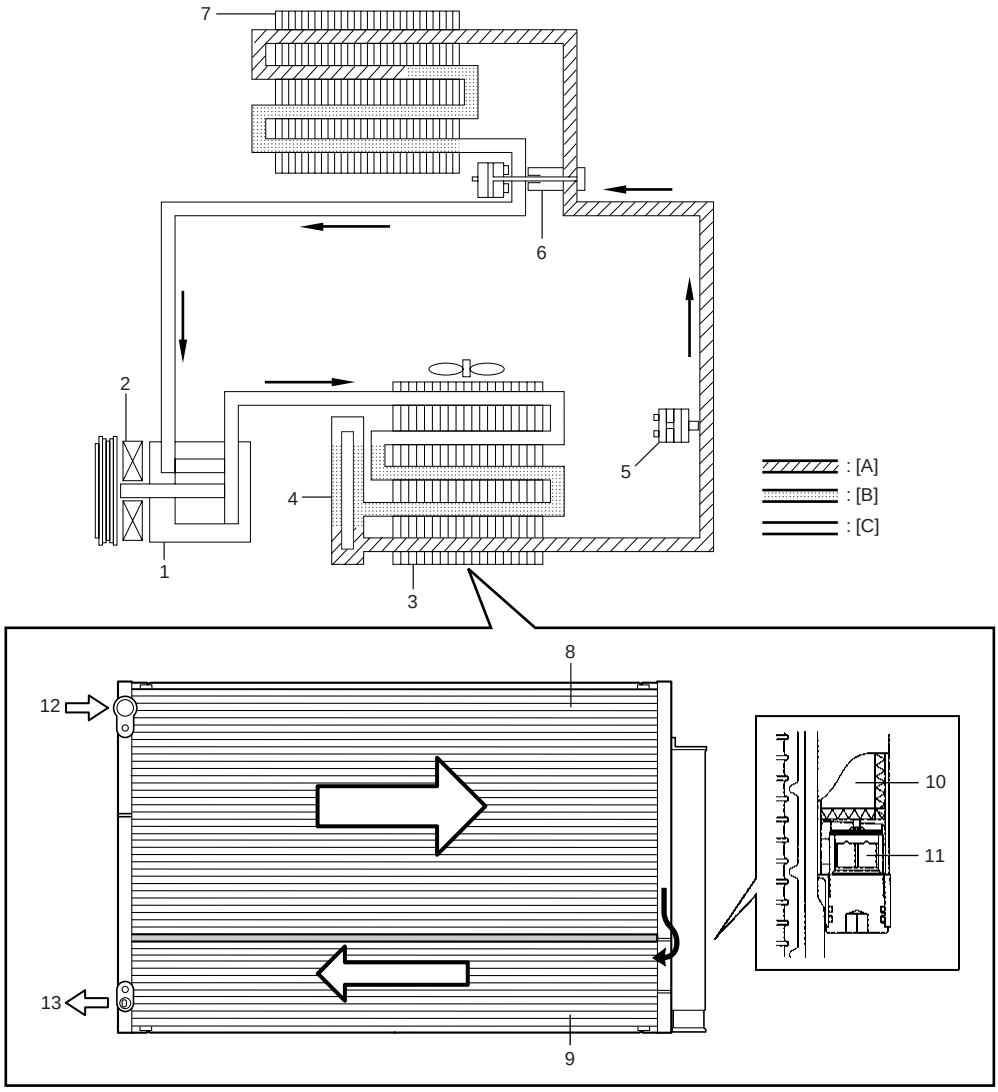
I4RS0A720002-

[A]: HFC-134a (R-134a)
[B]: CFC-12 (R-12)

Sub-Cool A/C System Description

S4RS0A7201004

In the sub-cool A/C system (condenser integrated with receiver / dryer), the inside of the condenser is divided into the condensation part and the sub-cooler part, and the receiver / dryer is located between those. In the receiver / dryer, the refrigerant is separated into the vapor refrigerant and the liquid refrigerant. Only the liquid refrigerant is delivered to the sub-cooler part of the condenser. The refrigerant is supercooled by the sub-cooler part of the condenser.



I4RS0A720051-

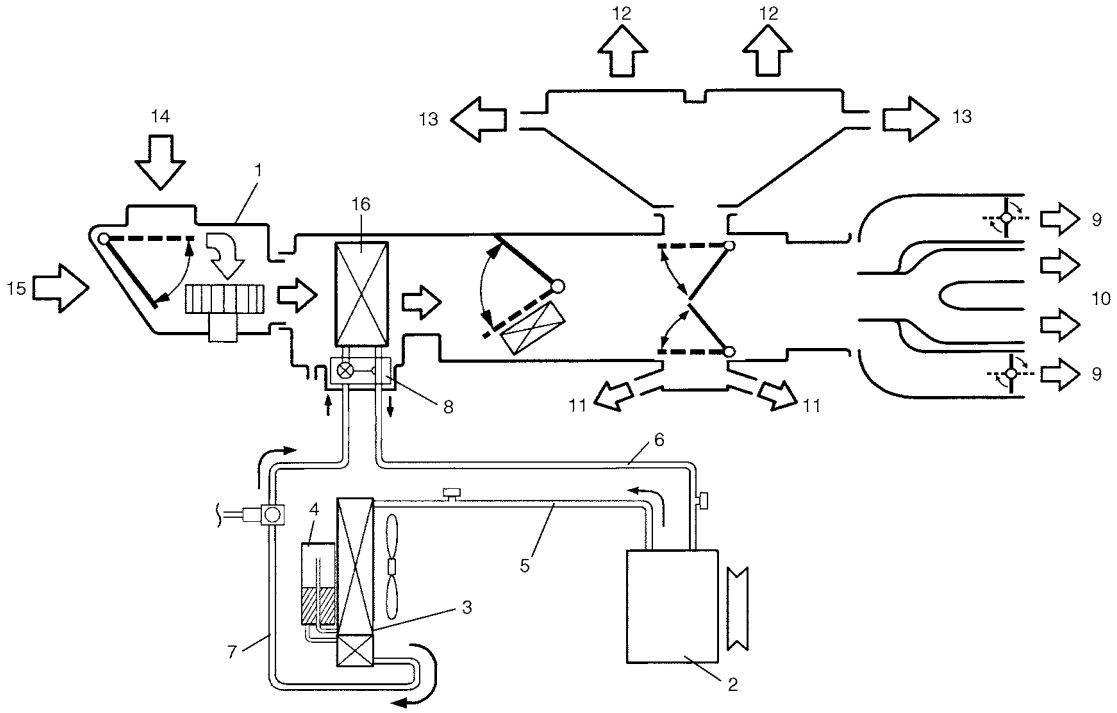
[A]: Liquid	2. Magnet clutch	6. Expansion valve	10. Desiccant
[B]: Vapor	3. Condenser	7. A/C evaporator	11. Filter
[C]: Superheated vapor	4. Receiver/dryer	8. Condensation part	12. Vapor refrigerant
1. Compressor	5. Refrigerant pressure switch	9. Sub-cooler part	13. Liquid refrigerant

Schematic and Routing Diagram

Major Components of A/C System

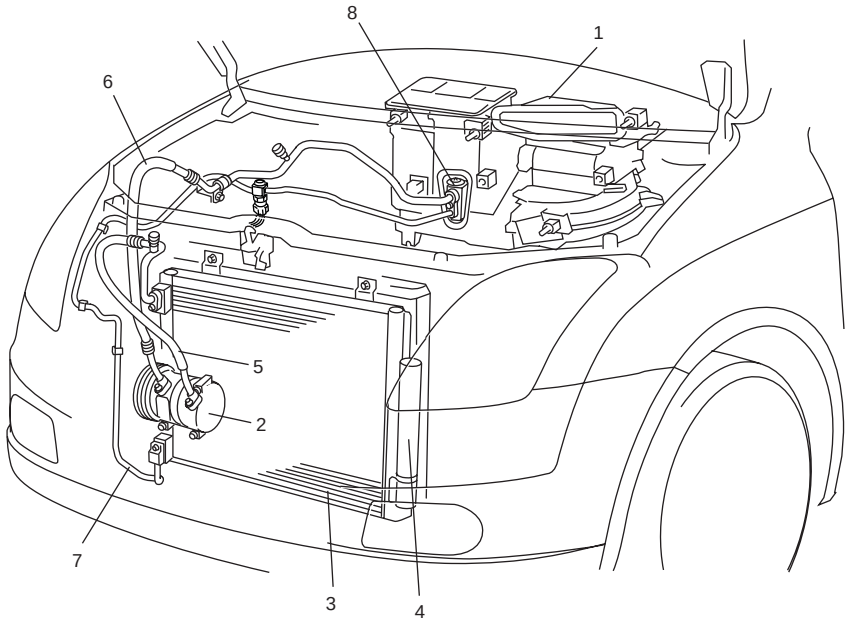
S4RS0A7202001

Airflow diagram



I4RS0A720003-

Major components of A/C system

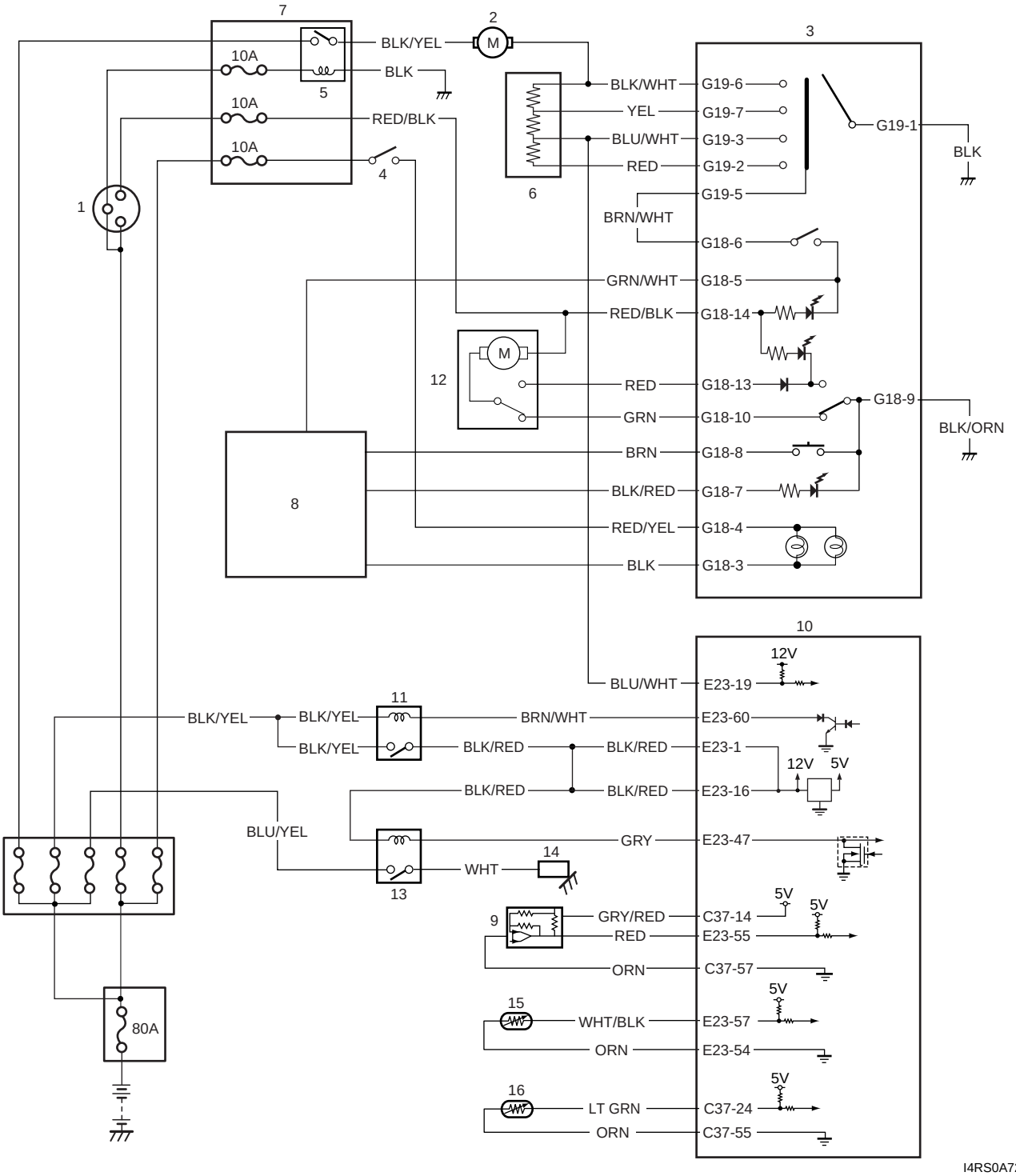


I4RS0A720004-

1. HVAC	5. Discharge hose	9. Side ventilation air	13. Side defroster air
2. Compressor	6. Suction hose	10. Center ventilation air	14. Fresh air
3. Condenser assembly	7. Liquid pipe	11. Foot air	15. Recirculation air
4. Receiver/dryer	8. Expansion valve	12. Front defroster air	16. Evaporator

A/C System Wiring Diagram

S4RS0A7202002



I4RS0A720005-

1. Ignition switch	5. Blower motor relay	9. A/C refrigerant pressure sensor	13. Compressor relay
2. Blower motor	6. Blower motor resistor	10. ECM	14. Compressor
3. HVAC control unit	7. Junction block assembly	11. Main relay	15. Evaporator thermistor (evaporator temperature sensor)
4. Lighting switch	8. BCM	12. Air intake control actuator	16. ECT sensor

Diagnostic Information and Procedures

A/C System Symptom Diagnosis

S4RS0A7204001

Condition	Possible cause	Correction / Reference Item
No cool air comes out (A/C system does not operate)	No refrigerant	*Perform recovery, evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".*
	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	A/C switch faulty	*Check A/C switch referring to "A/C Switch Inspection: ".*
	Blower speed selector faulty	*Check blower speed selector referring to "Blower Speed Selector Inspection: in Section 7A".*
	Evaporator thermistor (Evaporator temperature sensor) faulty	*Check A/C evaporator temperature sensor referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*
	A/C refrigerant pressure sensor faulty	*Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor Removal and Installation: ".*
	Wiring or grounding faulty	*Repair as necessary.*
	ECM and/or its circuit faulty	*Check ECM and/or its circuit referring to "A/C System Inspection at ECM: ".*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection: ".*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Compressor faulty	*Check compressor.*
	Compressor relay faulty	*Check compressor relay referring to "Compressor Relay Inspection: ".*
No cool air comes out (radiator cooling fan motor does not operate)	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Wiring or grounding faulty	*Repair as necessary.*
	Radiator cooling fan motor relay faulty	*Check radiator cooling fan motor relay referring to "Radiator Cooling Fan Relay Inspection: in Section 1F".*
	Radiator cooling fan motor faulty	*Check radiator cooling fan motor referring to "Radiator Cooling Fan Removal and Installation: in Section 1F".*
	ECM and/or its circuit faulty	*Check ECM and/or its circuit referring to "A/C System Inspection at ECM: ".*
No cool air comes out (Blower motor does not operate)	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Blower motor resistor faulty	*Check blower motor resistor referring to "Blower Motor Resistor Inspection: in Section 7A".*
	Blower speed selector faulty	*Check blower speed selector referring to "Blower Speed Selector Inspection: in Section 7A".*
	Wiring or grounding faulty	*Repair as necessary.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: in Section 7A".*

Condition	Possible cause	Correction / Reference Item
Cool air does not come out or insufficient cooling (A/C system normal operation)	Insufficient or excessive charge of refrigerant	*Check the amount of refrigerant and system for leaks.*
	Condenser clogged	*Check condenser referring to "Condenser Assembly On-Vehicle Inspection: ".*
	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Inspection: " and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*
	A/C evaporator temperature sensor faulty	*Check A/C evaporator temperature sensor referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*
	Expansion valve faulty	*Check expansion valve referring to "Expansion Valve Inspection: ".*
	Desiccant clogged	*Check desiccant.*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection: ".*
	Compressor faulty	*Check compressor.*
	Air in A/C system	*Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".*
	Air leaking from HVAC unit or air duct	*Repair as necessary.*
	Heater and ventilation system faulty	*Check HVAC unit.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: in Section 7A".*
	Excessive compressor oil in A/C system	*Drain excessive compressor oil from A/C system circuit and compressor.*
Cool air does not come out only intermittently	Wiring connection faulty	*Repair as necessary.*
	Expansion valve faulty	*Check expansion valve referring to "Expansion Valve Inspection: ".*
	Excessive moisture in A/C system	*Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection: ".*
	Excessive amount of refrigerant	*Check the amount of refrigerant.*
Cool air comes out only at high speed	Condenser clogged	*Check condenser referring to "Condenser Assembly On-Vehicle Inspection: ".*
	Insufficient charge of refrigerant	*Check the amount of refrigerant and system for leaks.*
	Air in A/C system	*Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Compressor faulty	*Check compressor.*
Cool air does not come out only at high speed	Excessive amount of refrigerant	*Check the amount of refrigerant.*
	A/C evaporator frosted	*Check A/C evaporator and evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Inspection: " and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*

Condition	Possible cause	Correction / Reference Item
Insufficient airflow of cooled air	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Inspection: " and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: ".*
	Air leaking from HVAC unit or air duct	*Repair as necessary.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection: in Section 7A".*
	Wiring or grounding faulty	*Repair as necessary.*

Abnormal Noise Symptom Diagnosis of A/C System

S4RS0A7204002

Abnormal Noise from Compressor

Condition	Possible cause	Correction / Reference Item
During compressor operation, a rumbling noise is heard proportional to engine revolutions	Inadequate clearance in scroll area	*Replace compressor.*
A loud noise is heard at a certain rpm, disproportionately to engine revolution	Loose or faulty compressor drive belt	*Adjust drive belt tension or replace drive belt.*
	Loose compressor mounting bolts	*Retighten mounting bolts.*
A loud rattle is heard at low engine rpm	Loose compressor clutch plate bolt	*Retighten clutch plate bolt.* *Replace compressor if it was operated in this condition for a long time.*

Abnormal Noise from Magnetic Clutch

Condition	Possible cause	Correction / Reference Item
A rumbling noise is heard when compressor is not in operation	Worn or damaged bearings	*Replace magnet clutch assembly.*
A chattering noise is heard when compressor is in operation	Faulty magnet clutch clearance (excessive clearance)	*Adjust magnet clutch clearance.*
	Worn magnet clutch friction surface	*Replace magnet clutch assembly.*
	Compressor oil leaked from shaft seal, contaminating the friction surface	*Replace compressor body assembly.*

Abnormal Noise from Tubing

Condition	Possible cause	Correction / Reference Item
A droning noise is heard from inside of the vehicle, but not particularly noticeable in engine compartment	Faulty tubing clamps	*Reposition clamps or increase the number of clamps.*
	Resonance caused by pulsation from variations in refrigerant pressure	*Attach a silencer to tubing, or modify its position and length.*

Abnormal Noise from Condenser Assembly

Condition	Possible cause	Correction / Reference Item
Considerable vibration in condenser assembly	Resonance from condenser assembly bracket and body	*Firmly insert a silencer between condenser assembly bracket and body.*

Abnormal Noise from Crankshaft Pulley

Condition	Possible cause	Correction / Reference Item
A large rattling noise is heard at idle or sudden acceleration	Loosen crankshaft pulley bolt	*Retighten bolt.*

Abnormal Noise from Tension Pulley

Condition	Possible cause	Correction / Reference Item
Clattering noise is heard from pulley	Worn or damaged bearing	*Replace tension pulley.*
Pulley cranks upon contact	Cracked or loose bracket	*Replace or retighten bracket.*

Abnormal Noise from A/C Evaporator

Condition	Possible cause	Correction / Reference Item
Whistling sound is heard from A/C evaporator	Depending on the combination of the interior / exterior temperatures, engine rpm and refrigerant pressure, the refrigerant flowing out of the expansion valve may, under certain conditions, make a whistling sound	*At times, slightly decreasing refrigerant volume may stop this noise.* *Inspect expansion valve and replace if faulty.*

Abnormal Noise from Blower Motor

Condition	Possible cause	Correction / Reference Item
Blower motor emits a chirping sound in proportion to its speed of rotation	Worn or damaged motor brushes or commutator	*Replace blower motor.*
Fluttering noise or large droning noise is heard from blower motor	Leaves or other debris introduced from fresh air inlet to blower motor	*Remove debris and make sure that the screen at fresh air inlet is intact.*

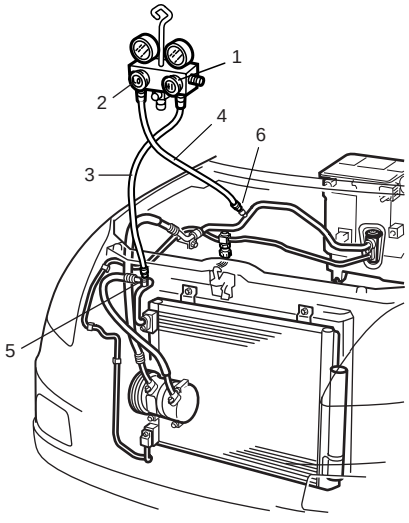
A/C System Performance Inspection

S4RS0A7204003

1) Confirm that vehicle and environmental conditions are as follows.
   - Vehicle is put indoors.
   - Ambient temperature is within 25 – 35 °C (77 – 95 °F).
   - Relative humidity is within 30 – 70%.
   - There is no wind indoors.
   - HVAC unit is normal.
   - Blower motor is normal.
   - There is no air leakage from air ducts.
   - Condenser fins are clean.
   - Are filter is not clogged with dirt and dust.
   - Battery voltage is about 12 V.
   - Radiator cooling fan operates normally.
2) Make sure that high pressure valve (1) and low pressure valve (2) of manifold gauge are firmly closed.
3) Connect high pressure charging hose (3) to high pressure service valve (5) on vehicle and low pressure charging hose (4) to low pressure service valve (6).
4) Bleed the air in charging hoses (3) and (4) by loosening their nuts respectively utilizing the refrigerant pressure. When a hissing sound is heard, immediately tighten nut.

CAUTION:

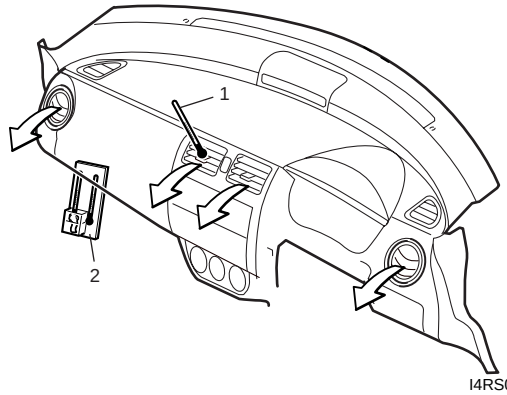
Do not connect high and low pressure charging hoses in reverse.



I4RS0A720006-

5) Warm up engine to the normal operating temperature and keep it at the specified idle speed.
6) Turn A/C switch ON, set blower speed selector at maximum speed position, temperature selector at maximum cold position, airflow selector at face position, and air intake switch at recirculation position. (Confirm that A/C compressor and condenser fans are working.)
7) Wait for ten minutes to stabilize the A/C operation.

8) Open front windows, front doors and engine food.
9) With about 20 mm (0.8 in.) of dry bulb thermometer (1) put right in front of center ventilation louver and a wet and dry bulb thermometer (2) near air inlet of HVAC unit.



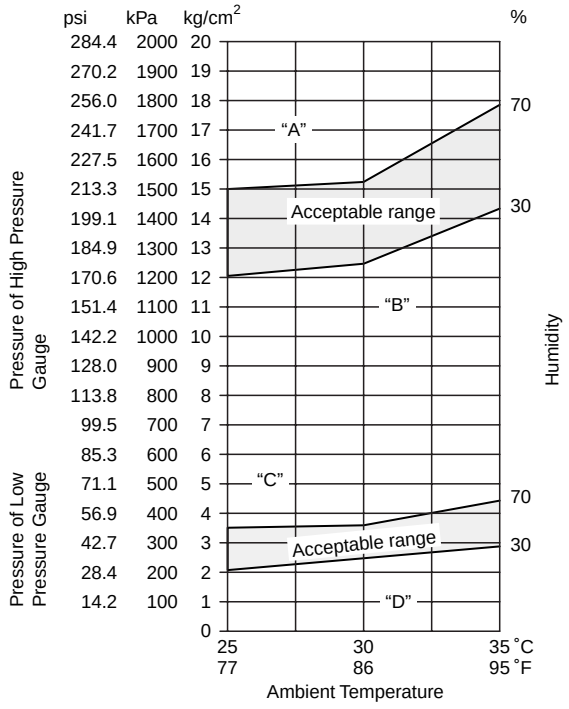
I4RS0A720007-

10) Check for each pressure of low side and high side if it is within shaded range of graph. If each gauge reading is out of specified pressure, correct defective part referring to the following table.

NOTE:

Pressure registered on gauge varies with ambient temperature. Therefore, use the graphs when determining if pressures are normal or not.

Low side and high side pressure example, Gauges should read as follows when ambient temperature is 30 °C (86 °F)
Pressure on high pressure gauge (HI): 1240 – 1520 kPa (12.4 – 15.2 kg/cm²)
Pressure on low pressure gauge (LO): 250 – 360 kPa (2.5 – 3.6 kg/cm²)



I4RS0A720008-

High pressure gauge

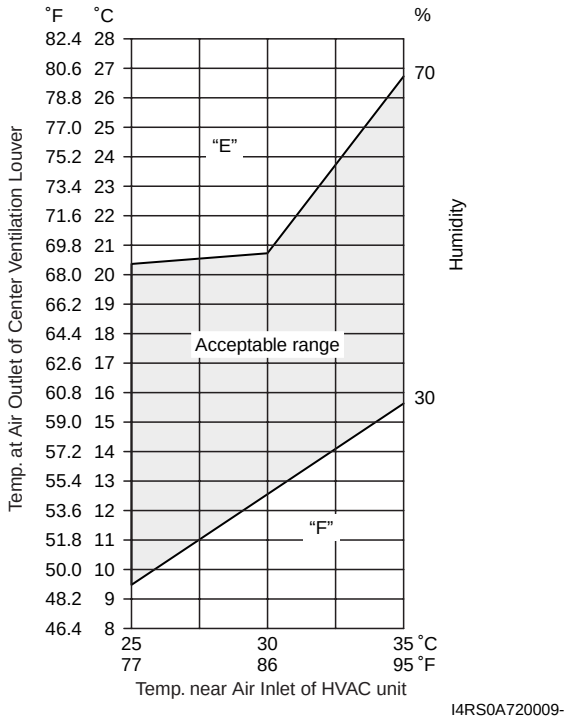
Condition	Possible cause	Correction
Pressure is higher than acceptable range (“A” area)	Refrigerant overcharged	Recharge.
	Expansion valve frozen or clogged	Check expansion valve.
	Clogged refrigerant passage of high pressure side	Clean or replace.
	Radiator cooling fan malfunction (Insufficient cooling of condenser)	Check radiator cooling fan.
	Dirty or bent condenser fins (Insufficient cooling of condenser)	Clean or repair.
	Compressor malfunction (Insufficient oil etc.)	Check compressor.
	Engine overheat	Check engine cooling system referring to “Engine Cooling Symptom Diagnosis: in Section 1F”.
Pressure is lower than acceptable range (“B” area)	Insufficient refrigerant (Insufficient charge or leakage)	Check for leakage, repair if necessary and recharge.
	Expansion valve malfunction (valve opens too wide)	Check expansion valve.
	Compressor malfunction (Insufficient compression)	Check compressor.

Low pressure gauge

Condition	Possible cause	Correction
Pressure is higher than acceptable range (“C” area)	Expansion valve malfunction (valve opens too wide)	Check expansion valve.
	Compressor malfunction (Insufficient compression)	Check compressor.
Pressure is lower than acceptable range (“D” area)	Insufficient refrigerant (Insufficient charge or leakage)	Check for leakage, repair if necessary and recharge.
	Expansion valve malfunction (valve opens too narrow)	Check expansion valve.
	Clogged refrigerant passage (crashed pipe)	Repair or replace.

11) Check inlet port temperature-to-outlet port temperature relationship using the graph. For example, if temperature near air inlet of HVAC unit is 30 °C (86 °F) and the one at air outlet of center ventilation louver is 17 °C (62.6 °F), their crossing point is within acceptable range as shown in the graph. In this case, cooling performance is satisfactory and proper.

12) If crossing point is out of acceptable range, diagnose trouble referring to the following table.



Thermometer at center duct

Condition	Possible cause	Correction
Crossing point is higher than acceptable range ("E" area)	Insufficient or excessive charge of refrigerant	Check refrigerant pressure.
	Dirty or bent A/C evaporator fins	Clean or repair.
	Air leakage from cooling (heater) unit or air duct	Repair or replace.
	Malfunctioning, switch over function of door in cooling (heater) unit	Repair or replace.
	Compressor malfunction	Check compressor.
Crossing point is lower than acceptable range ("F" area)	Insufficient air volume from center duct (Heater blower malfunction)	Check blower motor and fan.
	Compressor malfunction	Check compressor.

NOTE:

If ambient temperature is approximately 30 °C (86 °F), it is possible to diagnose A/C system in detail referring to the following table.

Condition			Possible cause	Correction
Manifold gauge	MPa (kg/cm^2) (psi)	Detail		
Lo	Hi			
0.23 – 0.36 (2.3 – 3.6) (33 – 51)	1.24 – 1.52 (12.4 – 15.2) (176 – 216)	Normal condition	—	—
Negative pressure	0.5 – 0.6 (5 – 6) (71.2 – 85.3)	The low pressure side reads a negative pressure, and the high pressure side reads an extremely low pressure. Presence of frost around tubing to and from receiver/dryer and expansion valve.	Dust particles or water droplets are either stuck or frozen inside expansion valve, preventing the refrigerant from flowing.	Clean expansion valve. Replace it if it cannot be cleaned. Replace receiver/dryer. Evacuate the A/C system and recharge with fresh refrigerant.

Condition			Possible cause	Correction
Manifold gauge	MPa (kg/cm^2) (psi)	Detail		
Lo	Hi			
Normal: 0.23 – 0.36 (2.3 – 3.6) (33 – 51) ↑ ↓ Abnormal: Negative pressure	Normal: 1.24 – 1.52 (12.4 – 15.2) (176 – 216) ↑ ↓ Abnormal: 0.7 – 1.0 (7 – 10) (100 – 142)	During A/C operation, the low pressure side sometimes indicates negative pressure, and sometimes normal pressure. Also high pressure side reading fluctuates between the abnormal and normal pressure.	Expansion valve is frozen due to moisture in the system, and temporarily shuts off the refrigeration cycle.	Replace expansion valve. Replace desiccant. Evacuate A/C system and recharge with fresh refrigerant.
0.05 – 0.15 (0.5 – 1.5) (4.2 – 21.3)	0.7 – 1.0 (7 – 10) (100 – 142)	Both low and high pressure sides indicate low readings. Output air is slightly cold.	Insufficient refrigerant in system (Refrigerant leaking).	Using leak detector, check for leaks and repair as necessary. Recharge refrigerant to a specified amount. If the pressure reading is almost 0 when the manifold gauges are attached, check for any leaks, repair them, and evacuate the system.
0.4 – 0.6 (4 – 6) (56.9 – 85.3)		Pressure on low pressure side is high. Pressure on high pressure side is low. Both pressure becoming equal right after A/C is turned OFF.	Internal leak in compressor.	Inspect compressor and repair or replace as necessary.
0.35 – 0.45 (3.5 – 4.5) (50 – 64)	2.0 – 2.5 (20 – 25) (285 – 355)	High pressure reading on both low and high pressure sides.	Overcharged A/C system. Faulty condenser cooling operation. Faulty radiator cooling fan operation.	Adjust refrigerant to specified amount. Clean condenser. Inspect and repair radiator cooling fan.
		High pressure reading on both low and high pressure sides. Low pressure side tubing is not cold when touched.	Presence of air in A/C system (Improperly evacuated).	Replace desiccant. Inspect quantity of compressor oil and presence of contaminants in oil. Evacuate system and recharge with fresh refrigerant.
0.45 – 0.55 (4.5 – 5.5) (64 – 78)		High pressure reading on both low and high pressure sides. Large amount of frost or dew on the low pressure side tubing.	Faulty expansion valve. Refrigerant flow is not regulated properly.	Replace expansion valve.

A/C System Inspection at ECM

S4RS0A7204004

Voltage Check

ECM and its circuits can be checked at ECM wiring couplers by measuring voltage.

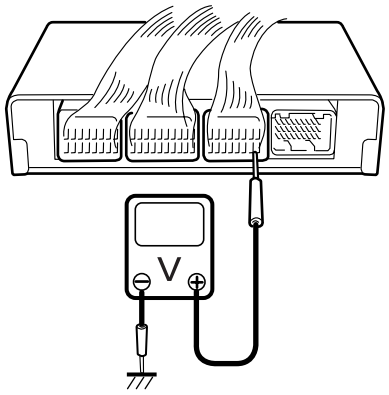
CAUTION:

- **ECM connectors are waterproofed. Each terminal of the ECM connectors is sealed up with the grommet. Therefore, do not measure circuit voltage and resistance by inserting the tester's probe into the sealed terminal at the harness side. Or, ECM and its circuits may be damaged by water.**
- **ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with couplers disconnected from ECM.**

1) Remove ECM from its bracket referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C".
2) Connect ECM couplers to ECM.
3) Check voltage at each terminal.

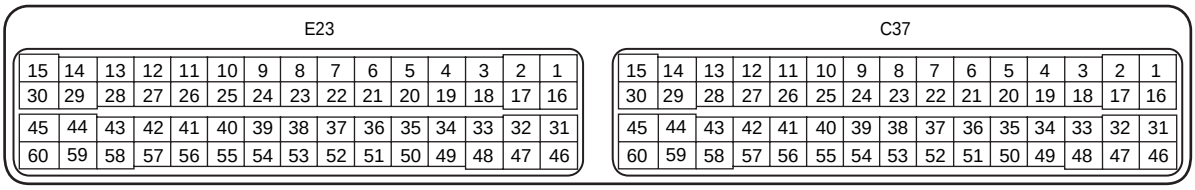
NOTE:

As each terminal voltage is affected by the battery voltage, confirm that the battery voltage is 11 V or more when ignition switch is ON position.



I4RS0A720050-

Terminal arrangement of ECM coupler (Viewed from harness side)



I4RS0A720010-

ECM Voltage Values Table for Relation of A/C Control

Terminal	Wire Color	Circuit	Normal Value	Condition
C37-14	GRY/RED	Output of 5 V power source	4.5 – 5.5 V	Ignition switch turned ON
C37-24	LT GRN	Engine coolant temp. (ECT) sensor signal	3.3 – 3.6 V	Ignition switch turned ON, ECT at 0 °C (32 °F)
			1.1 – 1.5 V	Ignition switch turned ON, ECT at 50 °C (122 °F)
C37-55	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
C37-57	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
C37-58	BLK/ORN	Ground for ECM	Below 0.3 V	Ignition switch turned ON
E23-1	BLK/RED	Main power supply	10 – 14 V	Ignition switch turned ON
E23-16	BLK/RED	Main power supply	10 – 14 V	Ignition switch turned ON
E23-19	BLU/WHT	Electric load signal for blower motor	10 – 14 V	Ignition switch turned ON, blower fan selector at OFF position
			0 – 1 V	Ignition switch turned ON, blower fan selector at 2nd speed position or more
E23-47	GRY	A/C compressor relay output	10 – 14 V	Engine running, A/C request signal high input
			0 – 1 V	Engine running, A/C request signal low input
E23-54	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
E23-55	RED	A/C refrigerant pressure sensor signal	1.46 – 1.71 V	Engine running, A/C refrigerant pressure at 0.8 MPa (8.0 kg/cm^2)(A/C refrigerant pressure measured by manifold gauge)
			2.55 – 2.80 V	Engine running, A/C refrigerant pressure at 1.6 MPa (16.0 kg/cm^2)(A/C refrigerant pressure measured by manifold gauge)
E23-57	WHT/BLK	Evaporator thermistor (evaporator temperature sensor) signal	3.45 – 3.65 V	Ignition switch turned ON, evaporator thermistor (evaporator temperature sensor) at 0 °C (32 °F)
			2.55 – 2.85 V	Ignition switch turned ON, evaporator thermistor (evaporator temperature sensor) at 15 °C (59 °F)
			1.7 – 2.1 V	Ignition switch turned ON, evaporator thermistor (evaporator temperature sensor) at 30 °C (86 °F)
E23-60	BRN/WHT	Main power supply relay output	10 – 14 V	Ignition switch turned OFF
			0 – 2 V	Ignition switch turned ON

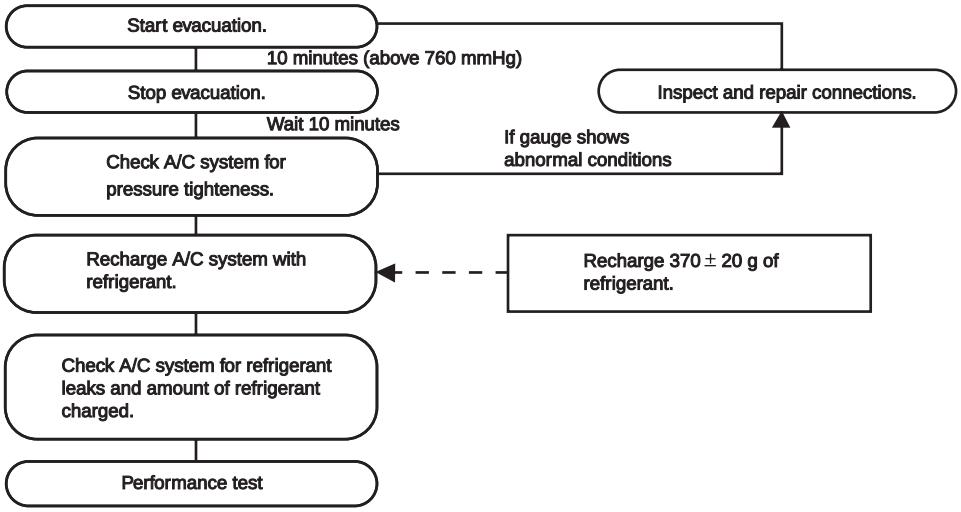
Repair Instructions

Operation Procedure for Refrigerant Charge

S4RS0A7206002

WARNING:

- **Your eyes should not be exposed to refrigerant (liquid).**
  Any liquid HFC-134a (R-134a) escaping by accident shows a temperature as low as approximately –6 °C (21.2 °F) below freezing point. Should liquid HFC-134a (R-134a) is exposed to your eyes, it may cause a serious injury. To protect your eyes from such accident, it is necessary to always wear goggles. Should it occur that HFC-134a (R-134a) is exposed to your eyes, consult a doctor immediately.
  - **Do not use your hand to rub the affected eye(s). Instead, use fresh cold water to splash it over the affected area to gradually raise temperature of such area above freezing point.**
  - **Obtain proper treatment as soon as possible from a doctor or eye specialist.**
- **Should the liquid refrigerant HFC-134a (R-134a) is exposed to your skin, the affected area should be treated in the same manner as when skin is frostbitten or frozen.**
- **Do not handle refrigerant near any place where welding or steam cleaning is performed.**
- **Refrigerant should be kept in a cold and dark place. It should never be stored in any place where temperature is high, e.g. where exposed to direct sun light, close to fire or inside vehicle (including trunk room).**
- **Avoid breathing fume produced when HFC-134a (R-134a) is burned. Such fume may be hazardous to your health.**

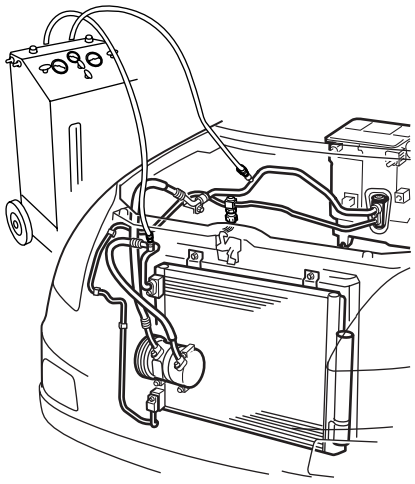


I4RS0A720011-

Recovery
When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment because discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environments.

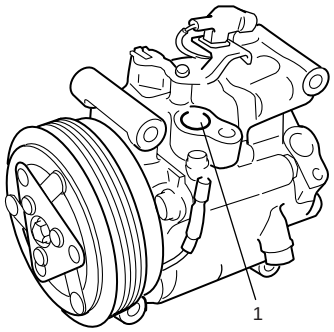
NOTE:

- **After recovering refrigerant from system, the amount of removed compressor oil must be measured for replenishing compressor oil.**
- **When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.**



I4RS0A720012-

Replenishing Compressor Oil
It is necessary to replenish specified amount of compressor oil to compressor from compressor suction side hole (1) before evacuating and charging refrigerant.



I4RS0A720013-

When charging refrigerant only
When charging refrigerant without replacing any component , replenish the same amount of measured oil when recovering refrigerant (if not measure, replenish 30 cm^3 (30 cc) oil).

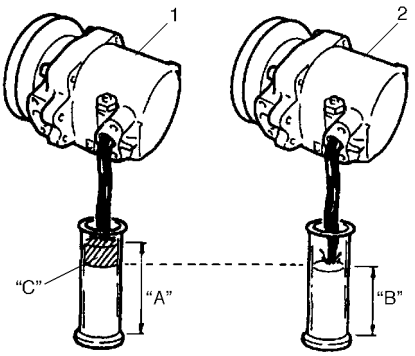
When replacing compressor

CAUTION:

Be sure to use P/N: 99000-99015-00A compressor oil or an equivalent compressor oil.

Compressor oil is sealed in each new compressor by the amount required for A/C system. Therefore, when using a new compressor, drain the calculated amount of oil from it.
"C" = "A" – "B"
"C": Amount of oil to be drained
"A": Amount of oil in a new compressor
"B": Amount of oil in removed compressor

Oil amount in compressor
90 ± 5 cm^3 (80 ± 5 cc, 4.88 ± 0.31 in^3)



I2RH01720015-

1.	New compressor
2.	Removed compressor

When replacing other parts
Replenish the following amount of oil to compressor.

Amount of compressor oil to be replenished
Evaporator: 25 cm^3 (25 cc, 1.53 in^3)
Condenser: 15 cm^3 (15 cc, 0.92 in^3)
Dryer: 20 cm^3 (20 cc, 1.22 in^3)
Hoses: 10 cm^3 (10 cc, 0.61 in^3) each
Pipes: 10 cm^3 (10 cc, 0.61 in^3) each

Evacuation

CAUTION:

Do not evacuate before recovering refrigerant in A/C system.

NOTE:

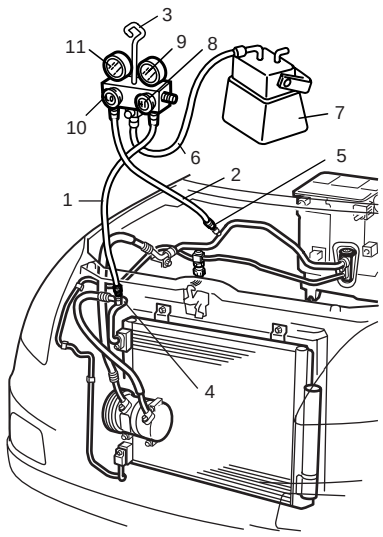
Once air conditioning system circuit is opened (exposed) to atmospheric air, system must be evacuated by using a vacuum pump. The A/C system should be attached with a manifold gauge set, and should be evacuated for approximately 15 minutes.

1) Connect high charging hose (1) and low charging hose (2) of manifold gauge set (3) respectively as follows:
   High charging hose → High pressure charging valve (4) on condenser outlet pipe
   Low charging hose → Low pressure charging valve (5) on suction pipe
2) Attach center charging hose (6) of manifold gauge set to vacuum pump (7).
3) Operate vacuum pump, and then open discharge side valve (Hi) (8) of manifold gauge set.
   If there is no blockage in the system, there will be an indication on high pressure gauge (9).
   In this case, open the other side valve (Lo) (10) of the set and repair the system.
4) Approximately 10 minutes later, low pressure gauge (11) should show a vacuum lower than –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.7 psi) providing no leakage exists.

NOTE:

- **If the system does not show a vacuum below –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.7 psi), close both valves, stop vacuum pump and watch movement of low pressure gauge.**
- **Increase in the gauge reading suggests existence of leakage. In this case, repair the system before continuing its evacuation.**
- **If the gauge shows a stable reading (suggesting no leakage), continue evacuation.**

5) Evacuation should be carried out for a total of at least 15 minutes.
6) Continue evacuation until low pressure gauge indicates a vacuum less than –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.7 psi), and then close both valves.
7) Stop vacuum pump. Disconnect center charging hose from pump inlet. Now, the system is ready for charging refrigerant.



I4RS0A720014-

Checking A/C System for Pressure Leaks

After completing the evacuation, close manifold gauge high pressure valve and low pressure valve and wait 10 minutes. Verify that low pressure gauge reading has not changed.

CAUTION:

If the gauge reading moves closer to "0", there is a leak somewhere. Inspect the tubing connections and make necessary corrections. And then, evacuate system once again and make sure that there are no leaks.

Charge

CAUTION:

- **Because the sight glass is not used for this A/C system, do not perform an additional charge to the A/C system. To charge the proper amount of refrigerant, recover and evacuate the A/C system first. And then, charge the proper amount of refrigerant into the A/C system.**
- **Always charge refrigerant through low pressure side of A/C system after the initial charge is performed from the high pressure side with the engine stopped.**
- **Never charge refrigerant through high pressure side of A/C system with engine running.**
- **Do not charge refrigerant while compressor is hot.**
- **When installing tap valve to refrigerant container to make a hole there through, carefully follow directions given by manufacturer.**
- **A pressure gauge should always be used before and during refrigerant charge.**
- **The refrigerant container should be emptied of refrigerant when discarding it.**
- **The refrigerant container should not be heated up to 40 °C (104 °F) or over.**
- **Refrigerant container should not be reversed in direction during refrigerant charge. Reversing in direction causes liquid refrigerant to enter compressor, causing troubles, such as compression of liquid refrigerant and the like.**

NOTE:

The air conditioning system contains HFC-134a (R-134a).
Described here is a method to charge the air conditioning system with refrigerant from the refrigerant service container.
When charging refrigerant recovered by using the refrigerant and recycling equipment (when recycling refrigerant), follow the procedure described in the equipment manufacturer's instruction manual.

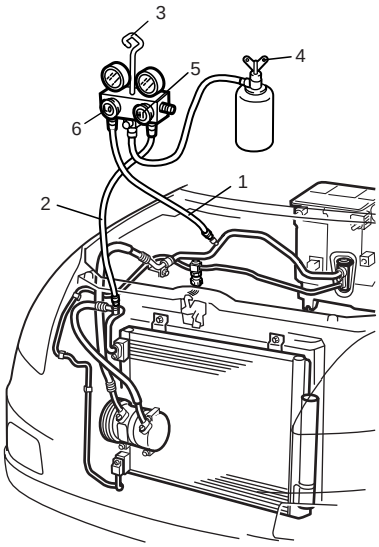
The initial charge of the A/C system is performed through the high pressure side with the engine stopped. And next, this method must be followed by charging from the low pressure side with the engine running.

1) Check if hoses are routed properly after evacuating the system.
2) Connect low charging hose (1) and high charging hose (2) of the manifold gauge set (3) in position. Then, open refrigerant container valve (4) to purge the charging line.
3) Open the high pressure side valve (5) and charge refrigerant to system.
4) After a while, open the low pressure side valve (6) and close the high pressure side valve.

WARNING:

Make sure that high pressure side valve is closed securely.

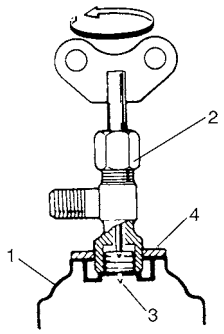
5) Start engine and keep engine speed at 1500 r/min, and then operate A/C system.
6) Charge A/C system with refrigerant in vapor state. At this time, refrigerant container should be held upright.



I4RS0A720015-

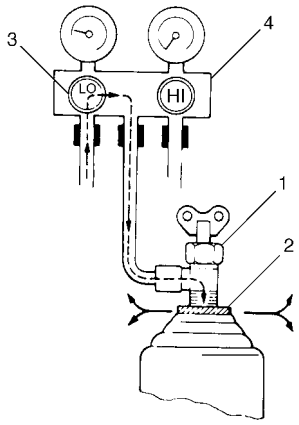
7) When refrigerant container (1) is emptied, use the following procedure to replace it with a new refrigerant container.
   a) Close low pressure valve.

b) Replace empty container with a refrigerant container which has been charged with refrigerant. When using refrigerant container tap valve (2), use the following procedure for replacement.
   i) Retract needle (3) and remove refrigerant container tap valve by loosening its plate nut (4).
   ii) Install the refrigerant container tap valve to a new refrigerant container.



I2RH01720018-

c) Purge any air existing in center charging hose. When using refrigerant container tap valve, use the following procedure to purge air.
   i) Once fully tighten refrigerant container tap valve (1), and then loosen (open) plate nut (2) slightly.
   ii) Open low pressure side valve (3) of manifold gauge set (4) a little.
   iii) As soon as refrigerant comes out with a “hiss” through a clearance between refrigerant container and tap valve, tighten plate nut as well as low pressure side valve.
   iv) Turn handle of tap valve clockwise so that its needle is screwed into the new container to make a hole for refrigerant flow.

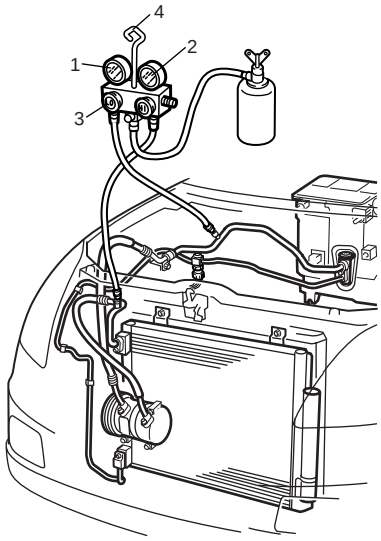


I2RH01720019-

8) After the system has been charged with specified amount (370 ± 20 g) of refrigerant or when low pressure gauge (1) and high pressure gauge (2) have indicated the following specified value, close low pressure side valve (3) on manifold gauge set (4).

Low side and high side pressure example

Gauges should read as follows when ambient temperature is 30 °C (86 °F).	
Pressure on high pressure gauge	**1240 – 1520 kPa 12.4 – 15.2 kg/cm^2 176 – 216 psi**
Pressure on low pressure gauge	**250 – 360 kPa 2.5 – 3.5 kg/cm^2 35.6 – 51 psi**



I4RS0A720016-

Removal of Manifold Gauge Set

WARNING:

High pressure side is under high pressure. Therefore, be careful not to get injured especially on your eyes and skin.

For the A/C system charged with the specified amount of refrigerant, remove manifold gauge set as follows:

1) Close low pressure side valve of manifold gauge set. (The high pressure side valve is closed continuously during the process of charging.)
2) Close refrigerant container valve.
3) Stop engine.
4) Using shop rag, remove charging hoses from service valves. This operation must be performed guickly.
5) Put caps on service valves.

Check A/C System for Refrigerant Leaks
Whenever a refrigerant leak is suspected in the system or any service operation has been performed which may result in malfunction of lines and connections, it is advisable to check for leaks.
Common sense should be used during refrigerant leak test, since the need and extent of any such test will, in general, depend upon the nature of a complaint and the type of a service performed on the system.

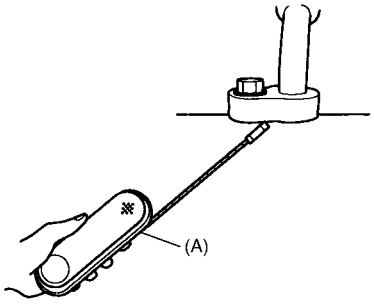
Liquid leak detector

WARNING:

- **To prevent explosions and fires, make sure that there are no flammables in the vicinity.**
- **When the refrigerant exposed to fire, it turns into a poisonous gas (phosgene). Do not inhale this gas.**

There is a number of fittings and places throughout the A/C system where a liquid leak detector solution may be used to pinpoint refrigerant leaks.
By merely applying the solution to the area in question with a swab, such as attached to the cap of a vial, bubbles will form within seconds if there is a leak.
For confined areas, such as sections of the evaporator and condenser, an electronic (refrigerant) leak detector is more practical for determining leaks.

Special tool
(A): 09990-86011



I2RH01720020-

Condenser Assembly On-Vehicle Inspection

S4RS0A7206008

Check the followings.

- Clog of condenser fins
  If any clog is found, condenser fins should be washed with water and should be dried with compressed air.
- Condenser fins for leakage and breakage
  If any defects are found, repair or replace condenser.
- Condenser fittings for leakage.
  If any defects are found, repair or replace condenser.

Condenser Assembly Removal and Installation

S4RS0A7206007

CAUTION:

Do not damage condenser fins. If condenser fin is bent, straighten it by using flat head screwdriver or pair of pliers.

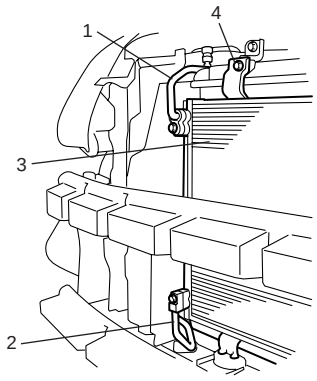
Removal

1) Recover refrigerant from A/C system referring to “Operation Procedure for Refrigerant Charge: ”.

NOTE:

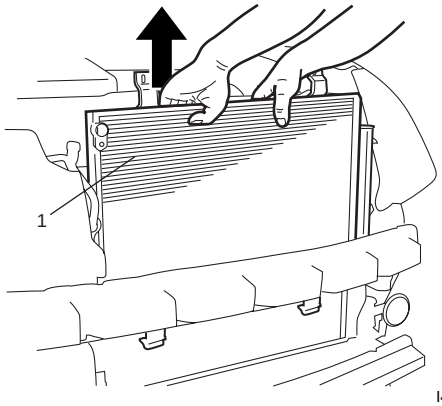
The amount of removed compressor oil must be measured for replenishing compressor oil.

2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect discharge hose (1) and liquid pipe (2) from condenser assembly (3).
4) Remove condenser assembly mounting bolts (4).



I4RS0A720017-

5) Remove condenser assembly (1) as shown.



I4RS0A720018-

Installation
Reverse the removal procedure to install condenser noting the following instructions.

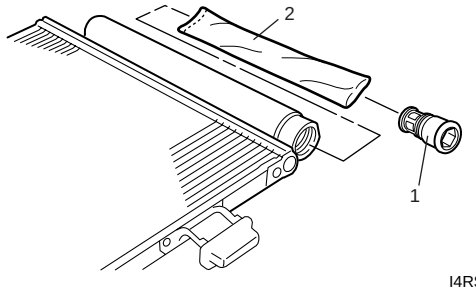
- Replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.

Desiccant Removal and Installation

S4RS0A7206009

Removal

1) Remove condenser assembly referring to “Condenser Assembly Removal and Installation: ”.
2) Remove cap (1) from receiver/dryer tank.
3) Remove desiccant (2) from receiver/dryer tank.



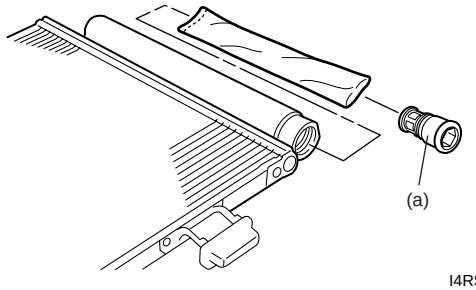
I4RS0A720019-

Installation
Reverse the removal procedure noting the following instructions.

- Replenish specified amount of compressor oil to compressor suction side referring to in “Operation Procedure for Refrigerant Charge: ”.
- Do not remove desiccant from the plastic bag until just before inserting it into the receiver.
- Install the desiccant with its welded part downward.
- Apply compressor oil to cap’s O-ring.
- Tighten cap to the specified torque

  Tightening torque
  Cap (a): 3.0 N·m (0.3 kg-m, 2.5 lb-ft)

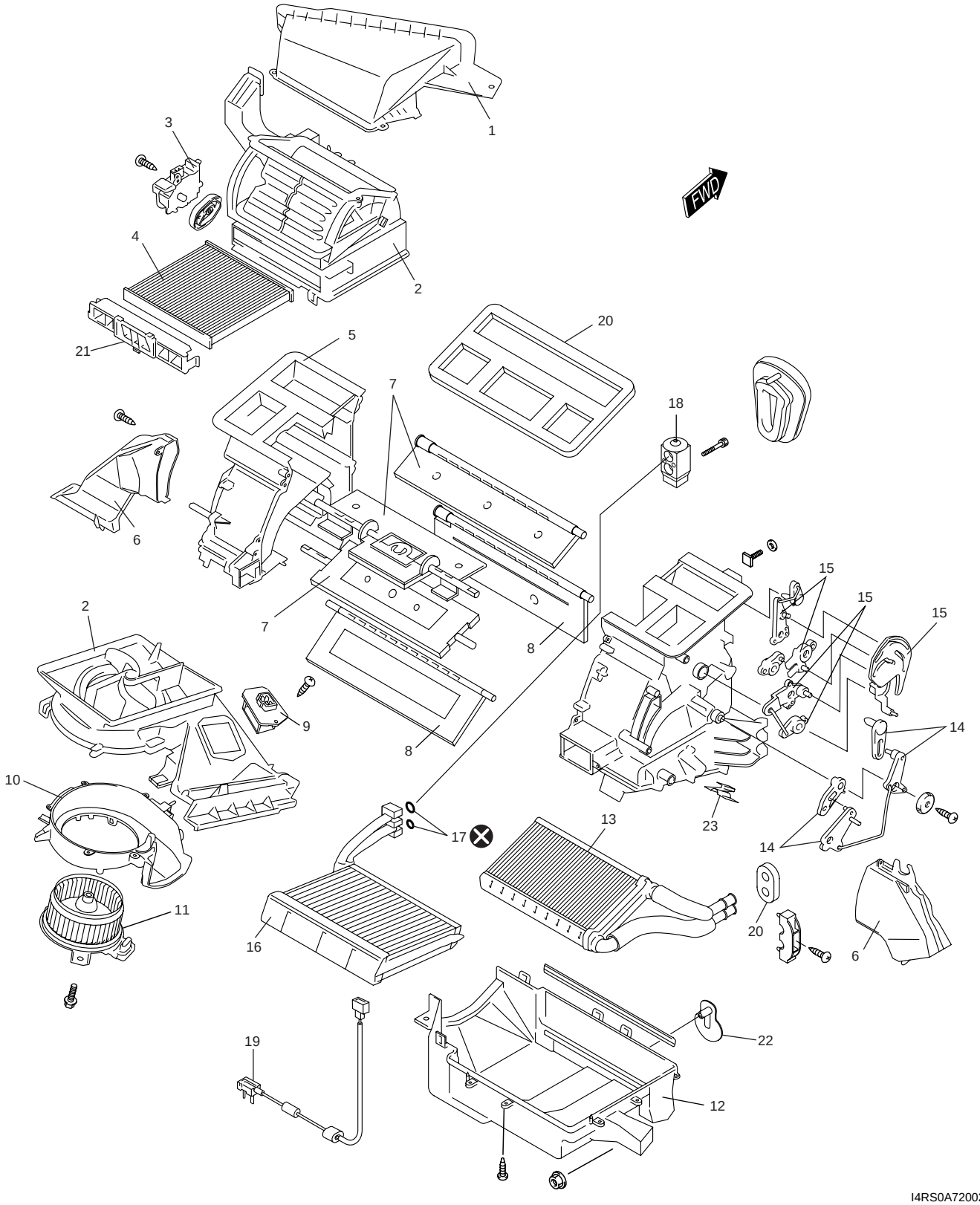
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.



I4RS0A720020-

HVAC Unit Components

S4RS0A7206003



I4RS0A720021-

1. Fresh air inlet duct	7. Airflow control door assembly	13. Heater core	19. Evaporator thermistor (evaporator temperature sensor)
2. Blower upper case	8. Temperature control door assembly	14. Temperature control lever	20. Packing
3. Air intake control actuator	9. Blower motor resistor	15. Airflow control lever	21. Filter cover
4. Air filter	10. Blower lower case	16. Evaporator	22. Drain hose
5. Heater unit upper case	11. Blower motor	17. O-ring	23. Cable lock clamp

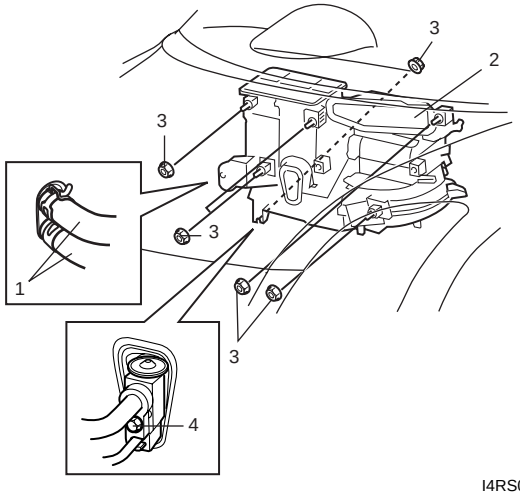
6. Foot duct	12. Heater unit lower case	18. Expansion valve	⊗ : Do not reuse.

HVAC Unit Removal and Installation

S4RS0A7206012

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Recover refrigerant from A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
4) Remove cowl top panel referring to “Cowl Top Components: in Section 9K”.
5) Drain engine coolant, and then disconnect heater hoses (1) from HVAC unit (2).
6) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation: in Section 9C”.
7) Loosen suction hose and liquid pipe bolt (4).
8) Remove nuts (3).
9) Remove HVAC unit from vehicle body.

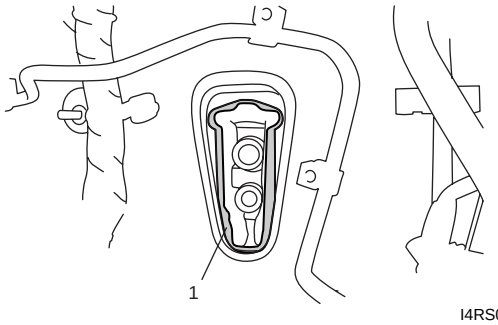


I4RS0A720022-

Installation

Reverse removal procedure noting the following instructions.

- Replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.
- Install the padding (1) to the installation hole uniformly.



I4RS0A720023-

- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.
- Adjust control cables referring to “HVAC Control Unit Removal and Installation: in Section 7A”.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Evaporator Inspection

S4RS0A7206013

Check the followings.

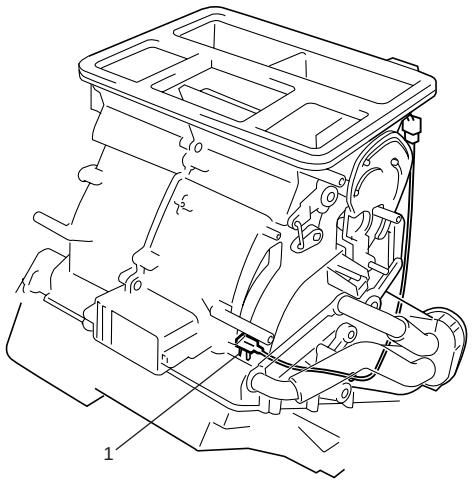
- Clog of A/C evaporator fins.
  If any clogs are found, A/C evaporator fins should be washed with water, and then should be dried with compressed air.
- A/C evaporator fins for leakage and breakage.
  If any defects are found, repair or replace A/C evaporator.
- A/C evaporator fittings for leakage.
  If any defects are found, repair or replace A/C evaporator.

Evaporator Thermistor (Evaporator Temperature Sensor) Removal and Installation

S4RS0A7206033

Removal

1) Disconnect negative (–) cable from battery.
2) Remove HVAC unit from vehicle body referring to “HVAC Unit Removal and Installation: ”.
3) Remove evaporator thermistor (evaporator temperature sensor) (1) from evaporator by disassembling HVAC unit.

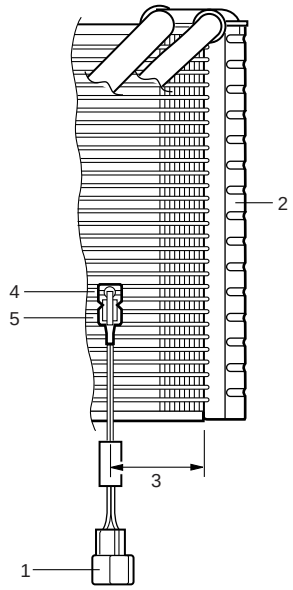


I4RS0A720052-

Installation

Reverse the removal procedure noting the following instruction.

- Install evaporator thermistor (evaporator temperature sensor) (1) onto evaporator (2) as shown.



I4RS0A720053-

3.	50 ± 5 mm (2 ± 0.2 in.)
4.	Sensor part fixed to 10th fin from the bottom
5.	Holding part fixed to 8th fin from the bottom

Evaporator Thermistor (Evaporator Temperature Sensor) Inspection

S4RS0A7206014

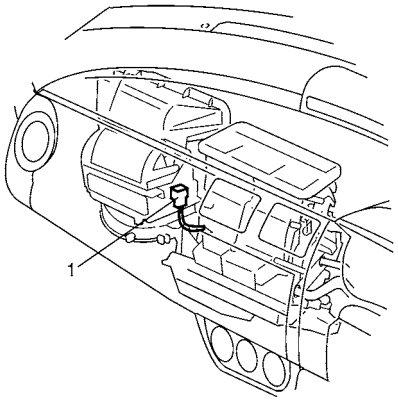
Check resistance between terminals of evaporator thermistor (1).

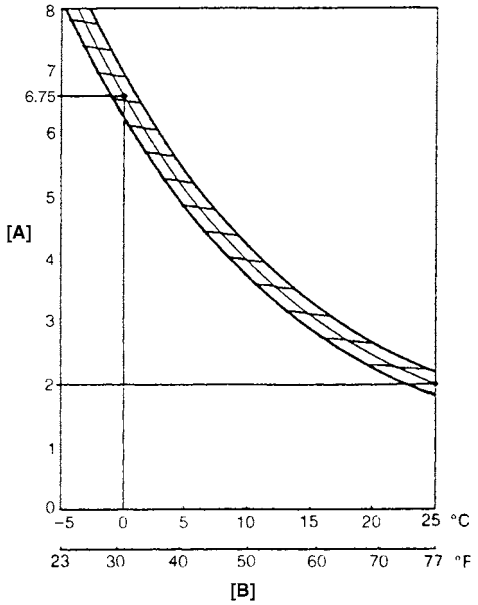
If check results are as not specified, replace evaporator thermistor.

Evaporator themistor resistance

0 °C (32 °F): 6.6 – 6.9 kΩ

25 °C (77 °F): 1.9 – 2.3 kΩ





I4RS0A720027-

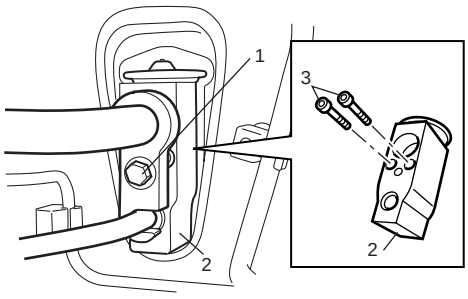
[A]:	Resistance (kΩ)
[B]:	Temperature

Expansion Valve Removal and Installation

S4RS0A7206015

Removal

1) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
2) Loosen a bolt (1) and remove pipes from expansion valve (2).
3) Loosen bolts (3) and remove expansion valve.



I4RS0A720028-

Installation
Reverse removal procedure noting the following instructions.

- Apply compressor oil to O-ring of expansion valve and pipes.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.

Expansion Valve Inspection

S4RS0A7206016

Refer to “A/C System Performance Inspection: ”

A/C Refrigerant Pressure Sensor and Its Circuit Inspection

S4RS0A7206034

1) Disconnect A/C refrigerant pressure sensor connector.
2) Turn ignition switch to ON position.
3) Check if voltage between “RED” wire terminal and “ORN” wire terminal of A/C refrigerant pressure sensor connector is 4.75 V to 5.25 V.
   If not, check A/C refrigerant pressure sensor circuit.
4) Connect A/C refrigerant pressure sensor connector with ignition switch turned OFF.
5) Connect manifold gauge set to the charging valves.
6) Check A/C refrigerant pressure sensor voltage of ECM connector referring to “A/C System Inspection at ECM: ”.
   If voltage is not as specified below, replace A/C refrigerant pressure sensor.

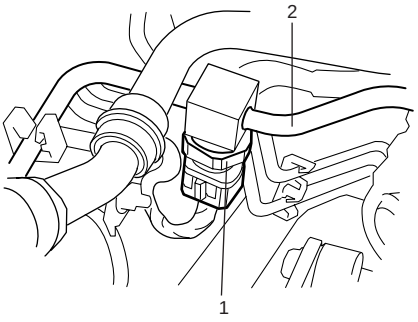
A/C refrigerant pressure sensor voltage specifications (A/C refrigerant pressure measured by manifold gauge)
0.8 MPa (8.0 kg/cm^2, 116 psi): 1.46 – 1.71 V
1.4 MPa (14 kg/cm^2, 203 psi): 2.28 – 2.53 V
1.6 MPa (16 kg/cm^2, 232 psi): 2.55 – 2.80 V
1.8 MPa (18 kg/cm^2, 261 psi): 2.82 – 3.03 V

A/C Refrigerant Pressure Sensor Removal and Installation

S4RS0A7206018

Removal

1) Recover refrigerant from the A/C system with the recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
2) Disconnect negative (–) cable from battery.
3) Disconnect A/C refrigerant pressure sensor connector.
4) Remove A/C refrigerant pressure sensor (1) from liquid pipe (2).

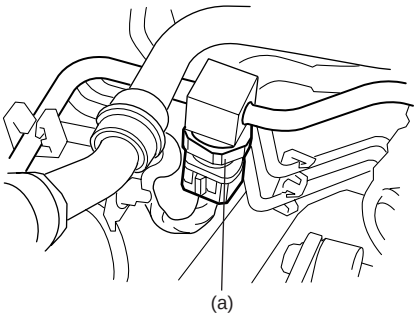


I4RS0A720029-

Installation.
Reverse removal procedure noting the following instructions.

- Apply compressor oil to O-ring of A/C refringerant pressure sensor.
- Tighten A/C refrigerant pressure sensor to specified torque.

  Tightening torque
  A/C refrigerant pressure sensor (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A720031-

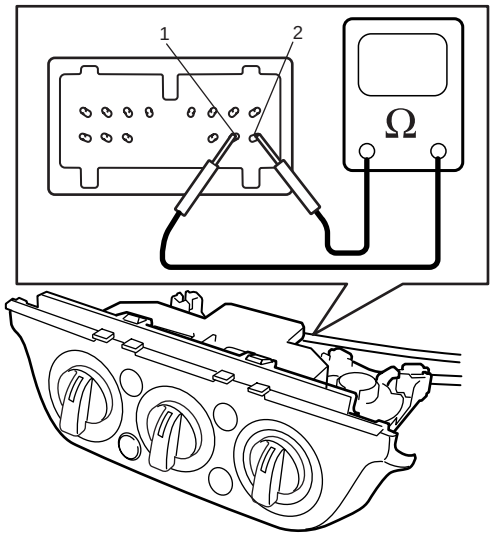
- Evacuate and charge system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.

A/C Switch Inspection

S4RS0A7206035

- Check that there is continuity between terminal (1) and terminal (2) when A/C switch is at ON position.
- Check that there is no continuity between terminal (1) and terminal (2) when A/C switch is at OFF position.

If check result does not meet the above conditions, replace HVAC control unit.

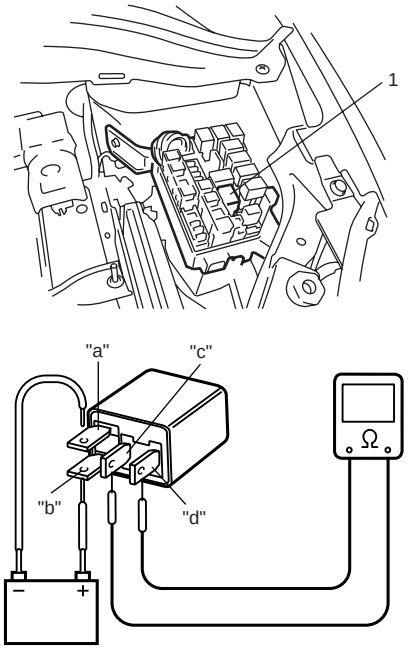


I4RS0A720030-

Compressor Relay Inspection

S4RS0A7206019

1) Disconnect negative (–) cable from battery.
2) Remove compressor relay (1) from main fuse box.
3) Check that there is no continuity between terminal “c” and “d”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “b” of relay and battery negative (–) terminal to terminal “a” of relay, and then check continuity between terminal “c” and “d”. If there is no continuity, replace relay.



I4RS0A720032-

Compressor Drive Belt Inspection and Adjustment

S4RS0A7206021

Inspection

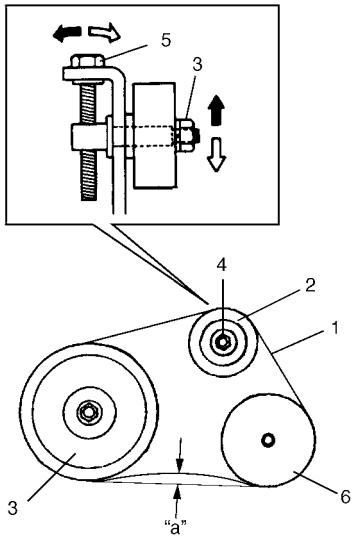
- Check compressor drive belt (1) for wear, crack, deformation and cleanliness. If any defect is found, replace the belt with new one referring to “Compressor Drive Belt Removal and Installation: ”.
- Check compressor drive belt tension by measuring how much it deflects when pushed intermediate point between tension pulley (2) and crankshaft pulley (3) with about 100 N (10 kg) force after rotating crankshaft pulley 360°. If belt tension is out of specification, adjust belt tension referring to “Adjustment”.

Compressor drive belt tension
“a”: 7 – 8mm (0.28 – 0.31 in.)

New compressor drive belt tension
“a”: 6 – 7mm (0.24 – 0.28 in.)

Adjustment

1) Loosen tension pulley nut (4).
2) Adjust belt tension by tighten or loosen tension pulley adjusting bolt (5).
3) Tighten tension pulley nut.
4) Rotate the crankshaft pulley 360°, and then recheck belt tension.



I4RS0A720033-

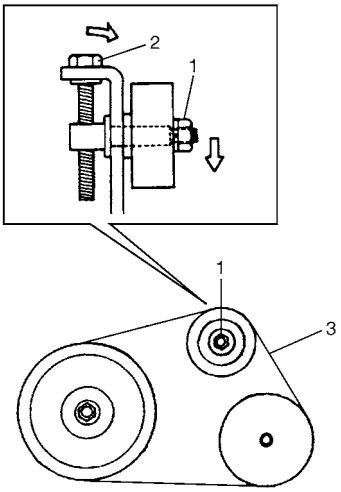
6. Magnet clutch pulley

Compressor Drive Belt Removal and Installation

S4RS0A7206036

Removal

1) Loosen tension pulley nut (1).
2) Loosen belt tension by loosening tension pulley adjusting bolt (2).
3) Remove compressor drive belt (3).



I4RS0A720034-

Installation

Reverse removal procedure noting the following instruction.

- Adjust belt tension referring to “Compressor Drive Belt Inspection and Adjustment: ”.

Compressor Assembly Removal and Installation

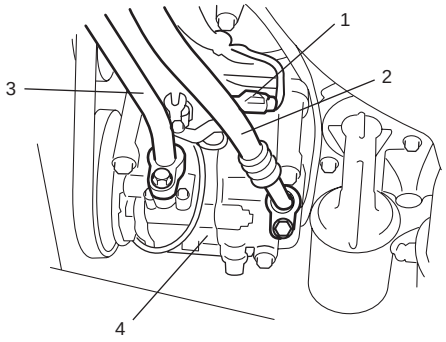
S4RS0A7206037

Removal

1) Run engine at idle speed with A/C ON for 10 minutes.
2) Stop the engine.
3) Disconnect negative (-) cable from battery.
4) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
5) Remove compressor drive belt referring to “Compressor Drive Belt Removal and Installation: ”.
6) Remove right side engine under cover.
7) Disconnect magnet clutch lead wire coupler (1).
8) Disconnect discharge hose (2) and suction hose (3) from compressor (4).

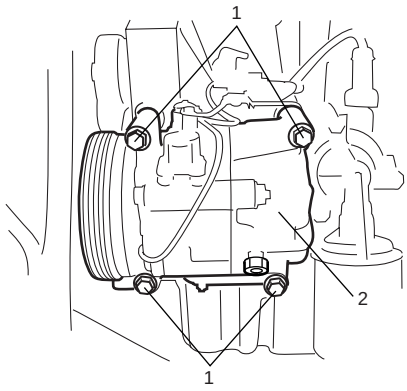
NOTE:

Cap open fittings immediately to keep moisture out of the system.



I4RS0A720035-

9) Remove compressor mounting bolts (1), and then remove compressor (2) from its bracket.



I4RS0A720036-

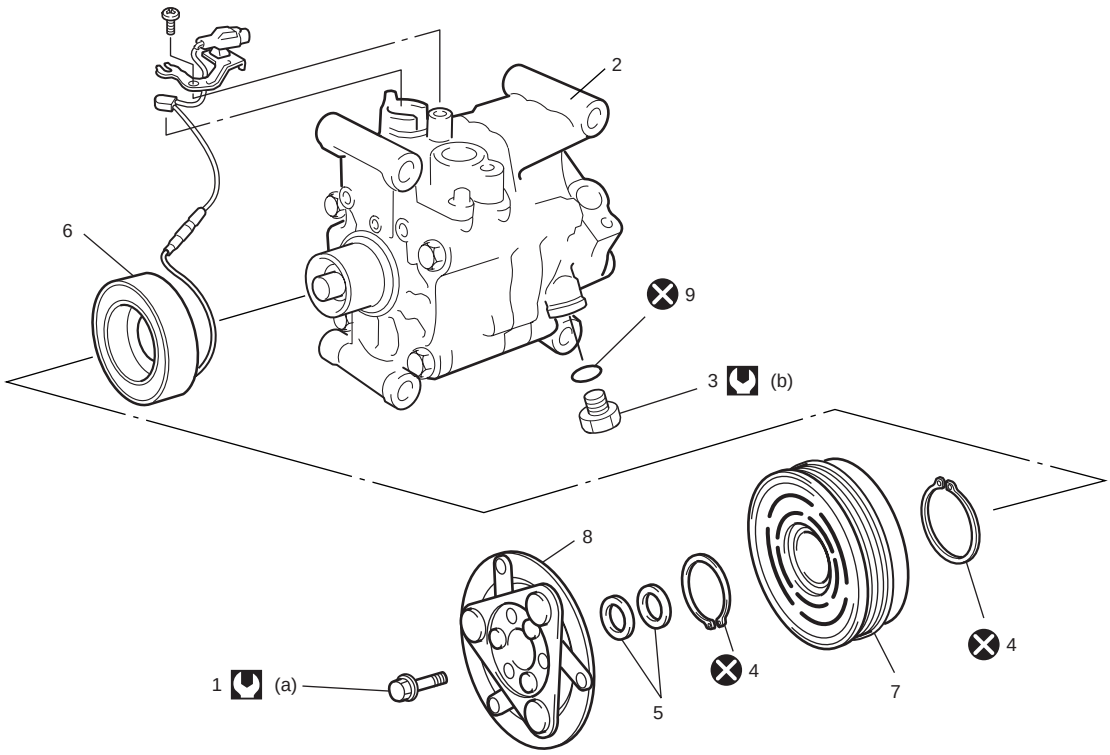
Installation

Reverse removal procedure noting the following instructions.

- If compressor is replaced, pour new compressor oil referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.
- Evacuate and charge system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.
- Adjust drive belt tension referring to “Compressor Drive Belt Inspection and Adjustment: ”.

Compressor Assembly Components

S4RS0A7206024



I4RS0A720037-

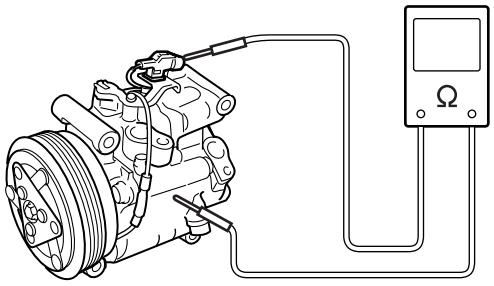
1. Armature plate bolt	4. Circlip	7. Magnet clutch pulley	: Do not reuse.
2. Compressor	5. Shim	8. Armature plate	(a) : 15 N·m (1.5 kg-m, 11.0 lb-ft)
3. Relief valve	6. Magnet clutch coil and thermal switch	9. O-ring	(b) : 8 N·m (0.8 kg-m, 6.0 lb-ft)

Magnet Clutch Inspection

S4RS0A7206023

- Check armature plate and magnet clutch pulley for wear and oil soak respectively.
- Check magnet clutch pulley bearing for noise, wear and grease leakage.
- Measure magnet clutch coil for resistance at 20 °C (68 °F). If the measured resistance does out of specification, replace magnet clutch assembly.

Magnet clutch coil resistance
Standard: 3.5 – 4.0 Ω



I4RS0A720038-

Magnet Clutch Removal and Installation

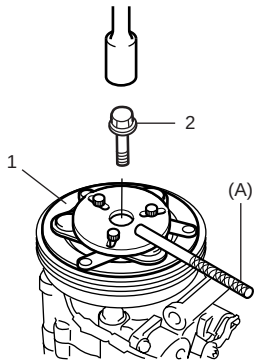
S4RS0A7206025

Removal

1) Remove compressor from vehicle referring to “Compressor Assembly Removal and Installation: ”.
2) Fix armature plate (1) with special tool and remove armature plate bolt (2).

Special tool
(A): 09991–06310

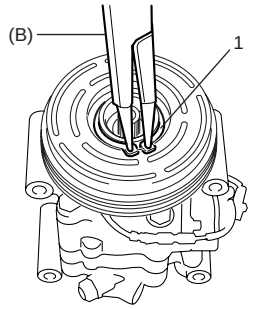
3) Remove armature plate (1).



I4RS0A720039-

4) Remove shims from shaft.
5) Remove circlip (1) using special tool.

Special tool
(B): 09900–06107

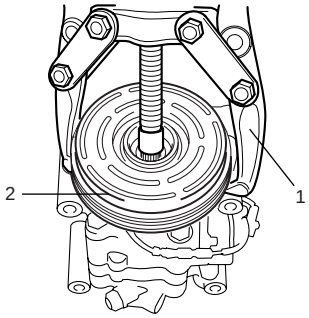


I4RS0A720040-

6) Remove magnet clutch pulley (2).

NOTE:

- **If it is difficult to remove magnet clutch pulley by hand, use puller (1).**
- **Do not damage magnet clutch pulley when using puller.**

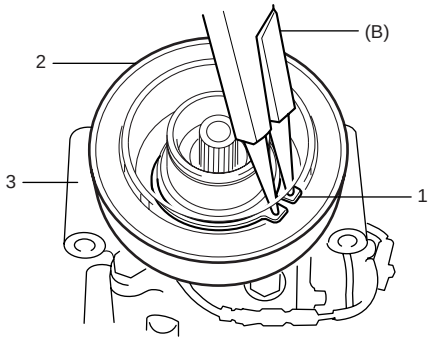


I4RS0A720041-

7) Remove magnet clutch lead wire clamp.
8) Remove circlip (1) by using special tool.

Special tool
(B): 09900–06107

9) Remove magnet clutch coil (2) from compressor (3).

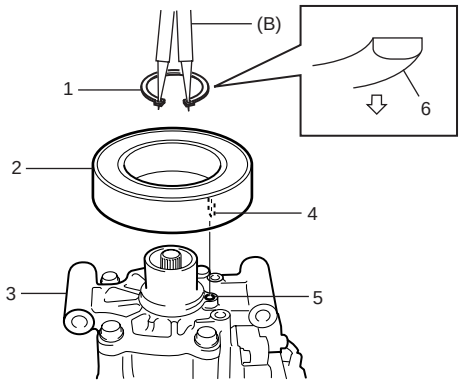


I4RS0A720042-

Installation

1) Install magnet clutch coil (2) fitting protrusion (4) of magnet clutch coil onto hole (5) of compressor (3).
2) Install new circlip (1) directing chamfer side (6) downward.

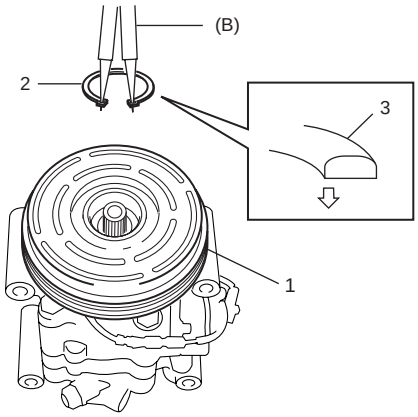
Special tool
(B): 09900-06107



I4RS0A720043-

3) Apply silicon to contact face of thermal switch.
4) Install magnet clutch lead wire clamp.
5) Install magnet clutch pulley (1).
6) Install new circlip (2) directing chamfer side (3) upward.

Special tool
(B): 09900–06107

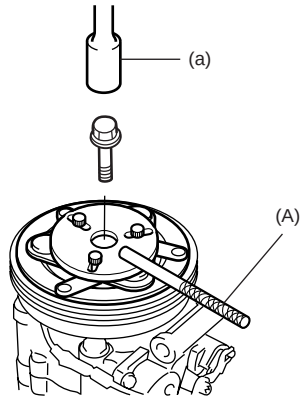


I4RS0A720044-

7) Tighten armature plate bolt to specified torque.

Tightening torque
Armature plate bolt (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

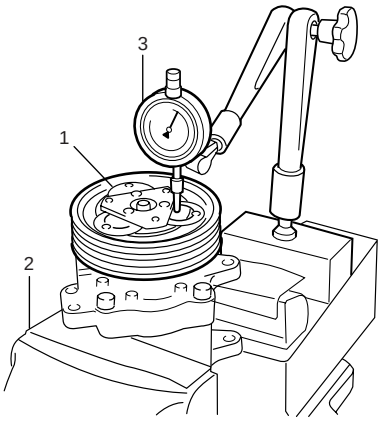
Special tool
(A): 09991–06310



I4RS0A720045-

8) Adjust clearance between magnet clutch plate (1) and magnet clutch pulley by putting shim(s) on compressor shaft. To measure the clearance, perform the following steps.
   a) Put compressor in a vise (2).
   b) Set dial gauge (3) on magnet clutch plate, and then adjust its pointer at 0.
   c) Connect battery positive terminal (+) to magnet clutch coil lead wire.
   d) Connect battery negative terminal (–) to compressor body assembly. (At this point, magnet clutch plate and magnet clutch pulley are kept in contact.)
   e) Disconnect battery negative terminal (–) to compressor body assembly. (At this point, magnet clutch plate and magnet clutch pulley are not in contact.)
   f) Read stroke of magnet clutch plate from dial gauge by performing step d) and e) repeatedly. (Stroke of magnet clutch plate is clearance between magnet clutch plate and magnet clutch pulley.)

Standard clearance between magnet clutch plate and magnet clutch plate:
0.3 – 0.5 mm (0.012 – 0.020 in.)



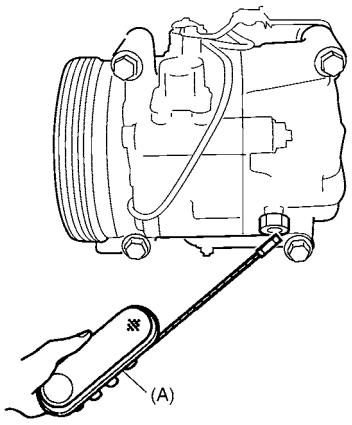
I4RS0A720046-

Relief Valve Inspection

S4RS0A7206031

By using special tool, check if there is refrigerant leakage. If there is refrigerant leakage, replace the relief valve.

Special tool
(A): 09990–86011



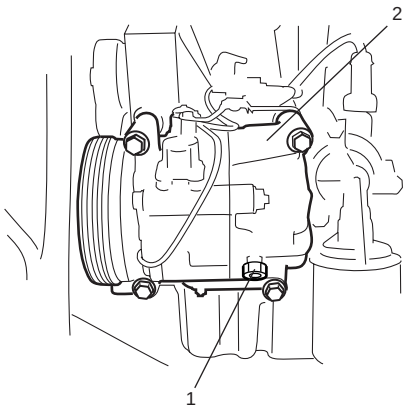
I4RS0A720047-

Relief Valve Removal and Installation

S4RS0A7206038

Removal

1) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
2) Remove relief valve (1) from compressor (2).

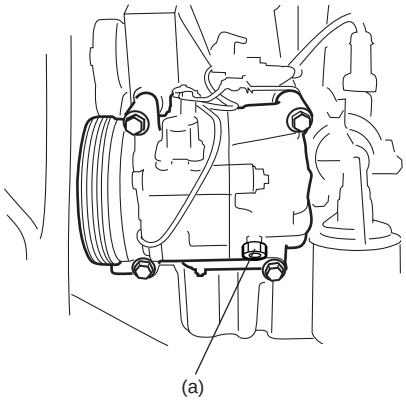


I4RS0A720048-

Installation
Reverse removal procedure noting the following instructions.

- Use new O-ring.
- Apply compressor oil to O-ring.
- Tighten relive valve to the specified torque.

Tightening torque
Relief valve (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)



I4RS0A720049-

- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.

Specifications

Tightening Torque Specifications

S4RS0A7207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Cap	3.0	0.3	2.5	☞
A/C refrigerant pressure sensor	11	1.1	8.0	☞
Armature plate bolt	15	1.5	11.0	☞
Relief valve	8	0.8	6.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Compressor Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A7208001

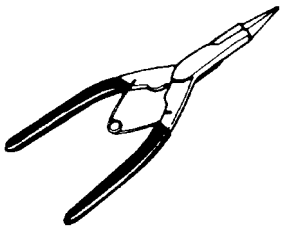
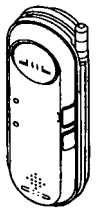
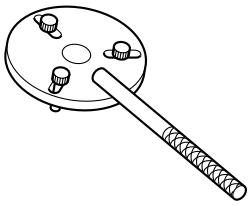
Material	SUZUKI recommended product or Specification		Note
Compressor oil	Compressor oil (MATSUSHITADENKI) - Domestic	P/No.: 99000–99015–00A	☞

NOTE:

Required service material is also described in the following.
“Precautions on Servicing A/C System: ”

Special Tool

S4RS0A7208002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ / ☞ / ☞		09990–86011 Gas leak detector ☞ / ☞	
09991–06310 Armature plate holder ☞ / ☞			

Section 8

Restraint

CONTENTS

Precautions 8-1
Precautions 8-1
Precautions on Restraint 8-1

Seat Belts 8A-1
Precautions 8A-1
Precautions on Service and Diagnosis of Seat Belt 8A-1
General Description 8A-1
Seat Belt Construction 8A-1
Diagnostic Information and Procedures 8A-2
Repair and Inspection Required after Accident 8A-2
Repair Instructions 8A-3
Front Seat Belt Components 8A-3
Front Seat Belt Removal and Installation 8A-3
Front Seat Belt Inspection 8A-4
Rear Seat Belt Components 8A-6
Rear Seat Belt Removal and Installation 8A-7
Rear Seat Belt Inspection 8A-7
Specifications 8A-7
Tightening Torque Specifications 8A-7

Air Bag System 8B-1
Precautions 8B-1
Precautions on Service and Diagnosis of Air Bag System 8B-1
Precautions on Handling and Storage of Air Bag System Components 8B-1
Precautions on Disposal of Air Bag and Seat Belt Pretensioner 8B-5
General Description 8B-5
Air Bag System Construction 8B-5
Air Bag System Input / Output Table 8B-6
Schematic and Routing Diagram 8B-7
Air Bag System Wiring Circuit Diagram 8B-7
Component Location 8B-9
Air Bag System Components, Wiring and Connectors Location 8B-9
Diagnostic Information and Procedures 8B-10
Air Bag Diagnostic System Check 8B-10
Air Bag Diagnostic System Check Flow 8B-10
DTC Table 8B-11
DTC Check 8B-12
DTC Clearance 8B-12
Scan Tool Data 8B-13
"AIR BAG" Warning Lamp Comes ON Steady 8B-13
"AIR BAG" Warning Lamp Does Not Come ON 8B-15
"AIR BAG" Warning Lamp Flashes 8B-17
DTC B1013: SDM fault 8B-18
DTC B1014: "AIR BAG" Warning Lamp Circuit Failure 8B-18
DTC B1016: Power Source Voltage High 8B-19
DTC B1017: Power Source Voltage Low 8B-21
DTC B1021: Front Air Bag Module Deployed 8B-23
DTC B1024 / B1025: Side-Air Bag (Driver / Passenger) Deployed 8B-23
DTC B1026: Pretensioner Activated 8B-24
DTC B1027: Reusable Number Exceeded 8B-25
DTC B1031: Driver Air Bag Initiator Circuit Resistance High 8B-25
DTC B1032: Driver Air Bag Initiator Circuit Resistance Low 8B-30
DTC B1033: Driver Air Bag Initiator Circuit Short to Ground 8B-35
DTC B1034: Driver Air Bag Initiator Circuit Short to Power Circuit 8B-40
DTC B1041: Passenger Air Bag Initiator Circuit Resistance High 8B-45
DTC B1042: Passenger Air Bag Initiator Circuit Resistance Low 8B-49
DTC B1043: Passenger Air Bag Initiator Circuit Short to Ground 8B-53
DTC B1044: Passenger Air Bag Initiator Circuit Short to Power Circuit 8B-57
DTC B1051 / B1055: Driver / Passenger Pretensioner Initiator Circuit Resistance High 8B-61
DTC B1052 / B1056: Driver / Passenger Pretensioner Initiator Circuit Resistance Low 8B-64
DTC B1053 / B1057: Driver / Passenger Pretensioner Initiator Circuit Short to Ground 8B-67
DTC B1054 / B1058: Driver / Passenger Pretensioner Initiator Circuit Short to Power Circuit 8B-69
DTC B1061 / B1065: Driver / Passenger Side-Air Bag Initiator Circuit Resistance High 8B-71
DTC B1062 / B1066: Driver / Passenger Side-Air Bag Initiator Circuit Resistance Low 8B-75
DTC B1063 / B1067: Driver / Passenger Side-Air Bag Initiator Circuit Short to Ground 8B-79

DTC B1064 / B1068: Driver / Passenger Side-Air Bag Initiator Circuit Short to Power Circuit 8B-82
DTC B1071: Forward-Sensor Performance Problem 8B-85
DTC B1072: Forward-Sensor Communication Error 8B-85
DTC B1073: Forward-Sensor Circuit Short to Ground 8B-85
DTC B1074: Forward-Sensor Circuit Short to Power Circuit or Open 8B-87
DTC B1081 / B1091: Driver / Passenger Side-Sensor Performance Problem 8B-89
DTC B1082 / B1092: Driver / Passenger Side-Sensor Communication Error 8B-89
DTC B1083 / B1093: Driver / Passenger Side-Sensor Circuit Short to Ground 8B-89
DTC B1084 / B1094: Driver / Passenger Side-Sensor Circuit Short to Power Circuit or Open 8B-91
DTC B1085 / B1095: Wrong Side-Sensor (Driver Side / Passenger) ID 8B-93
DTC B1361 / B1365: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance High 8B-93
DTC B1362 / B1366: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance Low 8B-95
DTC B1363 / B1367: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Ground 8B-97
DTC B1364 / B1368: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Power Circuit 8B-99
Inspection of Intermittent and Poor Connections 8B-101
Repair and Inspection Required after Accident 8B-102
Repair Instructions 8B-105
Disabling Air Bag System 8B-105
Enabling Air Bag System 8B-105
SDM Removal and Installation 8B-106
SDM Inspection 8B-107
Driver Air Bag (Inflator) Module Removal and Installation 8B-107
Driver Air Bag (Inflator) Module Inspection 8B-108
Passenger Air Bag (Inflator) Module Removal and Installation 8B-109
Passenger Air Bag (Inflator) Module Inspection 8B-110
Side-Air Bag (Inflator) Module Removal and Installation 8B-111
Side-Air Bag (Inflator) Inspection 8B-112
Side Curtain-Air Bag (Inflator) Module Removal and Installation 8B-113
Side Curtain-Air Bag (Inflator) Module Inspection 8B-114
Forward-Sensor Removal and Installation 8B-114
Forward-Sensor Inspection 8B-115
Side-Sensor Removal and Installation 8B-115
Side-Sensor Inspection 8B-116
Passenger Air Bag (Inflator) Module Repair Harness Installation 8B-117
Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal 8B-118
Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal 8B-128
Specifications 8B-129
Tightening Torque Specifications 8B-129
Special Tools and Equipment 8B-129
Use of Special Tools 8B-129
Recommended Service Material 8B-130
Special Tool 8B-131

Precautions

Precautions

Precautions on Restraint

S4RS0A8000001

Air Bag System Service Warning
Refer to “Air Bag System Service Warning: in Section 00”.

Fastener Caution
Refer to “Fastener Caution: in Section 00”.

Precautions on Service and Diagnosis of Seat Belt
Refer to “Precautions on Service and Diagnosis of Seat Belt: in Section 8A”.

Precautions on Service and Diagnosis of Air Bag System
Refer to “Precautions on Service and Diagnosis of Air Bag System: in Section 8B”.

Precautions on Handling and Storage of Air Bag Components
Refer to “Precautions on Handling and Storage of Air Bag System Components: in Section 8B”.

Precautions on Disposal of Air Bag and Seat Belt Pretensioner
Refer to “Precautions on Disposal of Air Bag and Seat Belt Pretensioner: in Section 8B”.

Seat Belts

Precautions

Precautions on Service and Diagnosis of Seat Belt

S4RS0A8100001

WARNING:

If replacing seat belt is necessary, replace buckle and seat belt assembly together as a set. This is for the reason of ensuring locking of tongue plate with buckle. If these parts are replaced individually, such a locking condition may become unreliable. For this reason, SUZUKI will supply only the spare buckle and seat belt assembly in a set part.

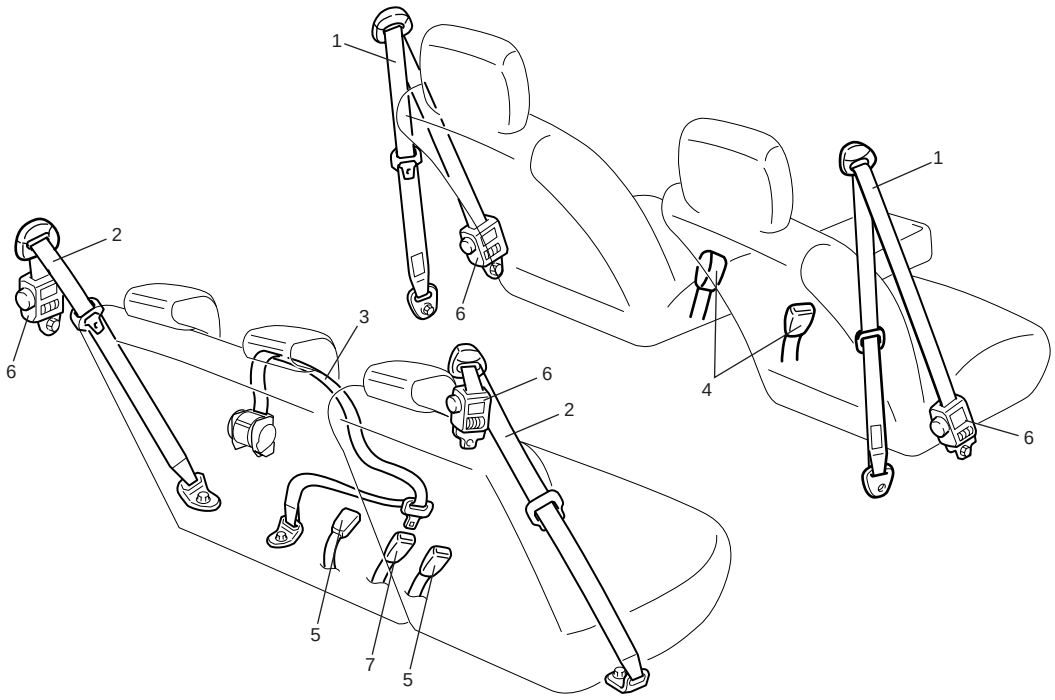
Before servicing or replacing seat belts, refer to the following precautionary items.

- Seat belts should be normal relative to strap retractor and buckle portions.
- Keep sharp edges and damaging objects away from belts.
- Avoid bending or damaging any portion of belt buckle or latch plate.
- Do not bleach or dye belt webbing. (Use only mild soap and lukewarm water to clean it.)
- When installing a seat belt anchor bolt, it should be tightened by hand at first to prevent cross-threading and then to specified torque.
- Do not attempt any repairs on retractor mechanisms or retractor covers. Replace defective assemblies with new replacement parts.
- Keep belts dry and clean at all times.
- If there exist any parts in question, replace such parts.
- Replace belts whose webbing is cut or otherwise damaged.
- Do not put anything into trim panel opening which seat belt webbing passes through.

General Description

Seat Belt Construction

S4RS0A8101001



I4RS0A810001-

1. Front seat belt assembly (with ELR and pretensioner)	4. Buckle for front seat belt assembly	7. Buckle for rear center seat belt
2. Rear seat belt assembly (with A-ELR)	5. Buckle for rear seat belt assembly	
3. Rear center seat belt (with A-ELR)	6. Retractor assembly	

Seat Belt with ELR
The seat belt with emergency locking retractor (ELR) is designed so that it locks immediately (to prevent the webbing from being pulled out of the retractor any further) when any of the following items is detected as exceeding each set value;

- Speed at which the webbing is pulled out of the retractor.
- Acceleration or deceleration of the vehicle speed.
- Inclination.

Seat Belt with A-ELR
The automatic and emergency locking retractor (A-ELR) works as an Emergency Locking Retractor (ELR) till its webbing is pulled all the way out and then on as an Automatic Locking Retractor (ALR) till it is retracted fully.
ALR: Automatically locks when the webbing is pulled out from the retractor and allowed to retract even a little. Then the webbing can not be pulled out any further, unless it is wound all the way back into the retractor, which releases the lock and allows the webbing to be pulled out.

Seat Belt with ELR and Pretensioner
The seat belt with ELR and a pretensioner has a pretensioner mechanism which operates in linkage with the air bag in addition to the described ELR.
The pretensioner is incorporated in retractor assembly and controlled by SDM as one of air bag system components. It will be activated at the same time as the driver and passenger air bag module when an impact at the front of vehicle exceeds the specified value.
When servicing seat belt (retractor assembly) with pretensioner, be sure to observe all WARNINGS and CAUTIONS and “Precautions on Service and Diagnosis of Air Bag System: in Section 8B”.

CAUTION:

Do not reuse the seat belt pretensioner (retractor assembly) that has activated. Replace it with a new seat belt assembly and buckle together as a set. For checking procedure of its activation, refer to “Repair and Inspection Required after Accident: in Section 8B”.

Diagnostic Information and Procedures

Repair and Inspection Required after Accident

S4RS0A8104001

After an accident, whether the seat belt pretensioner has been activated or not, be sure to perform checks and repairs described on “Repair and Inspection Required after Accident: in Section 8B”.

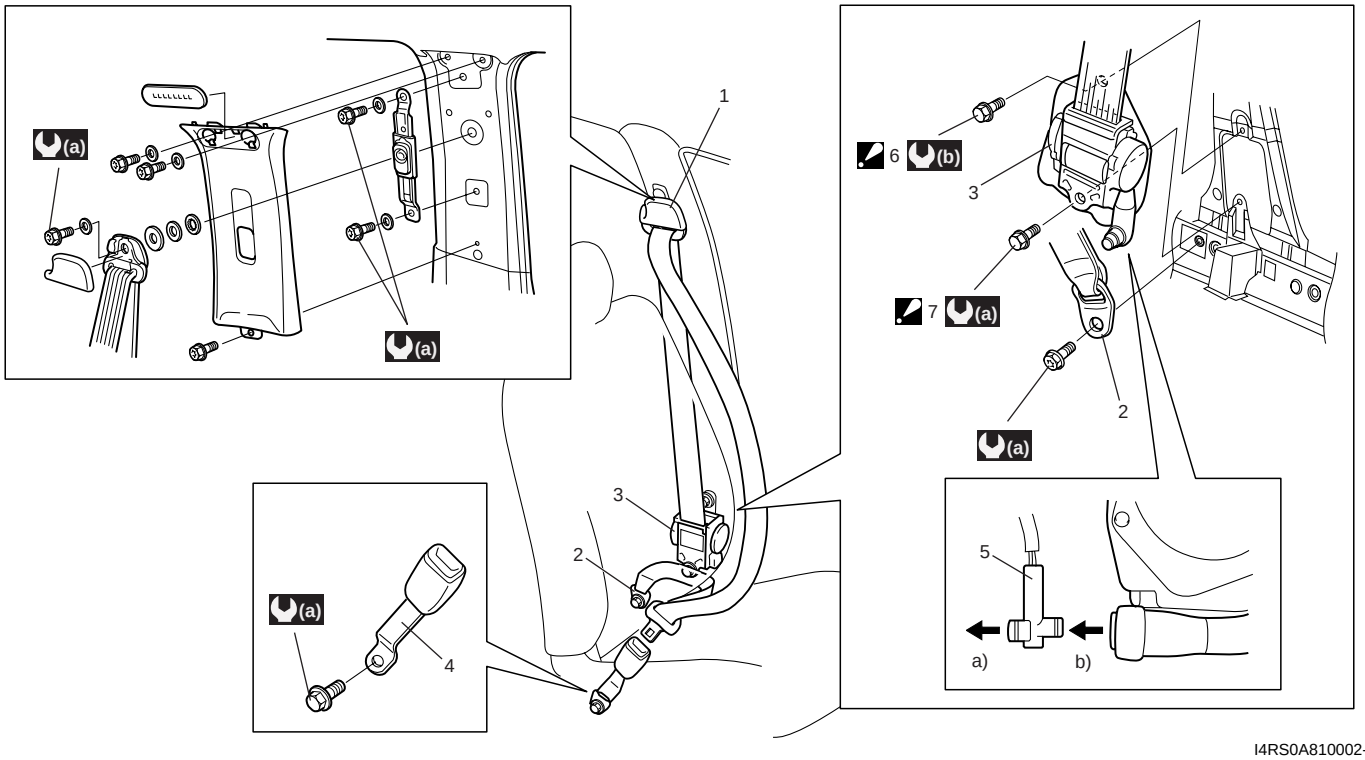
Repair Instructions

Front Seat Belt Components

S4RS0A8106001

WARNING:

- **Never attempt to disassemble or repair the seat belt pretensioner (retractor assembly). If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Seat Belt: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner when necessary.**



I4RS0A810002-

1. Upper anchor	4. Buckle	7. Retractor assembly lower mounting bolt : After tightening lower bolt, tighten upper bolt.
2. Lower anchor	5. Yellow connector (for seat belt pretensioner)	(a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
3. Retractor assembly	6. Retractor assembly upper mounting bolt : After tightening lower bolt, tighten upper bolt.	(b) : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

Front Seat Belt Removal and Installation

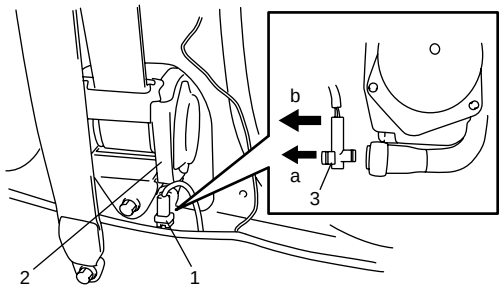
S4RS0A8106002

WARNING:

- **Never attempt to disassemble or repair the seat belt pretensioner (retractor assembly). If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Seat Belt: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner when necessary.**

Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system. Refer to "Disabling Air Bag System: in Section 8B".
3) Remove center pillar lower trim.
4) Disconnect Yellow connector (1) from seat belt pretensioner (2).
   a) Release locking of lock button (3).
   b) After unlocked, disconnect to connector.



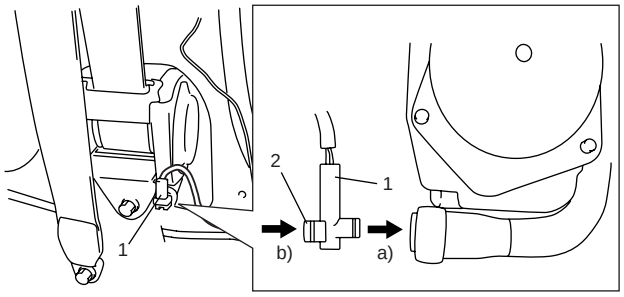
I2RH01810003-

5) Remove front seat belts from the vehicle.

Installation

Install in reverse order of removal, noting the following.

- Seat belt anchor bolts should have an unified fine thread (7/16-20 UNF). Under no circumstances should any different sized or metric screw threads be used.
- Connect Yellow connector (1) to seat belt pretensioner securely.
  a. Connect connector.
  b. Lock connector with lock slider (2).



I5RH01810002-

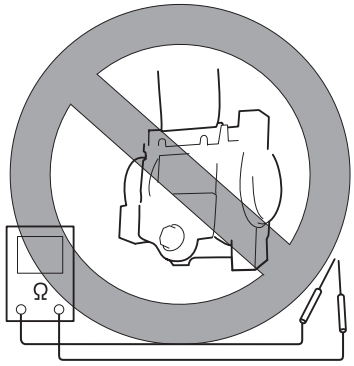
- Enable air bag system. Refer to “Enabling Air Bag System: in Section 8B”.

Front Seat Belt Inspection

S4RS0A8106003

WARNING:

- **Never attempt to disassemble or repair the seat belt pretensioner (retractor assembly). If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read “Precautions on Service and Diagnosis of Seat Belt: ”, before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner when necessary.**
- **Never measure resistance of pretensioner or disassemble it. Otherwise, personal injury may result.**



I2RH01810004-

CAUTION:

If seat belt pretensioner (retractor assembly) was dropped from a height of 30 cm (1 ft) or more, it should be replaced.

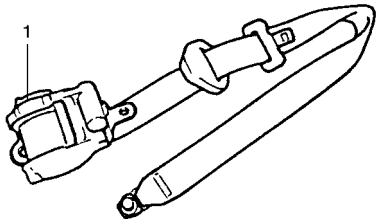
Seat belts and attaching parts can affect the vital components and systems of a vehicle.
Therefore, they should be inspected carefully and replaced with genuine parts only.

Seat Belt

- The seat belt webbing or strap should be free from damage.

Retractor Assembly (with Seat Belt Pretensioner)

1) Let the seat belt retract fully to confirm its easy retraction.
   - The retractor assembly should lock webbing when pulled quickly.
   - The front seat belt retractor assembly (1) should pass the inspection and should lock webbing even when tilted (approx. 15°) toward the fore and aft or right and left directions.
2) Check retractor assembly (1) with seat belt pretensioner appearance visually for following symptoms and if any one of them is applicable, replace it with a new one as an assembly.
   - Pretensioner has activated.
   - There is a crack in seat belt pretensioner (retractor assembly).
   - Seat belt pretensioner (retractor assembly) is damaged or a strong impact (e.g., dropping) was applied to it.



I2RH01810005-

Anchor Bolt

- Anchor bolts should be torqued to specification.

Belt Latch

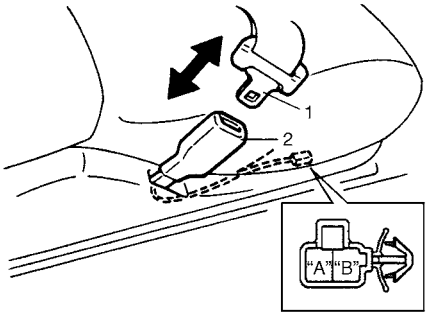
- It should be secure when latched.

Seat Belt Switch

Check driver side seat belt switch for continuity by using ohmmeter.

Seat belt switch specification

Without inserted buckle tongue to buckle catch:
Terminal "A" and "B": Continuity
With inserted buckle tongue to buckle catch:
Terminal "A" and "B": No continuity



I4RS0B810001-

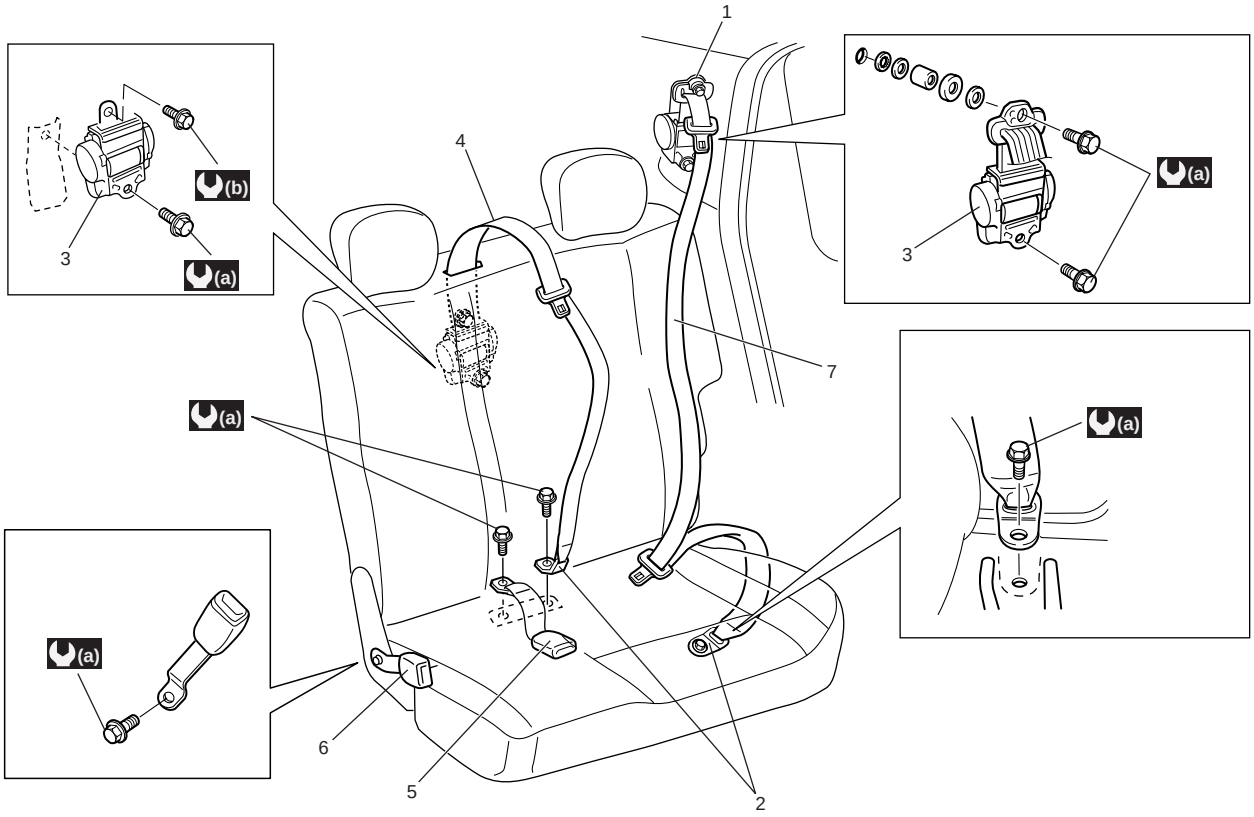
1.	Buckle tongue
2.	Buckle catch

Rear Seat Belt Components

S4RS0A8106006

WARNING:

Be sure to read “Precautions on Service and Diagnosis of Seat Belt: ” before starting to work and observe every precaution during work.



I4RS0A810003-

1. Upper anchor	4. Rear center seat belt	7. Rear seat belt
2. Lower anchor	5. Buckle for rear seat belt	(a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
3. Retractor assembly	6. Buckle for rear center seat belt	(b) : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

Rear Seat Belt Removal and Installation

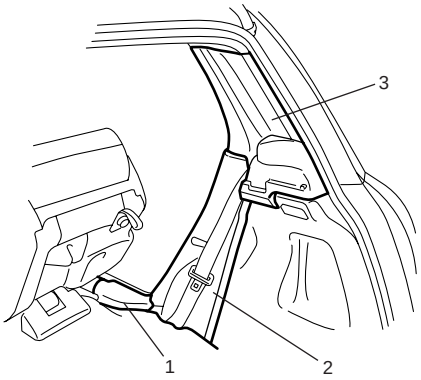
S4RS0A8106004

WARNING:

Be sure to read “Precautions on Service and Diagnosis of Seat Belt: ” before starting to work and observe every precaution during work.

Removal

1) Fold rear seats referring to “Folding Rear Seats” in Owners Manual.
2) Remove rear side sill scuff (1), quarter lower trim (2) and quarter upper trim (3).



I4RS0A810004-

3) Remove rear seat belt referring to “Rear Seat Belt Components: ”.

Installation

Reverse removal procedure for installation noting the following.

- Seat belt anchor bolts should have an unified fine thread (7/16-20 UNF). Under no circumstances should any different sized or metric screw threads be used.

Rear Seat Belt Inspection

S4RS0A8106005

WARNING:

Be sure to read “Precautions on Service and Diagnosis of Seat Belt: ” before starting to work and observe every precaution during work.

- Check the rear seat belt in the same way as “Front Seat Belt Inspection: ”.
- As to seat belts with A-ELR, check them as follows.
  – With vehicle at stop, pull seat belt all the way out, let it retract a little and try to pull it. It should not be pulled out, that is, it should be locked where retracted.
  – Let seat belt retract to its original state. Next, pull it half way out, let it retract a little and try to pull it again. It should be pulled out smoothly, that is it should not be locked at this time.

Specifications

Tightening Torque Specifications

S4RS0A8107001

NOTE:

The specified tightening torque is also described in the following.
“Front Seat Belt Components: ”
“Rear Seat Belt Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Air Bag System

Precautions

Precautions on Service and Diagnosis of Air Bag System

S4RS0A8200001

WARNING:

- **If the air bag system and another vehicle system both need repair, SUZUKI recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.**
- **Do not modify the steering wheel, dashboard, both front seat or any other on or around air bag system components. Modifications can adversely affect air bag system performance and lead to injury.**
- **Be sure to follow the procedures described in this section. Failure to follow procedures could result in possible air bag system activation, personal injury or unneeded air bag system repairs.**

- WARNING / CAUTION labels are attached on each part of air bag system components (SDM, air bag (inflator) modules and seat belt pretensioners). Be sure to follow the instructions.
- Many of service procedures require disconnection of “A/BAG” fuse and air bag (inflator) module(s) (driver, passenger, side of both sides and curtain of both sides) from initiator circuit to avoid an accidental deployment.
- Do not apply power to the air bag system unless all components are connected or a diagnostic flow requests it, as this will set a DTC.
- The “Air Bag Diagnostic System Check: ” must be the starting point of any air bag diagnostics. The “Air Bag Diagnostic System Check: ” will verify proper “AIR BAG” warning lamp operation and will lead you to the correct flow to diagnose any air bag malfunctions. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacements.
- Never use air bag component parts from another vehicle.
- If the vehicle will be exposed to temperatures over 93 °C (200 °F) (for example, during a paint baking process), remove the air bag system components beforehand to avoid component damage or unintended system activation.
- When handling the air bag (inflator) modules (driver, passenger, side of both sides and curtain of both sides), seat belt pretensioners (driver and passenger), SDM, forward-sensor or side-sensor, be careful not to drop it or apply an impact to it. If an excessive impact was applied (e.g., SDM, forward-sensor and side-sensor are dropped, air bag (inflator) module is dropped from a height of 90 cm (3 ft) or more, seat belt pretensioner (retractor assembly) is dropped from a height of 30 cm (1 ft) or more), never attempt disassembly or repair but replace it with a new one.
- When using electric welding, be sure to disconnect air bag (inflator) module connectors (driver, passenger, side of both sides and curtain of both sides) and seat belt pretensioner connectors (driver and passenger) respectively.
- When applying paint around the air bag system related parts, use care so that the harness or connector will not be exposed to the paint mist.
- Never expose air bag system component parts directly to hot air (drying or baking the vehicle after painting) or flames.

WARNING:

When performing service on or around air bag system components or air bag wiring, follow the procedures listed in “Disabling Air Bag System: ” to temporarily disable the air bag system.
Failure to follow procedures could result in possible air bag system activation, personal injury or unneeded air bag system repairs.

Precautions on Handling and Storage of Air Bag System Components

S4RS0A8200002

SDM

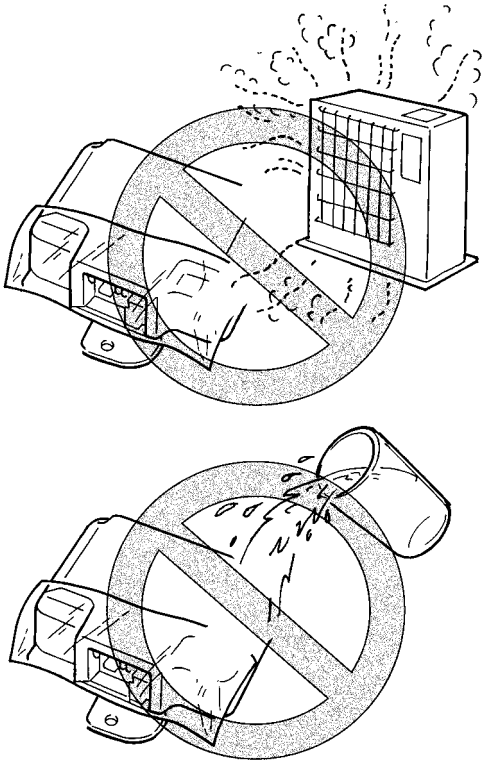
WARNING:

Never power up air bag system when SDM is not rigidly attached to the vehicle. Otherwise, personal injury may result.

CAUTION:

After detecting one time of such collision as to meet deployment conditions, SDM must not be used. Refer to “Air Bag Diagnostic System Check: ” when checking SDM.

- Never attempt disassembly of SDM.
- When storing SDM, select a place where neither high temperature nor high humidity is anticipated and oil, water and dust are kept off.



I5RH01820001-

- If SDM has been dropped, replace it with a new one.
- If SDM installation part of floor was damaged, repair that part completely before reinstallation.
- All SDM and mounting bracket fasteners must be carefully torqued and the arrow must be pointed toward the front of the vehicle to ensure proper operation of the air bag system.

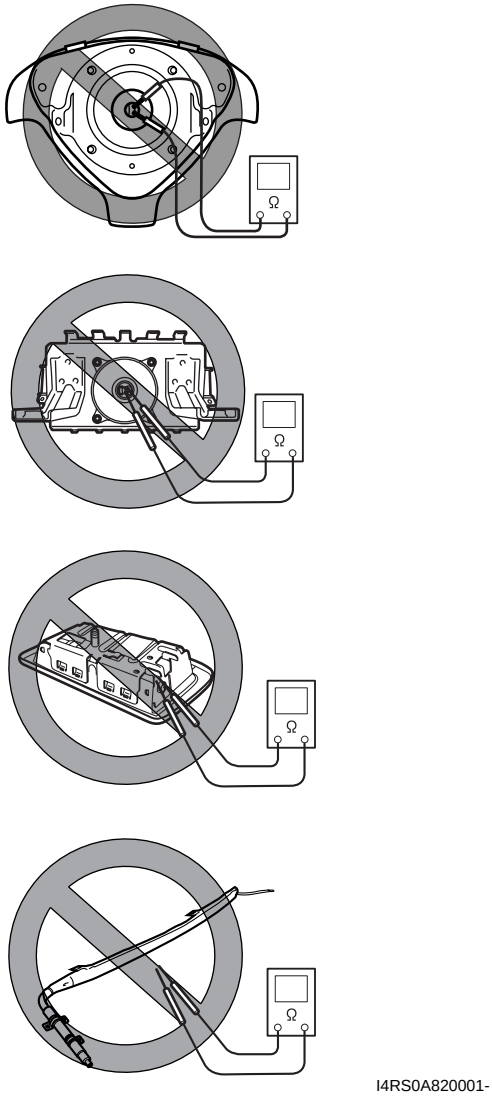
Live (Undeployed) Air Bag (Inflator) Modules

Special care is necessary when handling and storing a live (undeployed) air bag (inflator) modules.

The rapid gas generation produced during deployment of the air bag could cause the air bag (inflator) module, or an object in front of the air bag (inflator) module, to be thrown through the air in the unlikely event of an accidental deployment.

WARNING:

Never attempt to measure the resistance of the air bag (inflator) modules (driver, passenger and side of both sides and curtain of both sides). It is very dangerous as the electric current from the tester may deploy the air bag.



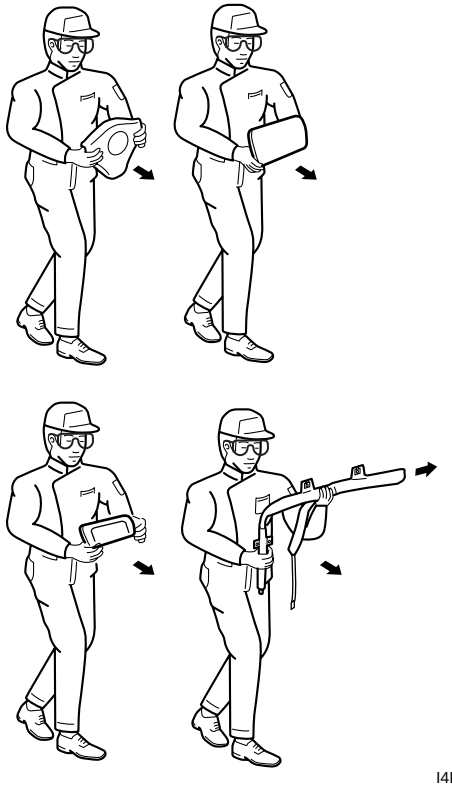
I4RS0A820001-

- Never attempt disassembly of the air bag (inflator) modules.
- If any abnormality is found, be sure to replace it with new one as an assembly.
- When an abnormality is noted as existing in the live (undeployed) air bag (inflator) module, be sure to deploy it before discarding it.
- When grease, cleaning agent, oil, water, etc., got on the air bag (inflator) modules (driver, passenger, side of both sides and curtain of both sides), wipe it off immediately with a dry cloth.
- If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced with a new one as an assembly.

WARNING:

- **For handling and storage of a live air bag (inflator) module, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. Never carry the air bag (inflator) module by the wires or connector on the underside of the module.**

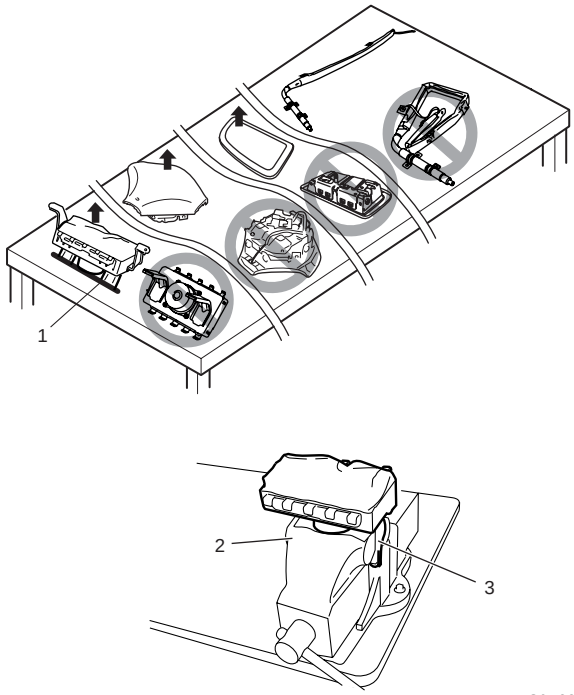
Otherwise, personal injury may result.



I4RS0A820002-

WARNING:

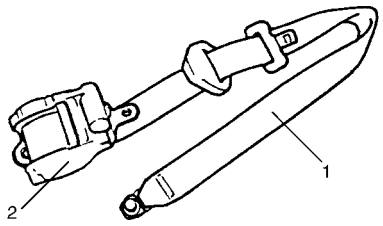
When placing a live air bag (inflator) module on bench or other surface, always face the bag up, away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit (1) or use the workbench vise (2) to hold it securely at its lower mounting bracket (3).
It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules.
This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.
Otherwise, personal injury may result.



I4RS0A820003-

Live (Inactivated) Seat Belt Pretensioner

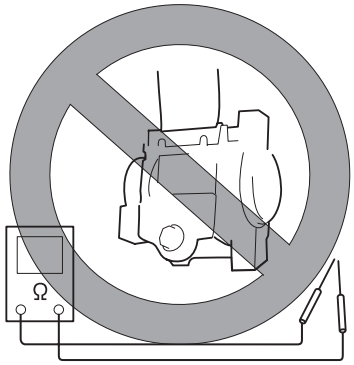
Special care is necessary when handling and storing a live (inactivated) seat belt pretensioners.
Also, when the seat belt pretensioners activate, gas is generated and the seat belt (1) is retracted into the retractor assembly (2) quickly.
Note, therefore, that if they activate accidentally, the seat belt pretensioners and other object(s) around them may be thrown through the air.



I3JA01820043-

WARNING:

Never attempt to measure the resistance of the seat belt pretensioners. It is very dangerous as the electric current from the tester may activate pretensioner.



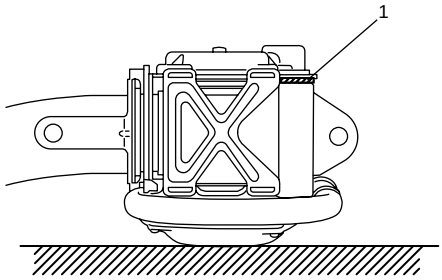
I2RH01820047-

- Never attempt to disassemble the seat belt pretensioners (retractor assembly).
- If any abnormality is found, be sure to replace it with new one as an assembly.
- When an abnormality is noted as existing in the live (inactivated) seat belt pretensioner, be sure to activate it before discarding it.
- When grease, cleaning agent oil, water, etc., got on the seat belt pretensioners (retractor assembly), wipe it off immediately with a dry cloth.
- If seat belt pretensioner was dropped from a height of 30 cm (1 ft) or more, it should be replaced with a new one as an assembly.

WARNING:

- **For handling and storage of a live seat belt pretensioner, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Never carry the seat belt pretensioner by webbing.**
- **When placing a live seat belt pretensioner on the workbench or other surface, be sure not to lay it with its exhaust hole (1) provided side facing down. It is also prohibited to put something on its face with an exhaust hole (1) or to put a seat belt pretensioner on top of another.**

Otherwise, personal injury may result.



I2RH01820048-

Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner

WARNING:

- **The air bag (inflator) module and seat belt pretensioner immediately after deployment/activation is very hot. Wait for at least 30 minutes to cool it off before proceeding the work.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module and to activate seat belt pretensioner.**
- **After an air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and by-products of the chemical reaction. As with many service procedures, gloves and safety glasses should be worn.**
- **Wash your hands with mild soap and water after completing the work.**

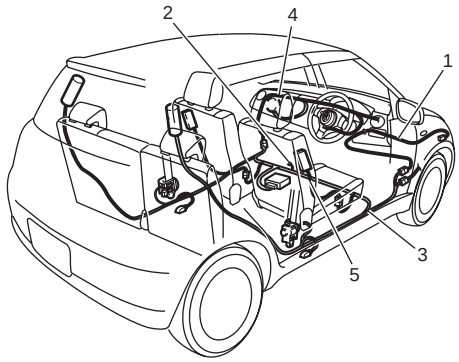
Refer to the procedure described under “Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal: ” for disposal.

Air Bag Wire Harness and Connector

Air bag wire harness is included in main harness (1), instrument panel harness (4), floor harness (3) and seat harness (5). Air bag wire harness can be identified easily as the part of connector side wire harness is covered with a yellow protection tube. Be very careful when handling it.

- When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.
- When installing it, be careful so that the air bag wire harness is not caught or does not interfere with other parts.

- Make sure air bag system grounding point (2) is clean and ground is securely fastened for optimum metal-to-metal contact. Poor grounding can cause intermittent problems that are difficult to diagnose.



I4RS0A820004-

Precautions on Disposal of Air Bag and Seat Belt Pretensioner

S4RS0A8200003

Do not dispose of the live (undeployed) air bag (inflator) modules and the live (inactivated) seat belt pretensioners.
When disposal is necessary, be sure to deploy / activate the air bag and seat belt pretensioner according to deployment / activation procedure described in “Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal: ”.

WARNING:

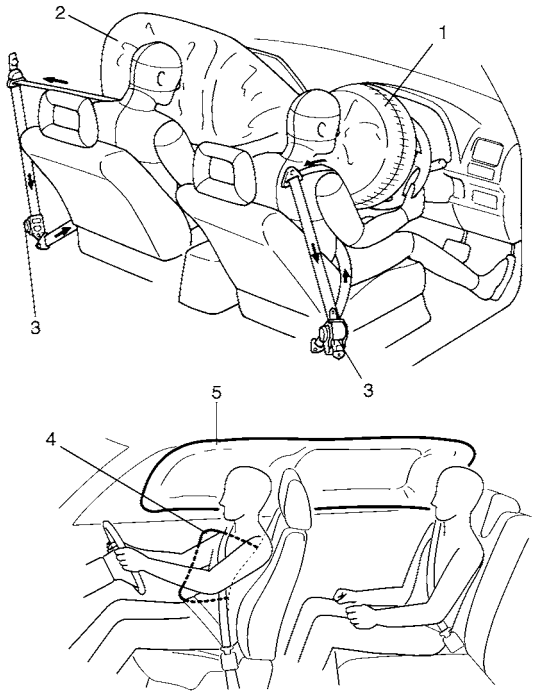
Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which could cause personal injury. Undeployed air bag (inflator) module and inactivated seat belt pretensioner must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module and inactivated seat belt pretensioner contain substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

General Description

Air Bag System Construction

S4RS0A8201001

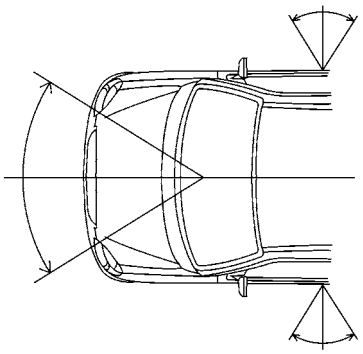
With the air bag system which includes front air bags, side curtain-air bag and side-air bags for both the driver’s and passenger’s sides as well as the seat belt pretensioners, the sag of the seat belt is taken up (for seat belt with pretensioner), the driver air bag (inflator) module is deployed from the center of the steering column and the passenger air bag (inflator) module from the top of the instrument panel in front of the front passenger seat in occurrence of a front collision with an impact larger than a certain set value to supplement protection offered by the driver and front passenger seat belts.
Side-air bag (inflator) module is deployed from the side of the seat back in occurrence of a sideward collision with an impact larger than a certain set value.
Side curtain-air bag (inflator) module is deployed from the roof side in occurrence of a sideward collision with an impact larger than a certain set value.



I4RS0A820102-

1. Driver air bag	4. Side-air bag
2. Passenger air bag	5. Side curtain-air bag
3. Seat belt pretensioner	

The air bag system is designed to activate only in severe frontal and sideward collisions. It is not designed to activate in rear impacts, rollovers, or minor frontal and sideward collisions, since it would offer no protection in those types of accidents.



I2RH0B820007-

Air Bag System Input / Output Table

S4RS0A8201002

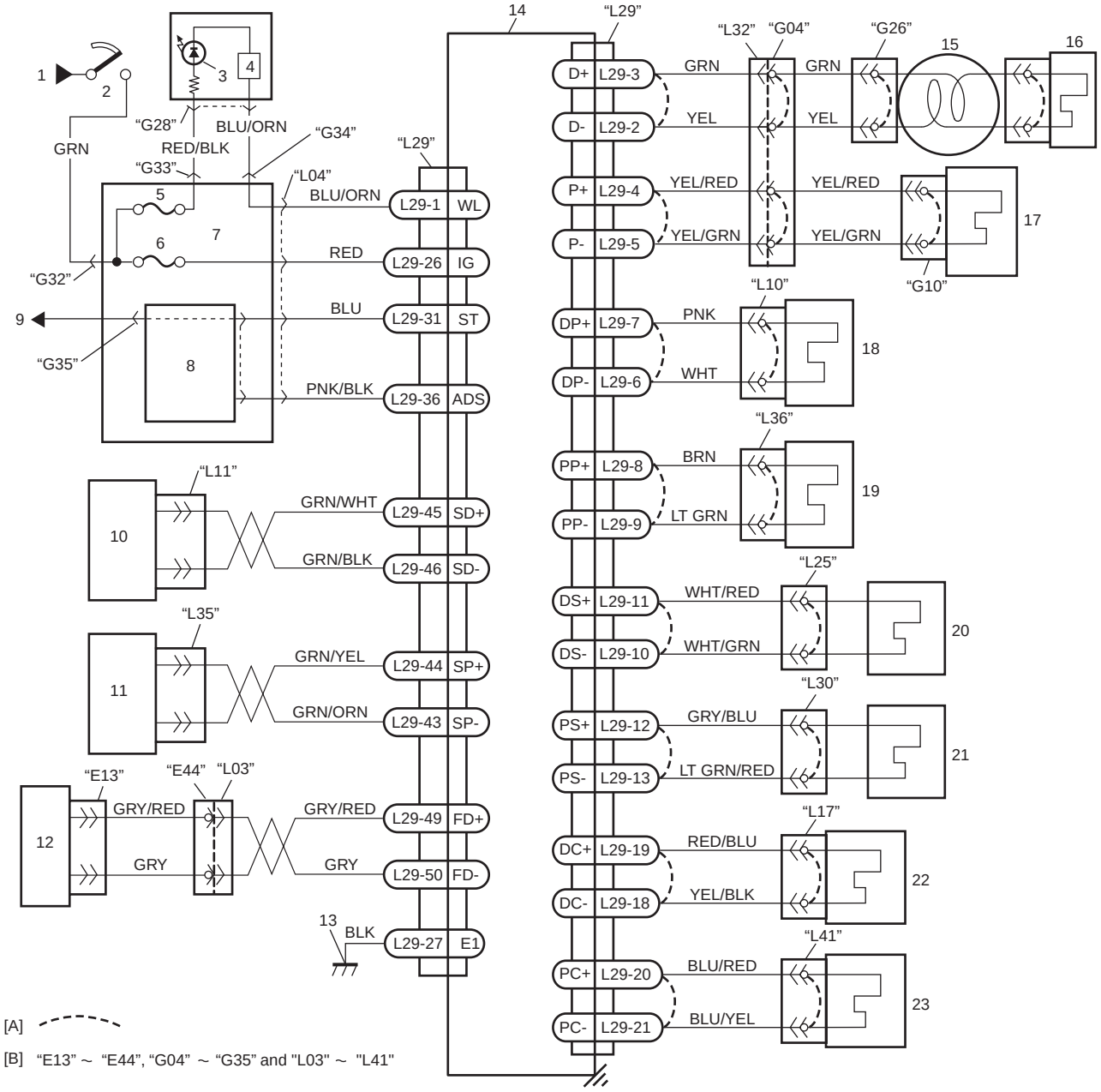
INPUT \ OUTPUT		Driver air bag, Passenger air bag, Seat belt with pretensioner (LH) and Seat belt with pretensioner (RH)	Driver side-air bag and Driver side curtain-air bag	Passenger side-air bag and Passenger side curtain-air bag
Signal from sensor	Sensor in SDM and forward-sensor	○	—	—
	Driver side-sensor	—	○	—
	Passenger side-sensor	—	—	○

I4RS0A820005-

Schematic and Routing Diagram

Air Bag System Wiring Circuit Diagram

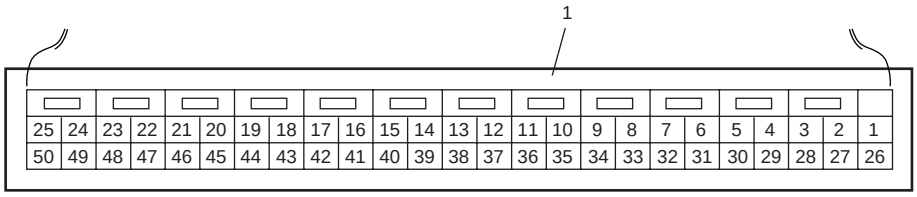
S4RS0A8202001



I4RS0A820006-

[A]: Shorting bar	8. BCM	17. Passenger air bag (inflator) module
[B]: Connector	9. To data link connector (DLC)	18. Driver seat belt pretensioner
1. To battery	10. Driver side-sensor (if equipped)	19. Passenger seat belt pretensioner
2. Ignition switch	11. Passenger side-sensor (if equipped)	20. Driver side-air bag (inflator) module (if equipped)
3. "AIR BAG" warning lamp	12. Forward-sensor	21. Passenger side-air bag (inflator) module (if equipped)
4. Lamp driver	13. Ground for air bag system	22. Driver side curtain-air bag (inflator) module (if equipped)
5. "IG SIG" fuse	14. SDM	23. Passenger side curtain-air bag (inflator) module (if equipped)
6. "A/BAG" fuse	15. Contact coil	
7. Junction block assembly	16. Driver air bag (inflator) module	

Terminal arrangement of SDM (viewed from harness side)



I5RH01820003-

1. SDM Connector “L29”

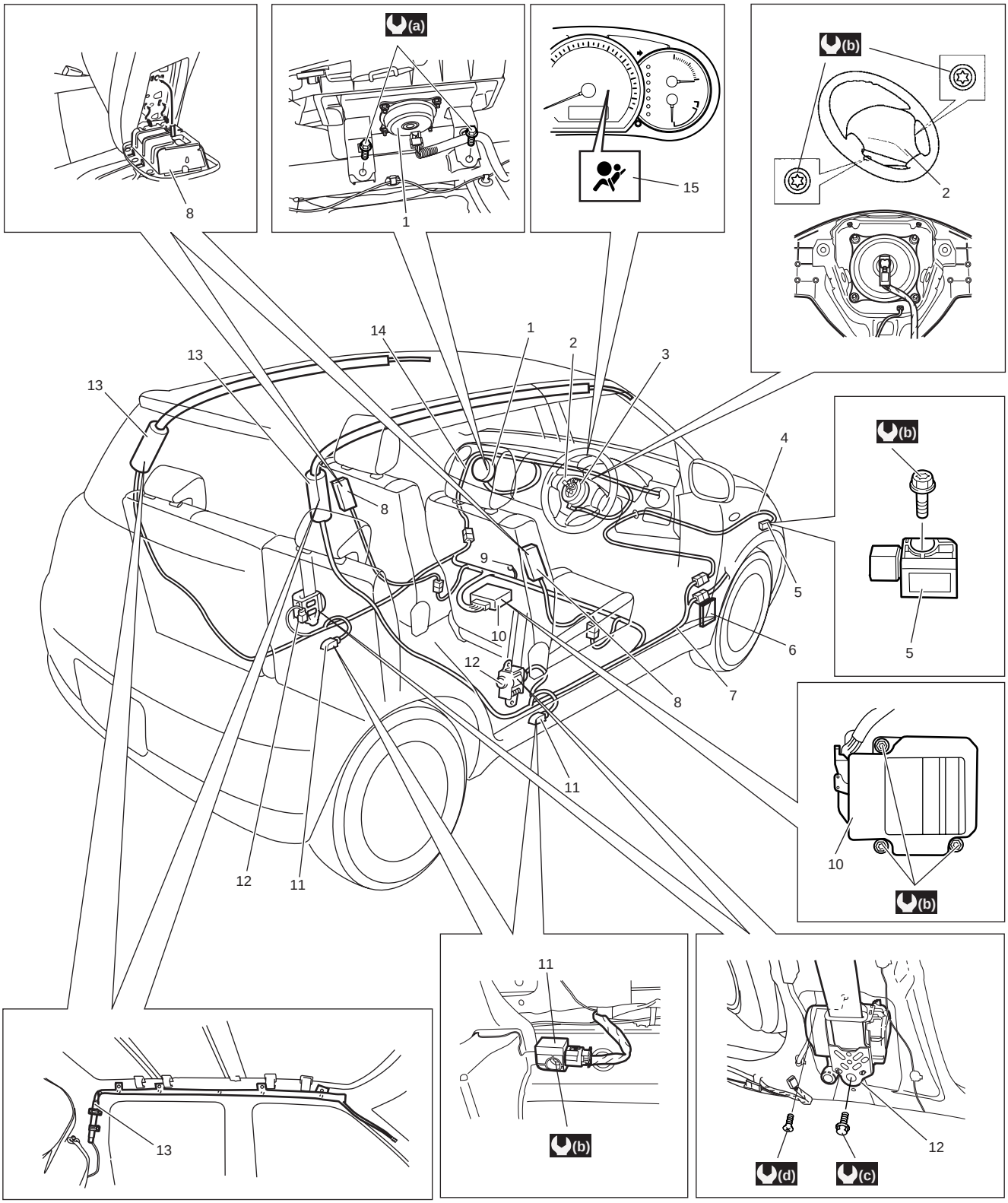
Connector “L29” (SDM connector)

Terminal	Terminal symbol	Circuit	Terminal	Terminal symbol	Circuit
L29-1	WL	“AIR BAG” warning lamp	L29-26	IG	Ignition switch (power source)
L29-2	D1–	Driver air bag (–)	L29-27	E1	Ground
L29-3	D1+	Driver air bag (+)	L29-28	—	—
L29-4	P1+	Passenger air bag (+)	L29-29	—	—
L29-5	P1–	Passenger air bag (–)	L29-30	—	—
L29-6	DP–	Driver seat belt pretensioner (–)	L29-31	ST	DLC
L29-7	DP+	Driver seat belt pretensioner (+)	L29-32	—	—
L29-8	PP+	Passenger seat belt pretensioner (+)	L29-33	—	—
L29-9	PP–	Passenger seat belt pretensioner (–)	L29-34	—	—
L29-10	DS–	Driver side-air bag (–) (If equipped)	L29-35	—	—
L29-11	DS+	Driver side-air bag (+) (If equipped)	L29-36	ADS	Air bag deployed signal for BCM
L29-12	PS+	Passenger side-air bag (+) (If equipped)	L29-37	—	—
L29-13	PS–	Passenger side-air bag (–) (If equipped)	L29-38	—	—
L29-14	—	—	L29-39	—	—
L29-15	—	—	L29-40	—	—
L29-16	—	—	L29-41	—	—
L29-17	—	—	L29-42	—	—
L29-18	DS–	Driver side curtain-air bag (–)	L29-43	SP–	Passenger side-sensor (–)
L29-19	DS+	Driver side curtain-air bag (+)	L29-44	SP+	Passenger side-sensor (+)
L29-20	PS+	Passenger side curtain-air bag (+)	L29-45	SD+	Driver side-sensor (+)
L29-21	PS–	Passenger side curtain-air bag (–)	L29-46	SD–	Driver side-sensor (–)
L29-22	—	—	L29-47	—	—
L29-23	—	—	L29-48	—	—
L29-24	—	—	L29-49	FD+	Forward-sensor (+)
L29-25	—	—	L29-50	FD–	Forward-sensor (–)

Component Location

Air Bag System Components, Wiring and Connectors Location

S4RS0A8203001



I4RS0A820007-

1. Passenger air bag (inflator) module	8. Side-air bag (inflator) module (if equipped)	15. “AIR BAG” warning lamp
2. Driver air bag (inflator) module	9. Ground for air bag system	(a) : 23 N·m (2.3 kg-m, 16.5 lb-ft)
3. Contact coil assembly	10. SDM	(b) : 9 N·m (0.9 kg-m, 6.5 lb-ft)
4. Air bag harness in main harness	11. side-sensor (if equipped)	(c) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
5. Forward-sensor	12. Seat belt pretensioner	(d) : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)
6. “A/BAG” fuse in junction block assembly (including BCM)	13. Side curtain-air bag (inflator) module (if equipped)	
7. Air bag harness in floor harness	14. Air bag harness in instrument panel harness	

Diagnostic Information and Procedures

Air Bag Diagnostic System Check

S4RS0A8204001

WARNING:

To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified in this manual. Do not use a non-powered probe type tester.
Instructions in this manual must be followed carefully, otherwise personal injury may result.

CAUTION:

The order in which DTCs are diagnosed is very important. Failure to diagnose the DTCs in the order specified may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.

The diagnostic procedures used are designed to find and repair air bag system malfunctions.

To get the best results, it is important to use the diagnostic flow and follow the sequence in the following.

1) Perform the “Air Bag Diagnostic System Check Flow: ”.
(The “Air Bag Diagnostic System Check Flow: ” must be the starting point of any air bag system diagnosis. The “Air Bag Diagnostic System Check Flow: ” checks for proper “AIR BAG” warning lamp operation through “AIR BAG” warning lamp and whether air bag DTCs exist.)
2) Refer to the proper diagnostic flow as directed by the “Air Bag Diagnostic System Check Flow: ”.
(The “Air Bag Diagnostic System Check Flow: ” will lead you to the correct flow to diagnose any air bag system malfunctions. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.)
3) Repeat the “Air Bag Diagnostic System Check Flow: ” after any repair or diagnostic procedures have been performed.
(Performing the “Air Bag Diagnostic System Check Flow: ” after all repair or diagnostic procedures will ensure that the repair has been made correctly and that no other malfunctions exist.)

Air Bag Diagnostic System Check Flow

S4RS0A8204087

Flow test description
Step 1: Check that “AIR BAG” warning lamp lights.
Step 2: Check that “AIR BAG” warning lamp lights.
Step 3: Check that “AIR BAG” warning lamp flashes 6 times after ignition switch is turned ON.
Step 4: Check that history codes are in SDM memory.
Step 5: Check that current code is in SDM memory.

Step	Action	Yes	No
1	1) Make sure that battery voltage is about 11 V or higher. 2) Note “AIR BAG” warning lamp as ignition switch is turned ON. *Does “AIR BAG” warning lamp come ON when ignition switch is turned ON?*	Go to Step 2.	Proceed to ““AIR BAG” Warning Lamp Does Not Come ON: ”.
2	*Does “AIR BAG” warning lamp come ON steady?*	Proceed to ““AIR BAG” Warning Lamp Comes ON Steady: ”.	Go to Step 3.
3	*Does “AIR BAG” warning lamp turn OFF, after flashing 6 times?*	“AIR BAG” warning lamp circuit is in good condition. Go to Step 4.	“AIR BAG” warning lamp circuit is in good condition. Go to Step 5.

Step	Action	Yes	No
4	1) Check DTC using SUZUKI scan tool referring to “DTC Check: ”. *Is “NO CODES” displayed on SUZUKI scan tool?*	Air bag system is in good condition.	An intermittent trouble has occurred at some place. Check the connector harness, etc. related to the sensed DTC. Refer to “Inspection of Intermittent and Poor Connections: ”. Then clear DTC (referring to “DTC Clearance: ”.) and repeat this flow.
5	Check DTC using SUZUKI scan tool, referring to “DTC Check: ”. *Is “NO CODES” displayed on SUZUKI scan tool?*	Substitute a known-good SDM and recheck.	Check and repair according to flow corresponding to that DTC.

DTC Table

S4RS0A8204004

SDM DTC

DTC	Diagnosis		
—	Normal		—
☞ B1013	SDM	SDM fault	Diagnose trouble according to diagnostic flow corresponding to each code No.
☞ B1014		“AIR BAG” warning lamp circuit failure	
☞ B1016	Power source voltage	Too high	
☞ B1017		Too low	
☞ B1021	SDM	Front air bag module exploded	
☞ B1024		Driver side-air bag module exploded	
☞ B1025		Passenger side-air bag module exploded	
☞ B1026		Pretensioner activated	
☞ B1027		Reusable number exceeded	
☞ B1031	Driver air bag circuit	Resistance high	
☞ B1032		Resistance low	
☞ B1033		Short to ground	
☞ B1034		Short to power circuit	

DTC	Diagnosis	
☞ B1041	Passenger air bag circuit	Resistance high
☞ B1042		Resistance low
☞ B1043		Short to ground
☞ B1044		Short to power circuit
☞ B1051	Driver pretensioner circuit	Resistance high
☞ B1052		Resistance low
☞ B1053		Short to ground
☞ B1054		Short to power circuit
☞ B1055	Passenger pretensioner circuit	Resistance high
☞ B1056		Resistance low
☞ B1057		Short to ground
☞ B1058		Short to power circuit
☞ B1061	Driver side-air bag	Resistance high
☞ B1062		Resistance low
☞ B1063		Short to ground
☞ B1064		Short to power circuit
☞ B1065	Passenger side-air bag	Resistance high
☞ B1066		Resistance low
☞ B1067		Short to ground
☞ B1068		Short to power circuit
☞ B1071	Forward-sensor circuit	Performance problem
☞ B1072		Communication error
☞ B1073		Short to ground
☞ B1074		Short to power circuit or open

DTC	Diagnosis		
☞ B1081	Driver side-sensor	Performance problem	
☞ B1082		Communication error	
☞ B1083		Short to ground	
☞ B1084		Short to power circuit or open	
☞ B1085		Wrong assembly	
☞ B1091	Passenger side-sensor	Performance problem	
☞ B1092		Communication error	
☞ B1093		Short to ground	
☞ B1094		Short to power circuit or open	
☞ B1095		Wrong assembly	
☞ B1361	Driver side curtain-air bag circuit	Resistance high	
☞ B1362		Resistance low	
☞ B1363		Short to ground	
☞ B1364		Short to power circuit	
☞ B1365	Passenger side curtain-air bag circuit	Resistance high	
☞ B1366		Resistance low	
☞ B1367		Short to ground	
☞ B1368		Short to power circuit	

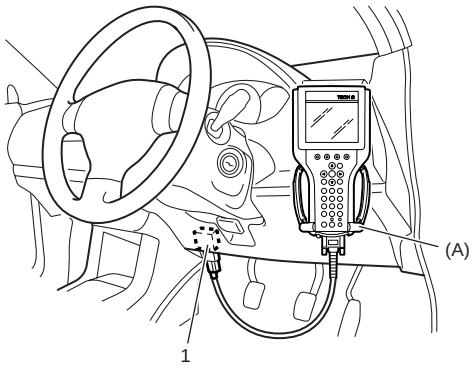
DTC Check

S4RS0A8204005

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) located on underside of instrument panel at driver's seat side.

   Special tool
   (A): SUZUKI scan tool

3) Turn ignition switch to ON position.
4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to SUZUKI scan tool operator's manual for further details.
   If communication between scan tool and SDM is not possible, check if scan tool is communicable by connecting it to SDM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC) (1).



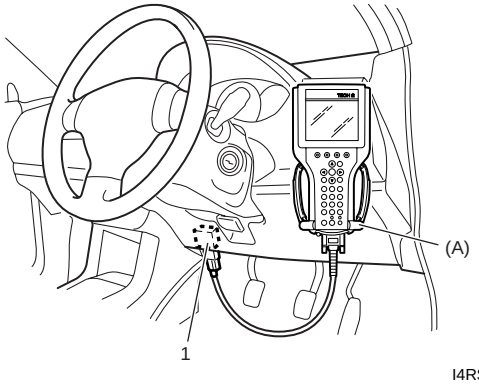
I4RS0A820008-

DTC Clearance

S4RS0A8204006

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) in the same manner as when making this connection for DTC check.

   Special tool
   (A): SUZUKI scan tool



I4RS0A820008-

3) Turn ignition switch to ON position.
4) Erase DTC according to instructions displayed on SUZUKI scan tool. Refer to SUZUKI scan tool operator's manual for further details.
5) After completing the clearance, perform "DTC Check: " and confirm that normal DTC (NO CODES) is displayed and not malfunction DTC.
6) Turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

NOTE:

If DTC B1013, DTC B1021 or DTC B1027 is stored in SDM, it is not possible to clear DTC.

Scan Tool Data

S4RS0A8204068

Data list of SDM

Scan Tool Data	Normal Condition / Reference Value
Battery voltage	10 – 14 V
Back up volt	27.0 – 33.0 V
System ID	4ch or 8ch
Driv A/B Ini Res	2.1 – 3.8 ohm
Pass A/B Ini Res	1.8 – 2.8 ohm
Driv Preten Ini Res	1.8 – 2.9 ohm
Pass Preten Ini Res	1.8 – 2.9 ohm
Driv Sidebag Ini Res	1.8 – 2.6 ohm
Pass Sidebag Ini Res	1.8 – 2.6 ohm
Driv curtain Ini Res	1.8 – 2.8 ohm
Pass curtain Ini Res	1.8 – 2.8 ohm

Scan Tool Data Definition

Back Up Volt (V): This parameter indicates the capacity of the backup condenser installed to maintain the ignition current (as much as possible) even when the power supply to SDM that ignites the inflator is shut off.

Battery Voltage (V): Battery voltage is an analog input signal read by SDM.

System ID (4ch/8ch): This parameter indicates the number of initiator circuits.

Driv A/B Ini Res (Driver air bag initiator resistance) (ohm): This parameter indicates the resistance of the driver air bag initiator circuit.

Pass A/B Ini Res (Passenger air bag initiator resistance) (ohm): This parameter indicates the resistance of the passenger air bag initiator circuit.

Driv Preten Ini Res (Driver pretensioner initiator resistance) (ohm): This parameter indicates the resistance of the driver seat belt pretensioner initiator circuit.

Pass Preten Ini Res (Passenger pretensioner initiator resistance) (ohm): This parameter indicates the resistance of the passenger seat belt pretensioner initiator circuit.

Driv Sidebag Ini Res (Driver side-air bag initiator resistance) (ohm): This parameter indicates the resistance of the driver side-air bag initiator circuit.

Pass Sidebag Ini Res (Passenger side-air bag initiator resistance) (ohm): This parameter indicates the resistance of the Passenger side-air bag initiator circuit.

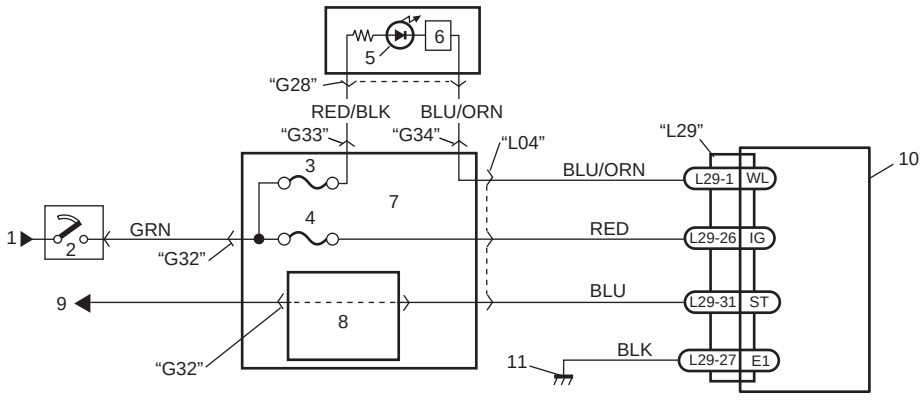
Driv curtain Ini Res (Driver side curtain-air bag initiator resistance) (ohm): This parameter indicates the resistance of the driver side curtain-air bag initiator circuit.

Pass curtain Ini Res (Passenger side curtain-air bag initiator resistance) (ohm): This parameter indicates the resistance of the passenger side curtain-air bag initiator circuit.

"AIR BAG" Warning Lamp Comes ON Steady

S4RS0A8204007

Wiring Diagram



I4RS0A820009-

1. From main fuse	5. "AIR BAG" warning lamp in combination meter	9. To DLC
2. Ignition switch	6. Lamp driver	10. SDM
3. "IG SIG" fuse	7. Junction block assembly	11. Ground for air bag system
4. "AIR BAG" fuse	8. BCM	

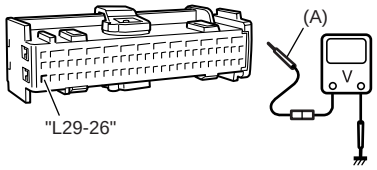
CAUTION:

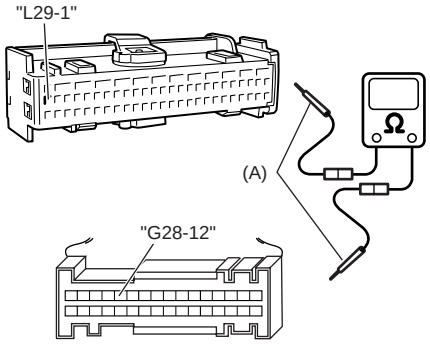
- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

Flow Test Description

Step 1: Check for “AIR BAG” fuse blown.
Step 2, 3: Check for loose connection between junction block assembly connector and junction block assembly.
Step 4: Check for loose connection between SDM connector and SDM.
Step 5: Check for SDM power supply circuit.
Step 6: Check for short circuit between “AIR BAG” warning lamp circuit and ground.

Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. 2) Remove and inspect “AIR BAG” fuse. *Is fuse good?*	Go to Step 2.	“RED” wire short to ground. After repair, replace “AIR BAG” fuse.
2	1) Check for loose connection of junction block assembly connector “L04”. *Is it connected securely?*	Go to Step 3.	Correct connector “L04” securely.
3	1) Check for loose connection of junction block assembly connector “G34”. *Is it connected securely?*	Go to Step 4.	Correct connector “G34” securely.
4	1) Check for loose connection of SDM connector “L29”. *Is it connected securely?*	Go to Step 5.	Correct connector “L29” securely.
5	1) Disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminal “L29-26”. 3) If OK, then check voltage between “L29-26” terminal of SDM connector and body ground with ignition switch ON. **Special tool** **(A): 09932-76010**  I4RS0A820100- *Is it 8 V or more?*	Go to Step 6.	“RED” wire (between “AIR BAG” fuse and SDM connector) open or “GRN” wire (between ignition switch and “AIR BAG” fuse) open or short to ground.

Step	Action	Yes	No
6	1) Disconnect combination meter connector “G28” referring to “Combination Meter Removal and Installation: in Section 9C”. 2) Check proper connection to combination meter at “BLU/ORN” terminal for “AIR BAG” warning lamp and to SDM at terminal “L29-1”. 3) If OK, then check resistance between “BLU/ORN” wire terminal of combination meter connector “G28” and “L29-1” terminal of SDM connector. **Special tool** **(A): 09932-76010**  *Is resistance 1 Ω or less?*	Substitute a known-good SDM and recheck. If “AIR BAG” warning lamp remain lighting, replace combination meter.	“BLU/ORN” wire (between combination meter and SDM connector) open or short to ground.

NOTE:

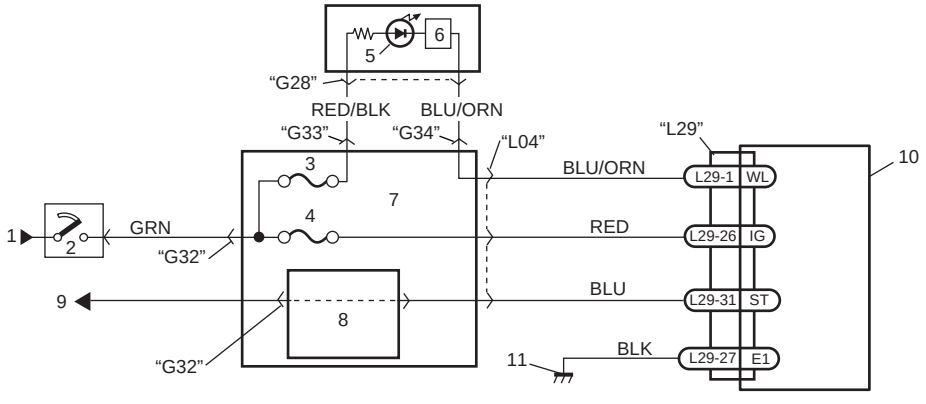
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

“AIR BAG” Warning Lamp Does Not Come ON

S4RS0A8204008

Wiring Diagram



1. From main fuse	5. “AIR BAG” warning lamp in combination meter	9. To DLC
2. Ignition switch	6. Lamp driver	10. SDM
3. “IG SIG” fuse	7. Junction block assembly	11. Ground for air bag system
4. “AIR BAG” fuse	8. BCM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

Flow Test Description
Step 1: Check combination meter power feed circuit.
Step 2: Check "AIR BAG" warning lamp circuit.

Troubleshooting

Step	Action	Yes	No
1	1) Set parking brake. 2) Note combination meter when ignition switch is turned ON. *Does the "BRAKE" indicator (warning lamp) come ON?*	Go to Step 2.	Check and correct the following possible cause. • Open circuit in "GRN" or "RED/BLK" wire. • Short circuit between "GRN" or "RED/BLK" and ground. • "METER" fuse blown.
2	1) Disconnect SDM connector "L29". 2) Note combination meter when ignition switch is turned ON. *Does the "AIR BAG" warning lamp come ON?*	Substitute a known-good SDM and recheck.	"BLU/ORN" circuit shorted to power circuit. If OK, replace combination meter.

NOTE:

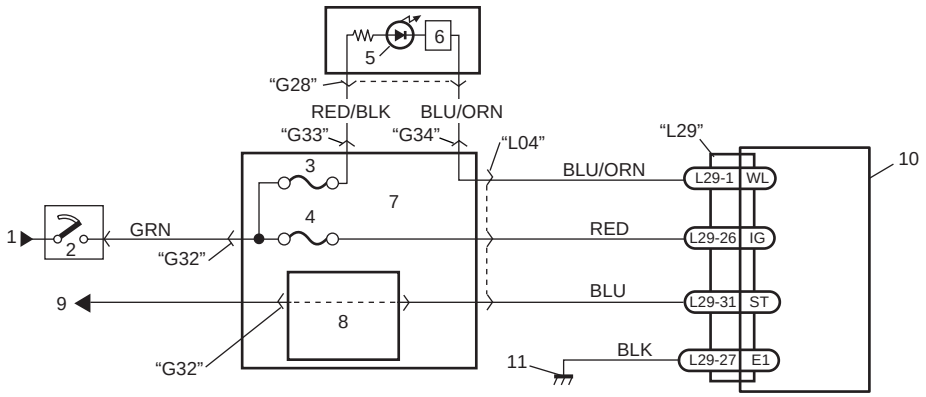
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

“AIR BAG” Warning Lamp Flashes

S4RS0A8204009

Wiring Diagram



I4RS0A820009-

1. From main fuse	5. “AIR BAG” warning lamp in combination meter	9. To DLC
2. Ignition switch	6. Lamp driver	10. SDM
3. “IG SIG” fuse	7. Junction block assembly	11. Ground for air bag system
4. “AIR BAG” fuse	8. BCM	

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

Flow Test Description

Check for short circuit between diagnosis switch circuit and ground.

Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check “L29-34” terminal of SDM. *Is it shorted to ground terminal or harness?*	Clean up terminal.	Substitute a know-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1013: SDM fault

S4RS0A8204030

DTC Will Set when
An internal SDM fault is detected by SDM.

NOTE:

DTC B1013 can never be cleared once it has been set.

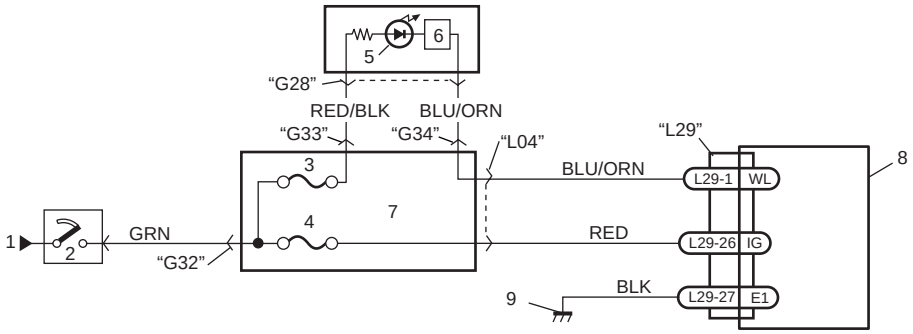
DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace SDM.
3) Repeat “Air Bag Diagnostic System Check: ”.

DTC B1014: “AIR BAG” Warning Lamp Circuit Failure

S4RS0A8204029

Wiring Diagram



I4RS0A820010-

1. From main fuse	4. “A/BAG” fuse	7. Junction block assembly
2. Ignition switch	5. “AIR BAG” warning lamp in combination meter	8. SDM
3. “IG SIG” fuse	6. Lamp driver	9. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The voltage at the “AIR BAG” warning lamp circuit terminal “L29-1” does not match the commanded state of the warning lamp driver for specified time.

Flow Test Description
Step 1: This test rechecks “AIR BAG” warning lamp operation.
Step 2: This test rechecks whether an abnormality is in SDM.

DTC Troubleshooting

Step	Action	Yes	No
1	1) This DTC is set when there is a trouble in “AIR BAG” warning lamp circuit. Failure to properly perform “Air Bag Diagnostic System Check” may also result in misdiagnosis. Therefore, check “AIR BAG” warning lamp circuit again according to “Air Bag Diagnostic System Check: ”. *Is “AIR BAG” warning lamp circuit in good condition?*	Go to Step 2.	Repair “AIR BAG” warning lamp circuit.
2	1) Clear DTC referring to “DTC Clearance: ”. 2) Check DTC referring to “DTC Check: ”. *Is DTC B1014 set?*	Substitute a known-good SDM and recheck.	Recheck air bag system referring to “Air Bag Diagnostic System Check: ”.

NOTE:

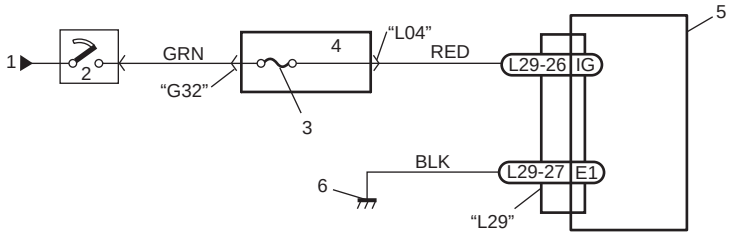
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1016: Power Source Voltage High

S4RS0A8204020

Wiring Diagram



I4RS0A820011-

1. From main fuse	3. “A/BAG” fuse	5. SDM
2. Ignition switch	4. Junction block assembly	6. Ground for air bag system

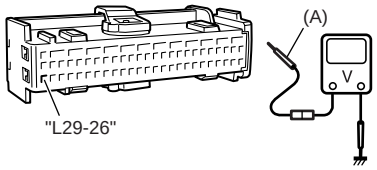
CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The power source voltage to SDM is above an approx. 21 V for specified time.

Flow Test Description
Step 1: Check if voltage applied to SDM is within normal range.
Step 2: Check if DTC B1016 still exists.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect SDM connector. 2) Check proper connection to SDM at "L29-26" terminal. 3) If OK, turn ignition switch ON and then check voltage between "L29-26" terminal on SDM connector and body ground. **Special tool** **(A): 09932-76010**  I4RS0A820100- *Is voltage 14 V or less?*	Go to Step 2.	Check charging system and repair as necessary referring to "Generator Test (Overcharged Battery Check): in Section 1J".
2	1) With ignition switch OFF, reconnect SDM connector. *With ignition switch ON, is DTC B1016 indicated?*	Substitute a known-good SDM and recheck.	Intermittent trouble. Check for intermittent trouble referring to "Inspection of Intermittent and Poor Connections: " If OK, substitute a known-good SDM and recheck.

NOTE:

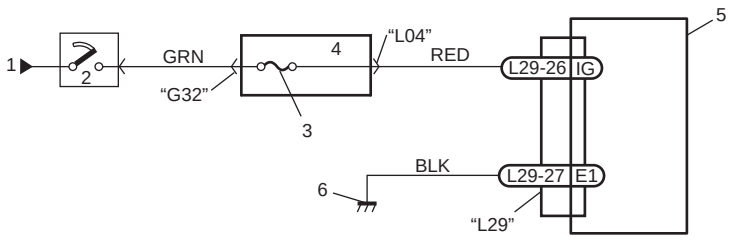
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1017: Power Source Voltage Low

S4RS0A8204021

Wiring Diagram



I4RS0A820011-

1. From main fuse	3. "A/BAG" fuse	5. SDM
2. Ignition switch	4. Junction block assembly	6. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when

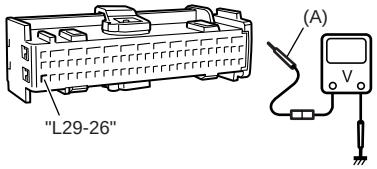
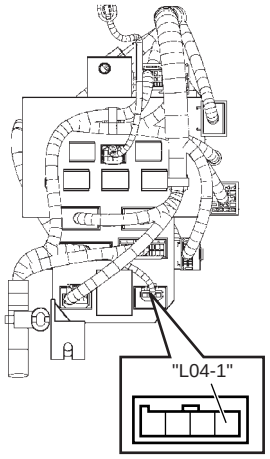
The power source voltage is below an approx. 8 V for specified time.

Flow Test Description

Step 1: Check if voltage on battery is within normal range.
Step 2: Check if voltage applied to SDM is within normal range.
Step 3: Check if voltage applied to "L04" connector is within normal range.
Step 4: Check if DTC B1017 still exists.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Measure voltage on battery. *Is voltage 11 V or more?*	Go to Step 2.	Check charging system and repair as necessary referring to "Generator Test (Undercharged Battery Check): in Section 1J".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector. 2) Check proper connection to SDM at “L29-26” terminal. 3) If OK, turn ignition switch ON and then check voltage between “L29-26” terminal on SDM connector and body ground. **Special tool** **(A): 09932-76010**  I4RS0A820100- *Is voltage 8 V or more?*	Go to Step 4.	Go to step 3.
3	1) With ignition switch OFF, disconnect on connector “L04” junction block assembly. 2) Check proper connection at “L04-1” terminal. 3) If OK, turn ignition switch ON and then check voltage between “L04-1” terminal and body ground.  I4RS0A820012- *Is voltage 8 V or more?*	Go to Step 4.	Check circuit from battery to “L04” connector and charging system.
4	1) With ignition switch OFF, reconnect SDM connector. *With ignition switch ON, does DTC B1017 exist?*	Substitute a known-good SDM and recheck.	Check charging system and repair as necessary referring to “Generator Test (Undercharged Battery Check): in Section 1J”.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1021: Front Air Bag Module Deployed

S4RS0A8204028

DTC Will Set when

The SDM detects a frontal crash of sufficient force to warrant activation of the air bag system. (SDM outputs a deployment command.)

Flow Test Description

Step 1: Check that DTC B1021 has been set although air bag has not been deployed.
Step 2: Check that DTC has been set due to failure of SDM.

NOTE:

Before executing items in this flow, be sure to perform "Air Bag Diagnostic System Check: ".

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. *Has air bag deployed?*	Replace components and perform inspections as directed in "Repair and Inspection Required after Accident: ".	Go to Step 2.
2	1) Inspect front of vehicle and undercarriage for signs of impact. *Are there signs of impact?*	Replace components and perform inspections as directed in "Repair and Inspection Required after Accident: ".	Substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**
- **Clear DTCs of BCM referring to "DTC Clearance: in Section 10B"**

DTC B1024 / B1025: Side-Air Bag (Driver / Passenger) Deployed

S4RS0A8204069

DTC Will Set when

The SDM detects a sideward crash (driver or passenger side) of sufficient force to warrant activation of the side-air bag system (driver or passenger). (SDM outputs a deployment command.)

Flow Test Description

Step 1: Check that DTC B1024 or B1025 has been set although side-air bag has not been deployed.
Step 2: Check that DTC has been set due to failure of SDM.

NOTE:

Before executing items in this flow, be sure to perform "Air Bag Diagnostic System Check: ".

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. *Has air bag deployed?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident: ”.	Go to Step 2.
2	1) Inspect front of vehicle and undercarriage for signs of impact. *Are there signs of impact?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident: ”.	Substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**
- **Clear DTCs of BCM referring to “DTC Clearance: in Section 10B”**

DTC B1026: Pretensioner Activated

S4RS0A8204070

DTC Will Set when

The SDM detects a frontal crash of sufficient force to warrant activation of the pretensioner. (SDM outputs a deployment command.)

Flow Test Description

Step 1: Check that DTC B1026 has been set although pretensioner has not been activated.
Step 2: Check that DTC has been set due to failure of SDM.

NOTE:

Before executing items in this flow, be sure to perform “Air Bag Diagnostic System Check: ”.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. *Has pretensioner activated?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident: ”.	Go to Step 2.
2	1) Inspect front of vehicle and undercarriage for signs of impact. *Are there signs of impact?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident: ”.	Substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**
- **Clear DTCs of BCM referring to “DTC Clearance: in Section 10B”**

DTC B1027: Reusable Number Exceeded

S4RS0A8204071

DTC Will Set when

The SDM has not been replaced though the side-air bag developed several times in the past.

NOTE:

DTC B1027 can never be cleared once it has been set.

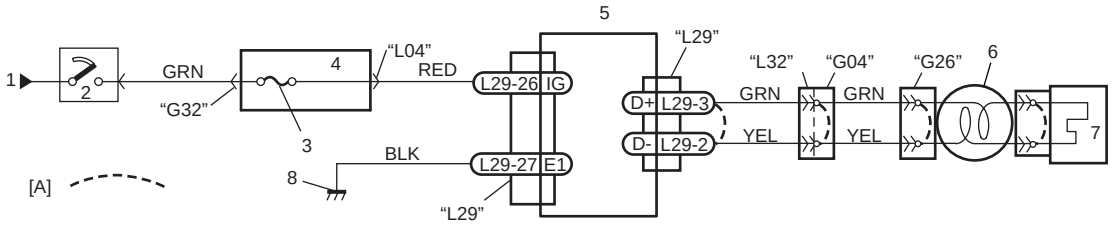
DTC Trouble shooting

1) Turn ignition switch OFF.
2) Replace SDM.
3) Repeat “Air Bag Diagnostic System Check: ”.

DTC B1031: Driver Air Bag Initiator Circuit Resistance High

S4RS0A8204052

Wiring Diagram



I4RS0A820013-

[A]: Shorting bar	3. “A/BAG” fuse	6. Contact coil assembly
1. From main fuse	4. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

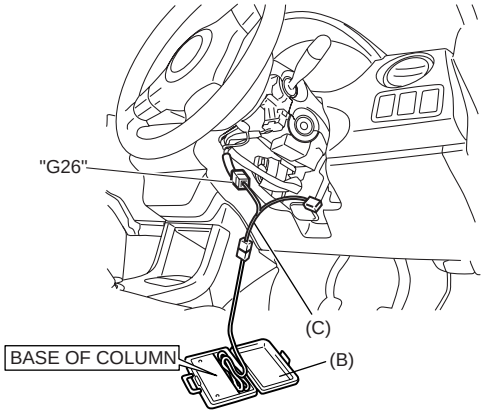
DTC Will Set when

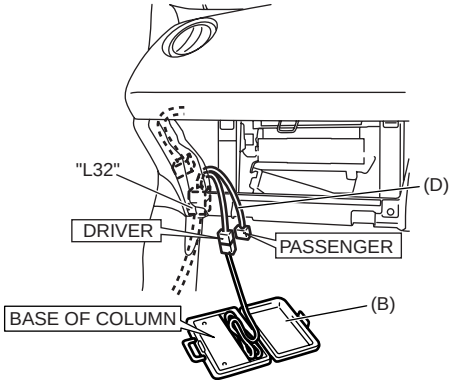
The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is above a specified value for specified time.

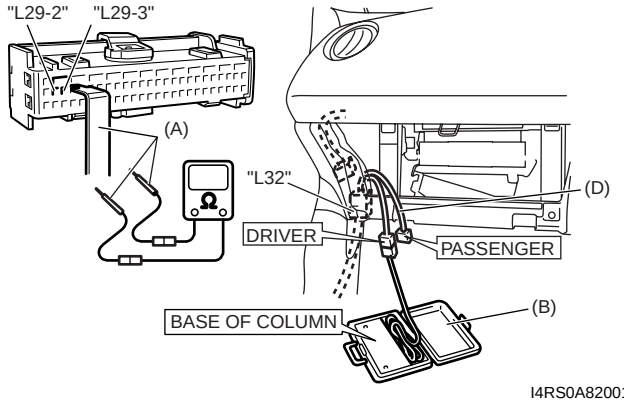
Flow Test Description

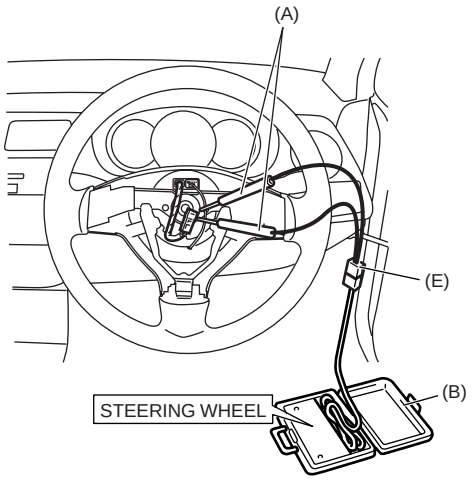
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit. (in instrument panel and floor harness)
Step 3: Check driver air bag (inflator) module initiator circuit. (in floor harness)
Step 4: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0A820014- 4) Check SDM DTC. *With ignition switch ON, is DTC B1031 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0A820015- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1031 indicated?*	Go to Step 3.	High resistance or open wire in “GRN” or “YEL” circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-2” and “L29-3”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-2” and “L29-3” terminals with connected special tools (B) and (D). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–77320**  *Is resistance 3.85 Ω or less?*	Substitute a known-good SDM and recheck.	High resistance or open wire in “GRN” or “YEL” circuit in floor harness.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from “G26” connector and then reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering wheel referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”. 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module connector. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0A820017- 5) Check SDM DTC. *With ignition switch ON, is DTC B1031 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to “Contact Coil Cable Assembly Removal and Installation: in Section 6B”.	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

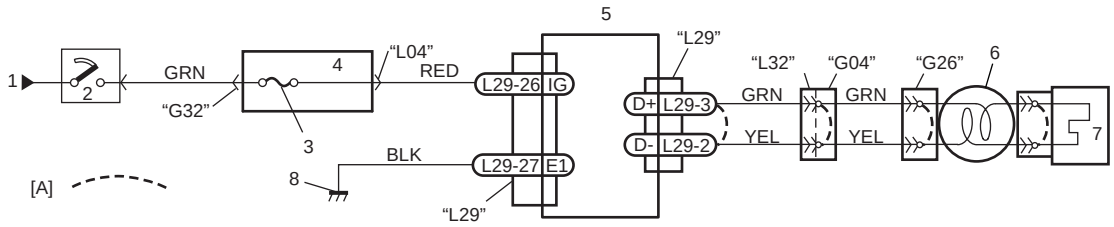
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1032: Driver Air Bag Initiator Circuit Resistance Low

S4RS0A8204017

Wiring Diagram



I4RS0A820013-

[A]: Shorting bar	3. "A/BAG" fuse	6. Contact coil assembly
1. From main fuse	5. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

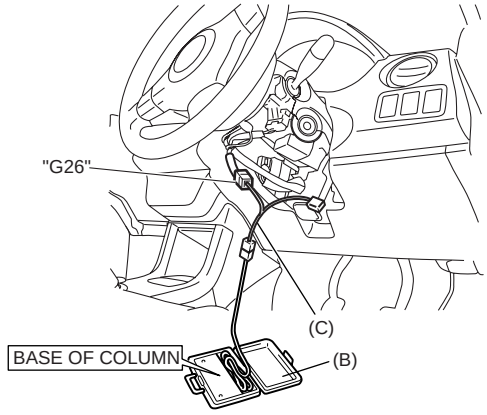
DTC Will Set when

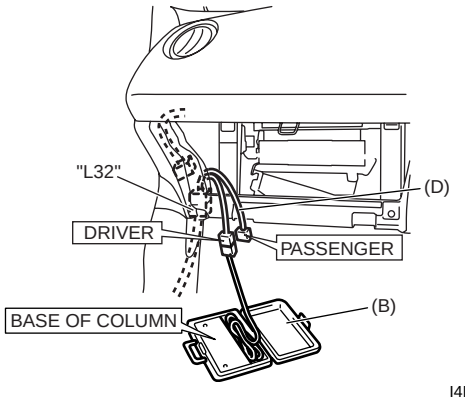
The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is below a specified value for specified time.

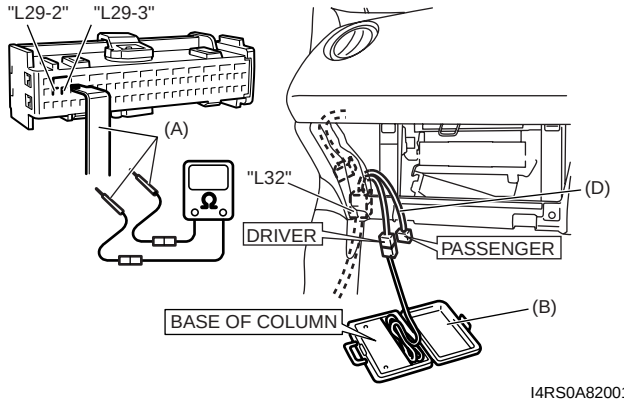
Flow Test Description

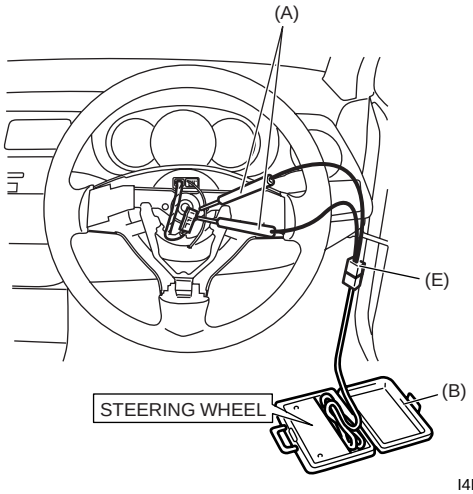
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit. (in instrument panel and floor harness)
Step 3: Check driver air bag (inflator) module initiator circuit. (in floor harness)
Step 4: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0A820014- 4) Check SDM DTC. *With ignition switch ON, is DTC B1032 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0A820015- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1032 indicated?*	Go to Step 3.	“GRN” circuit shorted to “YEL” circuit, “GRN” circuit or “YEL” circuit shorted to other circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-2” and “L29-3”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-2” and “L29-3” terminals with connected special tool (B) and (D). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–77320**  I4RS0A820016- *Is resistance 2.1 Ω or more?*	Substitute a known-good SDM and recheck.	“GRN” circuit shorted to “YEL” circuit, “GRN” circuit or “YEL” circuit shorted to other circuit in floor harness.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from “G26” connector and reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering column referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”. 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module connector. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0A820017- 5) Check SDM DTC. *With ignition switch ON, is DTC B1032 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to “Contact Coil Cable Assembly Removal and Installation: in Section 6B”.	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

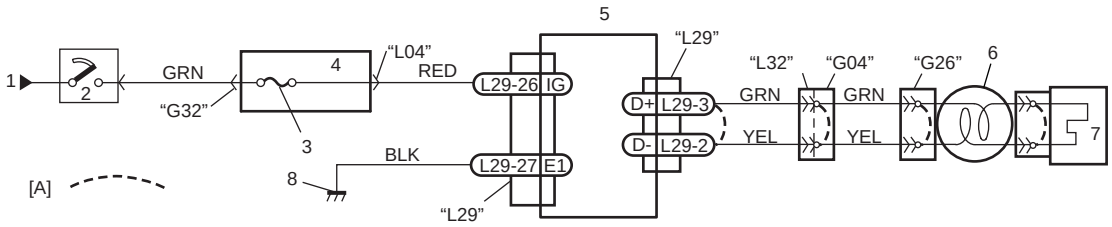
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1033: Driver Air Bag Initiator Circuit Short to Ground

S4RS0A8204018

Wiring Diagram



I4RS0A820013-

[A]: Shorting bar	3. "A/BAG" fuse	6. Contact coil assembly
1. From main fuse	4. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

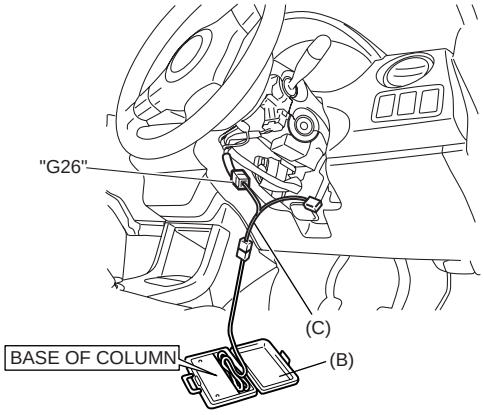
DTC Will Set when

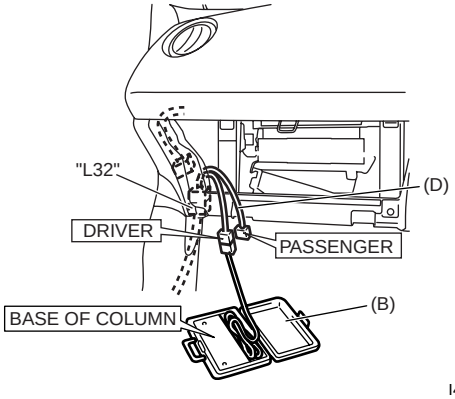
The voltage measured at driver air bag initiator circuit is below a specified value for specified time.

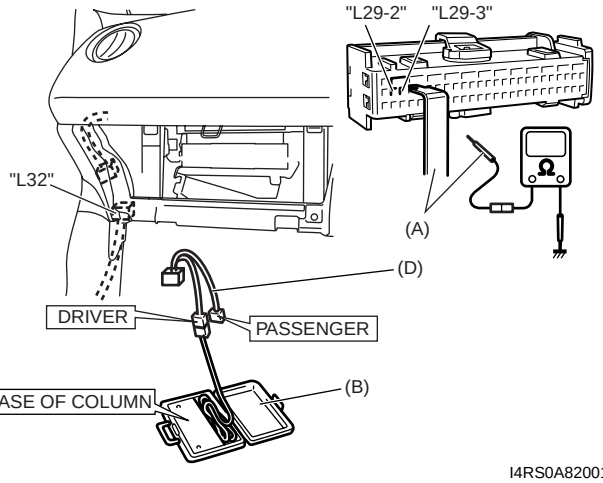
Flow Test Description

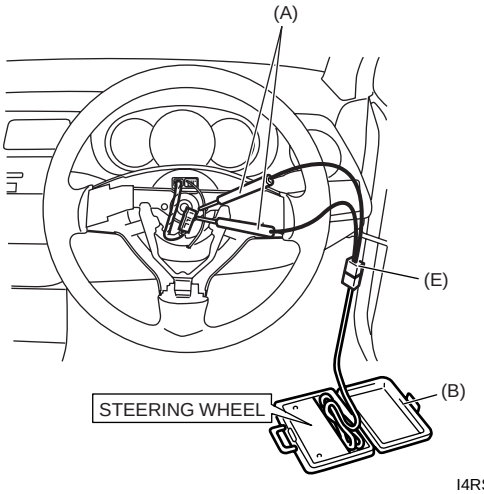
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit. (in instrument panel and floor harness)
Step 3: Check driver air bag (inflator) module initiator circuit. (in floor harness)
Step 4: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0A820014- 4) Check SDM DTC. *With ignition switch ON, is DTC B1033 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0A820015- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1033 indicated?*	Go to Step 3.	“GRN” circuit or “YEL” circuit shorted to ground in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (D) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release Shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-2” terminal and body ground and between “L29-3” terminal and body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–78340**  *Are resistances infinity?*	Substitute a known-good SDM and recheck.	“GRN” circuit or “YEL” circuit shorted to ground in floor harness.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from "G26" connector and reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering column referring to "Driver Air Bag (Inflator) Module Removal and Installation: ". 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module connector. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0A820017- 5) Check SDM DTC. *With ignition switch ON, is DTC B1033 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to "Contact Coil Cable Assembly Removal and Installation: in Section 6B".	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation: ".

NOTE:

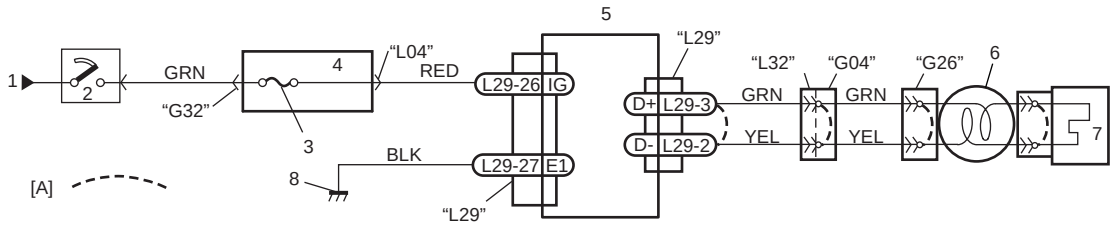
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1034: Driver Air Bag Initiator Circuit Short to Power Circuit

S4RS0A8204019

Wiring Diagram



I4RS0A820013-

[A]: Shorting bar	3. "A/BAG" fuse	6. Contact coil assembly
1. From main fuse	4. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

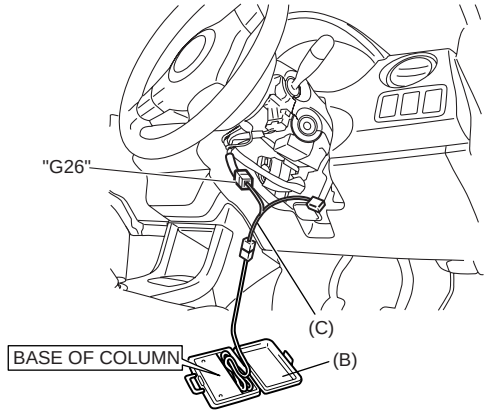
CAUTION:

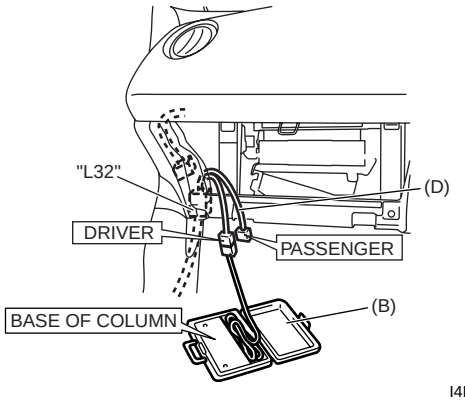
- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

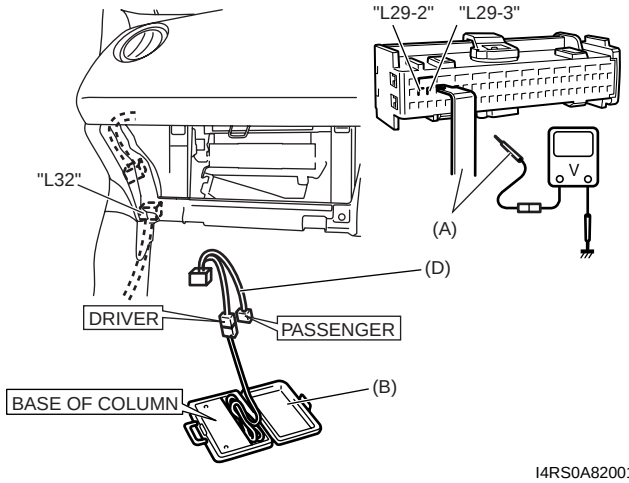
DTC Will Set when
The voltage measured at driver air bag initiator circuit is above a specified value for specified time.

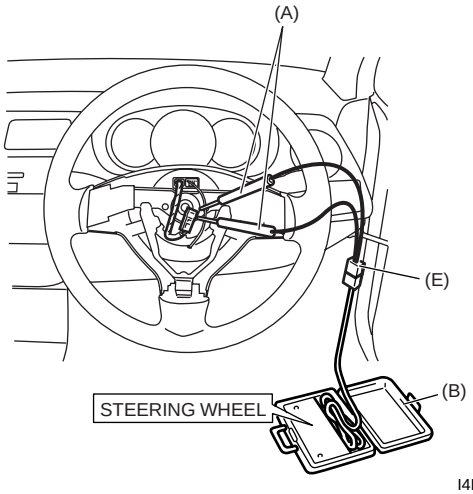
Flow Test Description
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit.
Step 3: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0A820014- 4) Check SDM DTC. *With ignition switch ON, is DTC B1034 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0A820015- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1034 indicated?*	Go to Step 3.	“GRN” circuit or “YEL” circuit shorted to power supply circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (D) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release Shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage from “L29-2” terminal to body ground and between “L29-3” terminal to body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–77320**  I4RS0A820019- *With ignition switch ON, is each measured value 1 V or less?*	Substitute a known-good SDM and recheck.	“GRN” circuit or “YEL” circuit shorted to power supply circuit.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from “G26” connector and reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering column referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”. 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0A820017- 5) Check SDM DTC. *With ignition switch ON, is DTC B1034 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to “Contact Coil Cable Assembly Removal and Installation: in Section 6B”.	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

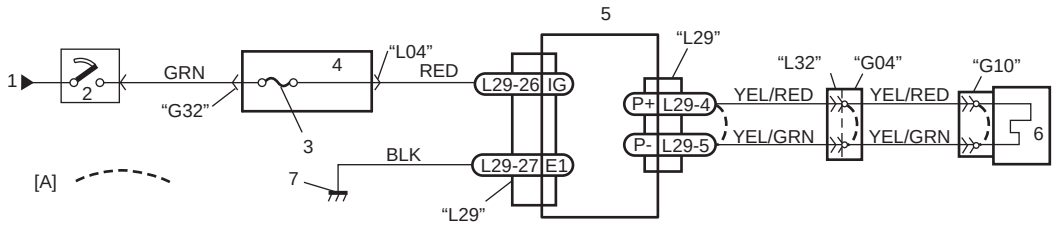
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1041: Passenger Air Bag Initiator Circuit Resistance High

S4RS0A8204012

Wiring Diagram



I4RS0A820020-

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

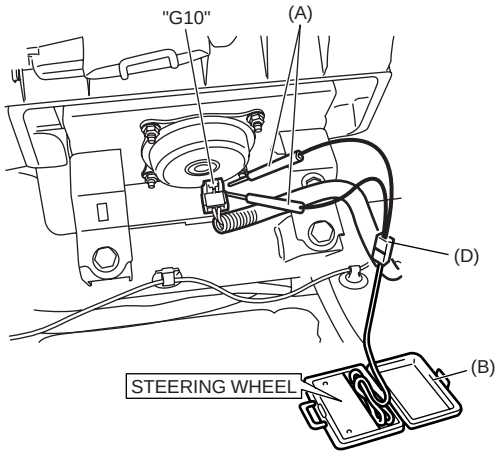
DTC Will Set when

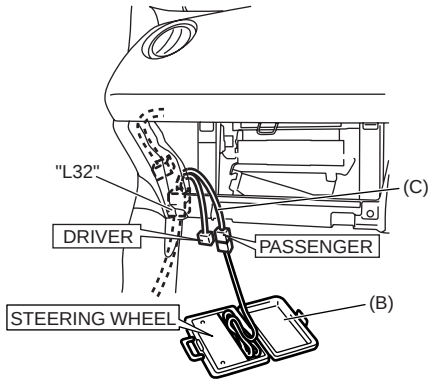
The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is above a specified value for specified time.

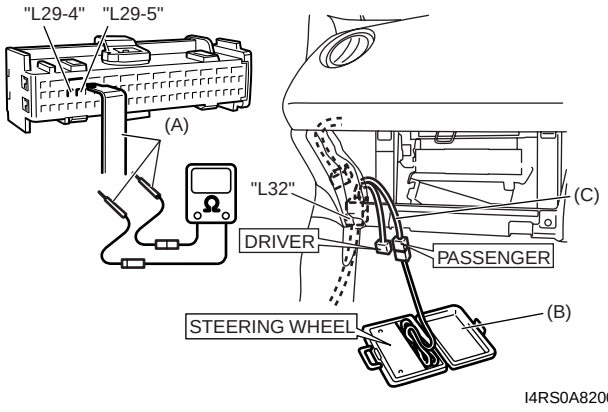
Flow Test Description

Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in “G10” connector. 3) If OK, then connect special tools (A), (B) and (D) to “G10” connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0A820021- 4) Check SDM DTC. *With ignition switch ON, is DTC B1041 indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820022- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1041 indicated?*	Go to Step 3.	High resistance or open wire “YEL/RED” or “YEL/GRN” circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-4” and “L29-5”. 3) If OK, release shorting bar in SDM connector inserting release too (1) included in special tool (A). 4) Measure resistance between “L29-4” and “L29-5” terminals with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  *Is resistance 2.82 Ω or less?*	Substitute a known-good SDM and recheck.	High resistance or open wire in “YEL/RED” or “YEL/GRN” circuit in floor harness.

NOTE:

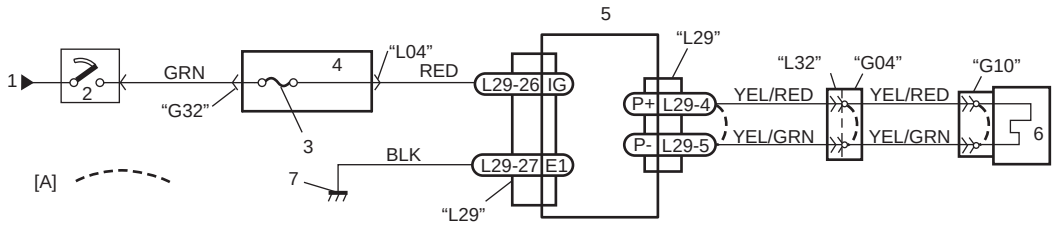
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1042: Passenger Air Bag Initiator Circuit Resistance Low

S4RS0A8204013

Wiring Diagram



I4RS0A820020-

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

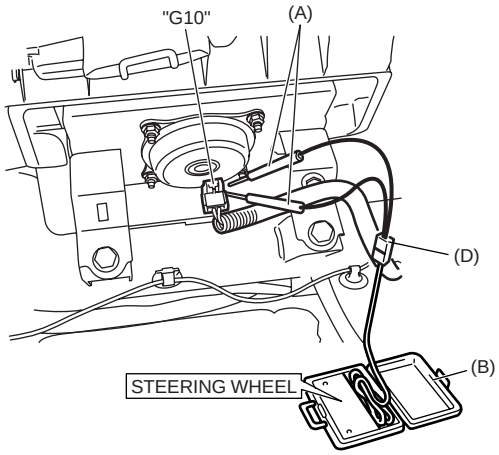
DTC Will Set when

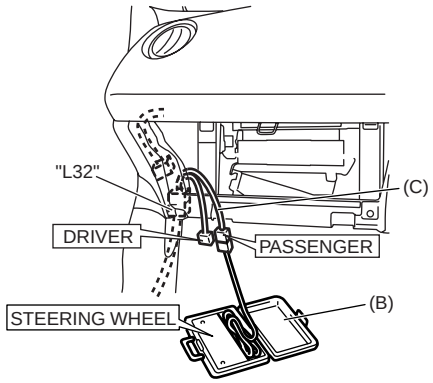
The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is below a specified value for specified time.

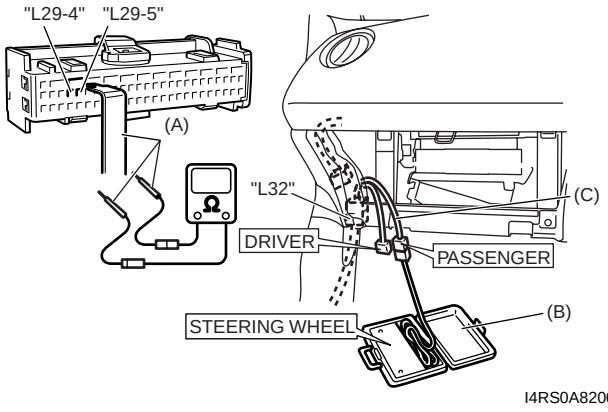
Flow Test Description

Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in “G10” connector. 3) If OK, then connect special tools (A), (B) and (D) to “G10” connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0A820021- 4) Check SDM DTC. *With ignition switch ON, is DTC B1042 indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820022- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1042 indicated?*	Go to Step 3.	“YEL/RED” circuit shorted to “YEL/GRN” circuit, “YEL/RED” circuit or “YEL/GRN” circuit shorted to other circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-4” and “L29-5”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-4” and “L29-5” terminals with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	“YEL/RED” circuit shorted to “YEL/GRN” circuit, “YEL/RED” circuit or “YEL/GRN” circuit shorted to other circuit in floor harness.

NOTE:

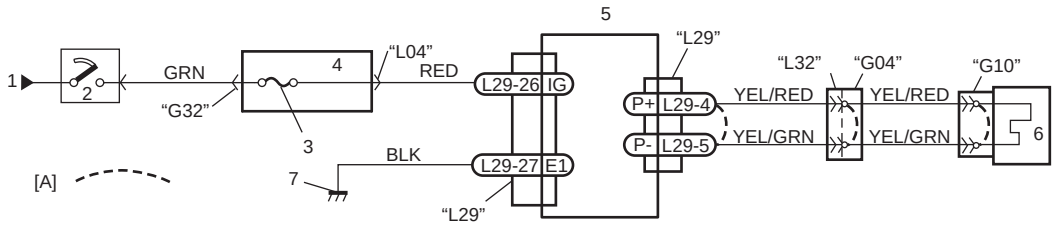
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1043: Passenger Air Bag Initiator Circuit Short to Ground

S4RS0A8204014

Wiring Diagram



I4RS0A820020-

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

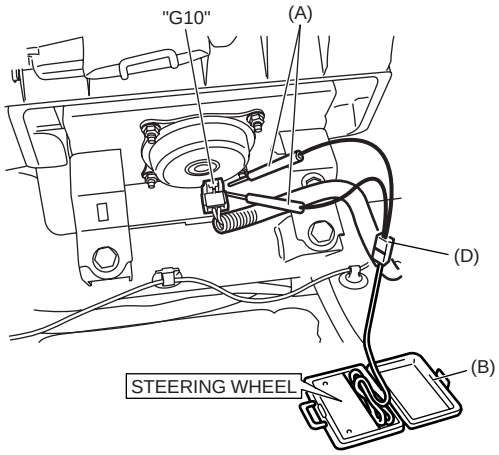
DTC Will Set when

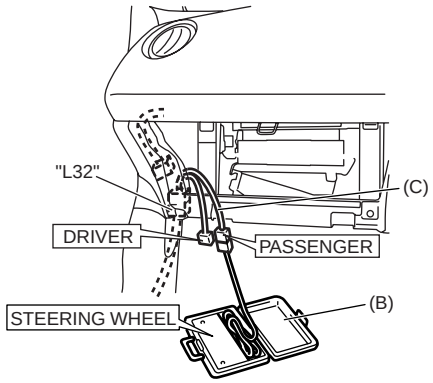
The voltage measured at passenger air bag (initiator) circuit is below a specified value for specified time.

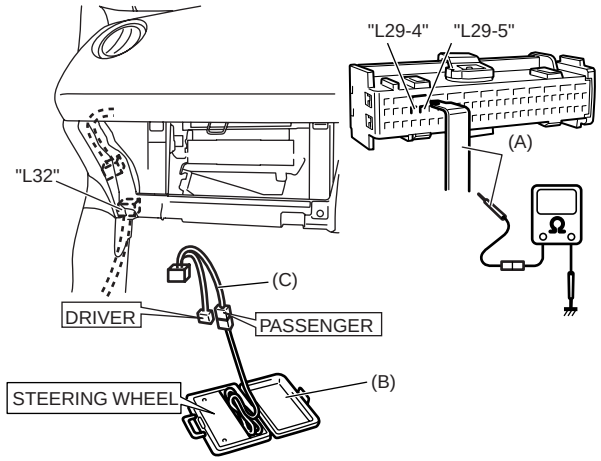
Flow Test Description

Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in “G10” connector. 3) If OK, then connect special tools (A), (B) and (D) to “G10” connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0A820021- 4) Check SDM DTC. *With ignition switch ON, is DTC B1043 indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820022- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1043 indicated?*	Go to Step 3.	“YEL/RED” or “YEL/GRN” circuit shorted to ground in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-4” terminal and body ground and between “L29-5” terminal and body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  *Is resistance infinity?*	Substitute a known-good SDM and recheck.	“YEL/RED” or “YEL/GRN” circuit shorted to ground in floor harness.

NOTE:

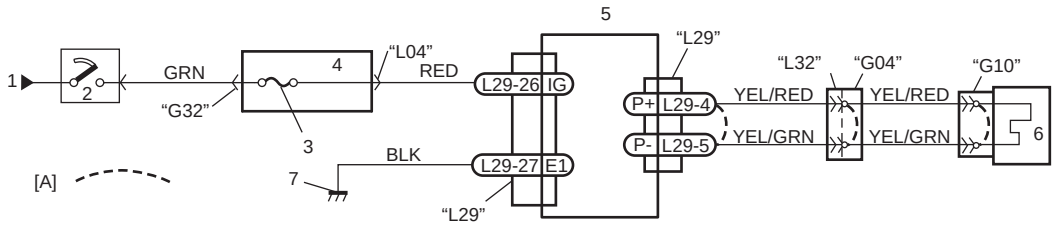
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1044: Passenger Air Bag Initiator Circuit Short to Power Circuit

S4RS0A8204015

Wiring Diagram



I4RS0A820020-

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

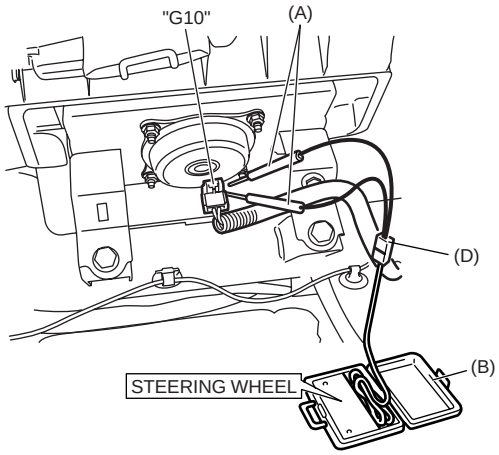
DTC Will Set when

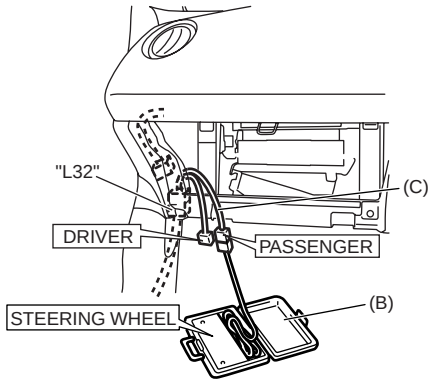
The voltage measured at passenger air bag (initiator) circuit is above a specified value for specified time.

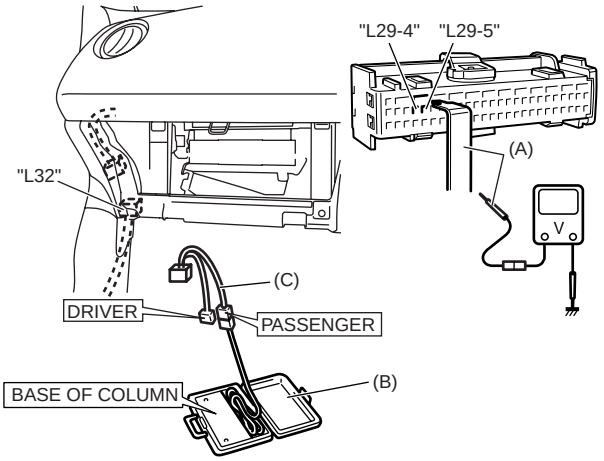
Flow Test Description

Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in “G10” connector. 3) If OK, then connect special tools (A), (B) and (D) to “G10” connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0A820021- 4) Check SDM DTC. *With ignition switch ON, is DTC B1044 indicated?*	Go to Step 3.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820022- 4) Check SDM DTC. **NOTE:** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1044 indicated?*	Go to Step 3.	“YEL/RED” or “YEL/GRN” circuit shorted to power supply circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage from “L29-4” terminal to body ground and from “L29-5” terminal to body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  I4RS0A820025- *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	“YEL/RED” or “YEL/GRN” circuit shorted to power supply circuit in floor harness.

NOTE:

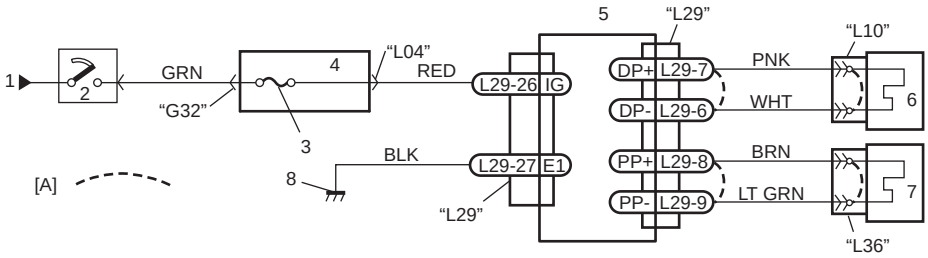
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1051 / B1055: Driver / Passenger Pretensioner Initiator Circuit Resistance High

S4RS0A8204024

Wiring Diagram



I4RS0A820026-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

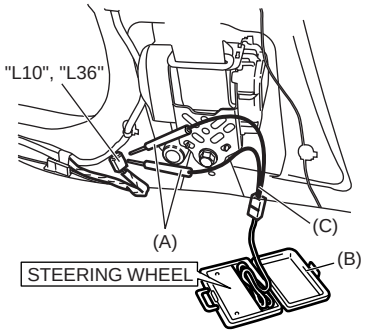
DTC Will Set when

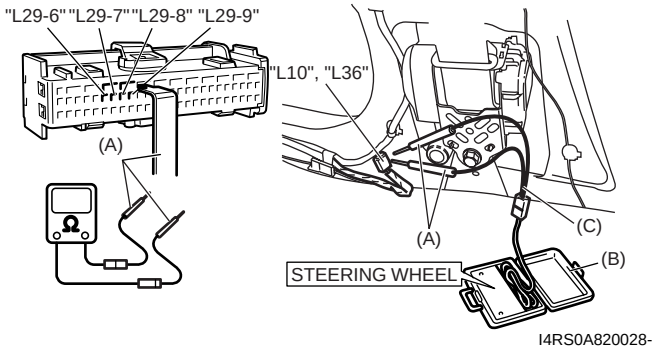
The resistance of driver or passenger seat belt pretensioner initiator circuit is above a specified value for specified time.

Flow Test Description

Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector “L10” or “L36” (1). 2) Check proper connection to seat belt pretensioner at terminals in “L10” or “L36” connector. 3) If OK, then connect special tools (A), (B) and (C) to “L10” or “L36” connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027- 4) Check SDM DTC. *With ignition switch ON, is DTC B1051 or B1055 still indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace seat belt pretensioner referring to “Front Seat Belt Removal and Installation: in Section 8A”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “29”. 2) Check proper connection to SDM at terminals in “L29-6” and “L29-7” (for DTC B1051) or “L29-8” and “L29-9” (for DTC B1055). 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-6” and “L29-7” terminals (for DTC B1051) or “L29-8” and “L29-9” terminals (for DTC B1055) with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78310**  *Is resistance 2.91 Ω or less?*	Substitute a known-good SDM and recheck.	DTC B1051: High resistance or open wire in “PNK” or “WHT” circuit. DTC B1055: High resistance or open wire in “BRN” or “LT GRN” circuit.

NOTE:

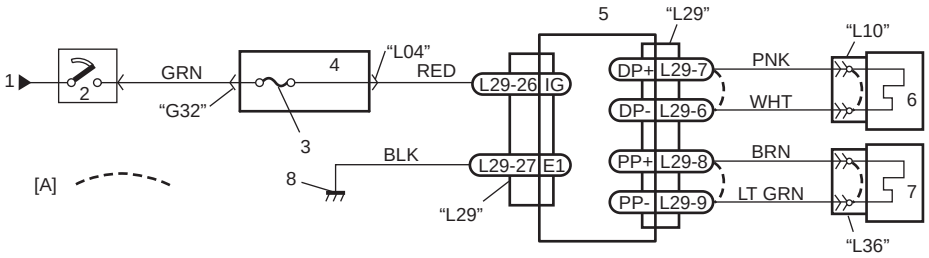
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1052 / B1056: Driver / Passenger Pretensioner Initiator Circuit Resistance Low

S4RS0A8204025

Wiring Diagram



I4RS0A820026-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

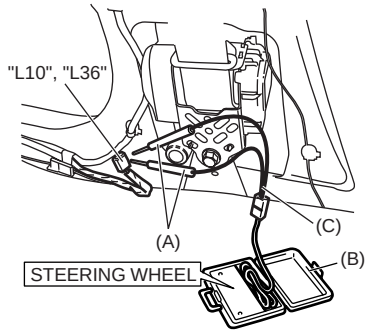
DTC Will Set when

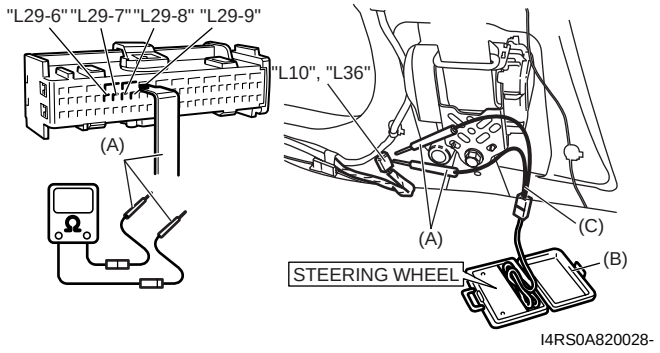
The resistance of driver or passenger seat belt pretensioner initiator circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector “L10” or “L36” (1). 2) Check proper connection to seat belt pretensioner at terminals in “L10” or “L36” connector. 3) If OK, then connect special tools (A), (B) and (C) to “L10” or “L36” connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027- 4) Check SDM DTC. *With ignition switch ON, is DTC B1052 or B1056 still indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace seat belt pretensioner referring to “Front Seat Belt Removal and Installation: in Section 8A”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “29”. 2) Check proper connection to SDM at terminals in “L29-6” and “L29-7” (for DTC B1052) or “L29-8” and “L29-9” (for DTC B1056). 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) If OK, then measure resistance between “L29-6” and “L29-7” terminals (for DTC B1052) or “L29-8” and “L29-9” terminals (for DTC B1056) with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78310**  *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	DTC B1052: “PNK” circuit shorted to “WHT” circuit, “PNK” circuit or “WHT” circuit shorted to other circuit. DTC B1056: “BRN” circuit shorted to “LT GRN” circuit, “BRN” circuit or “LT GRN” circuit shorted to other circuit.

NOTE:

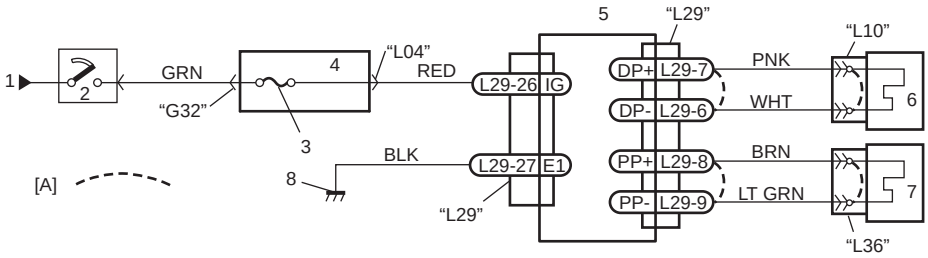
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1053 / B1057: Driver / Passenger Pretensioner Initiator Circuit Short to Ground

S4RS0A8204026

Wiring Diagram



I4RS0A820026-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

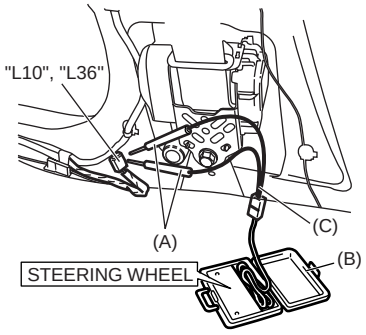
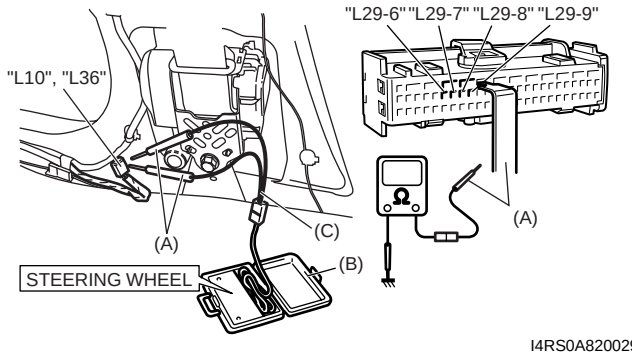
DTC Will Set when

The voltage measured at driver or passenger seat belt pretensioner initiator circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector “L10” or “L36” (1). 2) Check proper connection to seat belt pretensioner at terminals in “L10” or “L36” connector. 3) If OK, then connect special tools (A), (B) and (C) to “L10” or “L36” connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027- 4) Check SDM DTC. *With ignition switch ON, is DTC B1053 or B1057 still indicated?*	Go to Step 2.	Ignition switch OFF. Replace seat belt pretensioner referring to “Front Seat Belt Removal and Installation: in Section 8A”.
2	1) With ignition switch OFF, disconnect special tools (A), (B) and (C) and SDM connector. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-6” and body ground, and between “L29-7” and body ground (for DTC B1053) or between “L29-8” and body ground, and between “L29-9” and body ground (for DTC B1057). **Special tool** **(A): 09932-76010**  I4RS0A820029- *Is resistance infinity?*	Substitute a known-good SDM and recheck.	DTC B1053: “PNK” circuit or “WHT” circuit shorted to ground. DTC B1057: “BRN” circuit or “LT GRN” circuit shorted to ground.

NOTE:

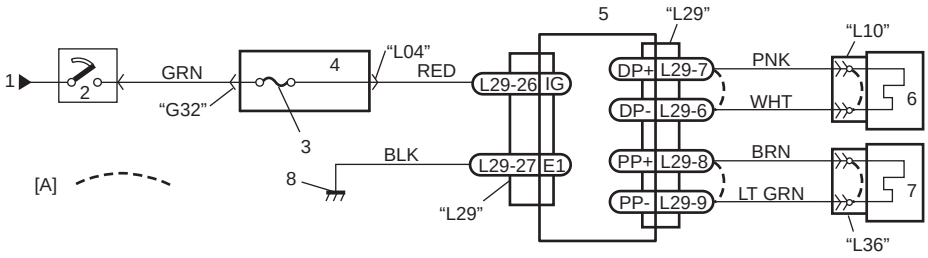
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1054 / B1058: Driver / Passenger Pretensioner Initiator Circuit Short to Power Circuit

S4RS0A8204027

Wiring Diagram



I4RS0A820026-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

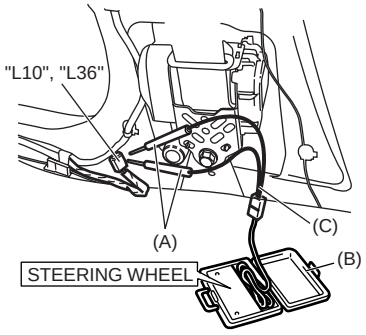
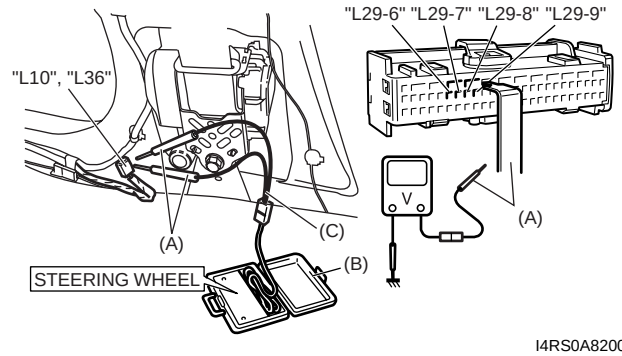
DTC Will Set when

The voltage measured at driver or passenger seat belt pretensioner initiator circuit is above a specified value for specified time.

Flow Test Description

Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector “L10” and “L36” (1). 2) Check proper connection to seat belt pretensioner at terminals in “L10” or “L36” connector. 3) If OK, then connect special tools (A), (B) and (C) to “L10” or “L36” connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027- 4) Check SDM DTC. *With ignition switch ON, is DTC B1054 or B1058 still indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace seat belt pretensioner referring to “Front Seat Belt Removal and Installation: in Section 8A”.
2	1) With ignition switch OFF, disconnect special tools (A), (B) and (C) and SDM connector. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage between “L29-6” and body ground, and between “L29-7” and body ground (for DTC B1054) or between “L29-8” and body ground, and between “L29-9” and body ground (for DTC B1058). **Special tool** **(A): 09932-76010**  I4RS0A820030- *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	DTC B1054: “PNK” circuit or “WHT” circuit shorted to power supply circuit. DTC B1058: “BRN” circuit or “LT GRN” circuit shorted to power supply circuit.

NOTE:

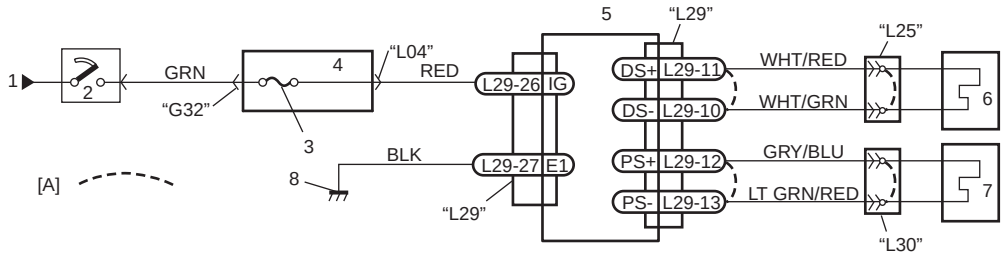
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1061 / B1065: Driver / Passenger Side-Air Bag Initiator Circuit Resistance High

S4RS0A8204072

Wiring Diagram



I4RS0A820031-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

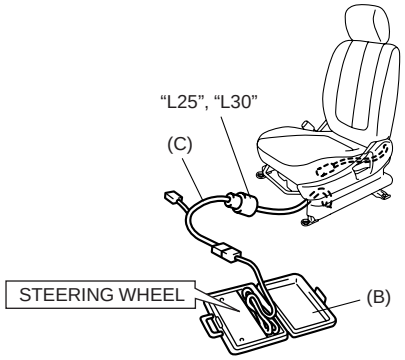
DTC Will Set when

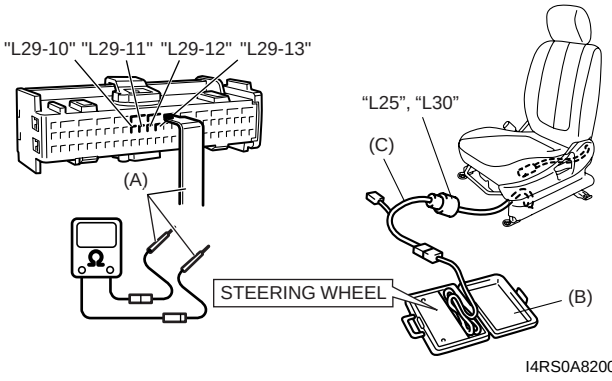
The combined resistance of the side-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is above a specified value for specified time.

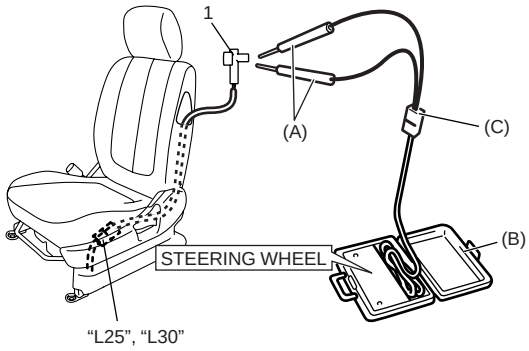
Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in “L25” or “L30” connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1). **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032- 4) Check SDM DTC. *With ignition switch ON, is DTC B1061 or B1065 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-10” and “L29-11” or “L29-12” and “L29-13”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-10” and “L29-11” terminals (for DTC B1061) or “L29-12” and “L29-13” terminals (for DTC B1065) with connected special tool (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  *Is resistance 2.62 Ω or less?*	Substitute a known-good SDM and recheck.	DTC B1061: Repair high resistance or open in “WHT/RED” or “WHT/GRN” wire circuit in floor harness. DTC B1065: Repair high resistance or open in “GRY/BLU” or “LT GRN/RED” wire circuit in floor harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034- 5) Check SDM DTC. *With ignition switch ON, is DTC B1061 or B1065 still indicated?*	DTC B1061: Repair high resistance or open in “WHT/RED” or “WHT/GRN” wire circuit in seat harness. DTC B1065: Repair high resistance or open in “GRY/BLU” or “LT GRN/RED” wire circuit in seat harness.	Replace side-air bag (inflator) module referring to “Side-Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

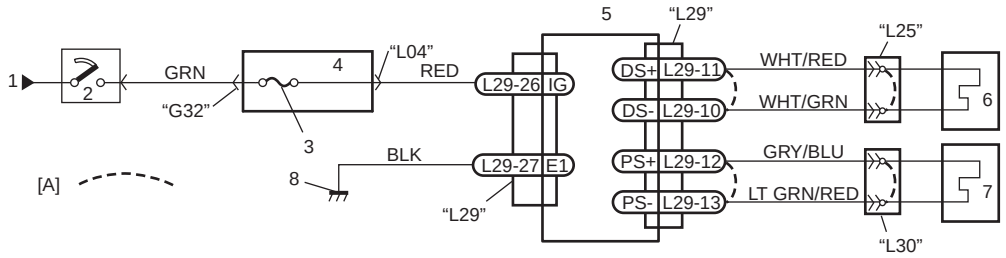
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1062 / B1066: Driver / Passenger Side-Air Bag Initiator Circuit Resistance Low

S4RS0A8204073

Wiring Diagram



I4RS0A820031-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

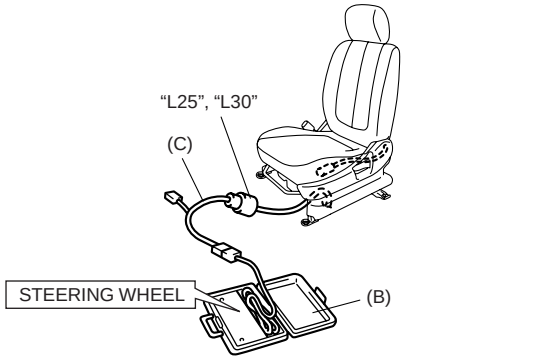
DTC Will Set when

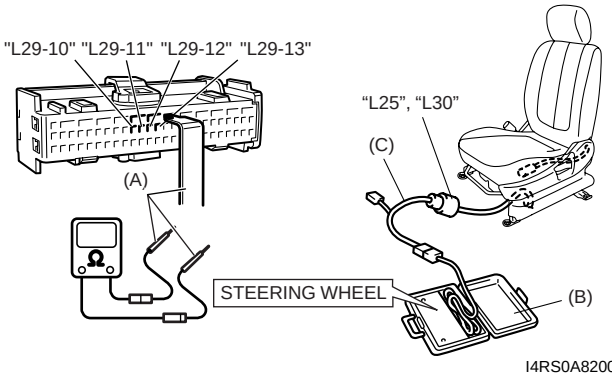
The combined resistance of the side-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is below a specified value for specified time.

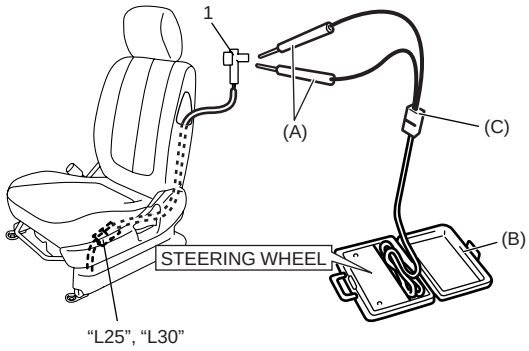
Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in “L25” or “L30” connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1. **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032- 4) Check SDM DTC. *With ignition switch ON, is DTC B1062 or B1066 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-10” and “L29-11” or “L29-12” and “L29-13”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-10” and “L29-11” terminals (for DTC B1062) or “L29-12” and “L29-13” terminals (for DTC B1066) with connected special tools (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820033- *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	DTC B1062: Repair short from “WHT/RED” wire circuit to “WHT/GRN” wire circuit or from “WHT/RED” or “WHT/GRN” wire circuit to other wire circuit in floor harness. DTC B1066: Repair short from “GRY/BLU” wire circuit to “LT GRN/RED” wire circuit or from “GRY/BLU” or “LT GRN/RED” wire circuit to other wire circuit in floor harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034- 5) Check SDM DTC. *With ignition switch ON, is DTC B1062 or B1066 still indicated?*	DTC B1062: Repair short from “WHT/RED” wire circuit to “WHT/GRN” wire circuit in seat harness or from “WHT/RED” or “WHT/GRN” wire circuit to other wire circuit. DTC B1066: Repair short from “GRY/BLU” wire circuit to “LT GRN/RED” wire circuit in seat harness or from “GRY/BLU” or “LT GRN/RED” wire circuit to other wire circuit.	Replace side-air bag (inflator) module referring to “Side-Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

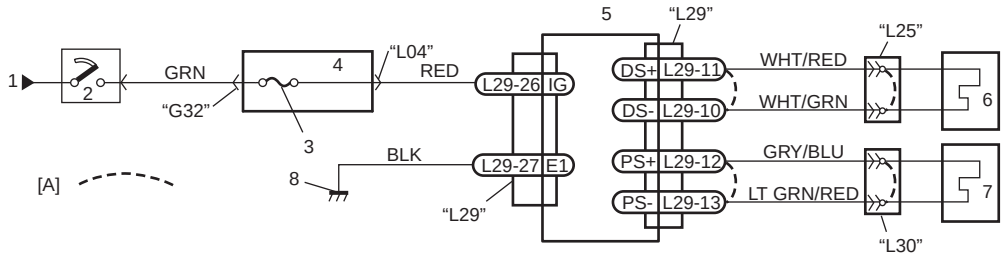
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1063 / B1067: Driver / Passenger Side-Air Bag Initiator Circuit Short to Ground

S4RS0A8204074

Wiring Diagram



I4RS0A820031-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

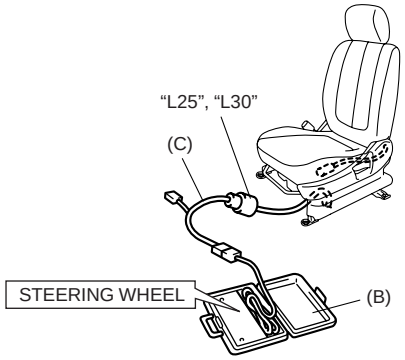
DTC Will Set when

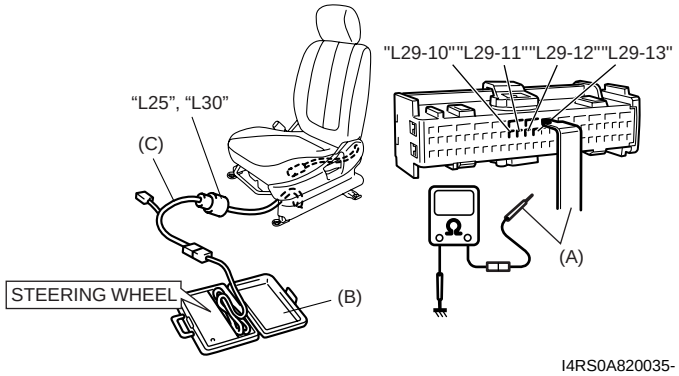
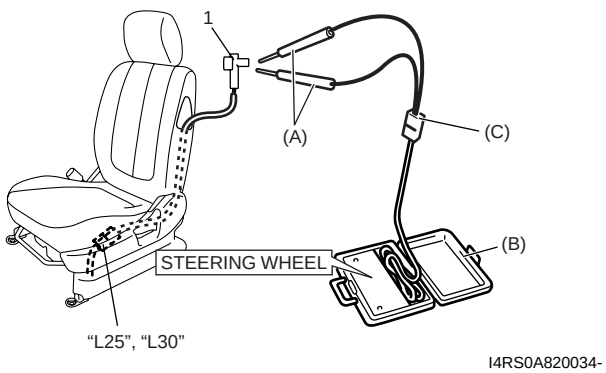
The voltage measured at side-air bag (driver or passenger) initiator circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in “L25” or “L30” connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1. **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032- 4) Check SDM DTC. *With ignition switch ON, is DTC B1063 or B1067 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect special tools and SDM connector “L29”. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-10” and body ground, and between “L29-11” and body ground (for DTC B1063) or “L29-12” and body ground, and between “L29-13” and body ground (for DTC B1067) with connected special tools (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  *Is resistance infinity?*	Substitute a known-good SDM and recheck.	DTC B1063: Repair short from “WHT/RED” or “WHT/GRN” wire circuit to ground in floor harness. DTC B1067: Repair short from “GRY/BLU” or “LT GRN/RED” wire circuit to ground in floor harness.
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  5) Check SDM DTC. *With ignition switch ON, is DTC B1063 or B1067 still indicated?*	DTC B1063: Repair short from “WHT/RED” or “WHT/GRN” wire circuit to ground in seat harness. DTC B1067: Repair short from “GRY/BLU” or “LT GRN/RED” wire circuit to ground in seat harness.	Replace side-air bag (inflator) module referring to “Side-Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

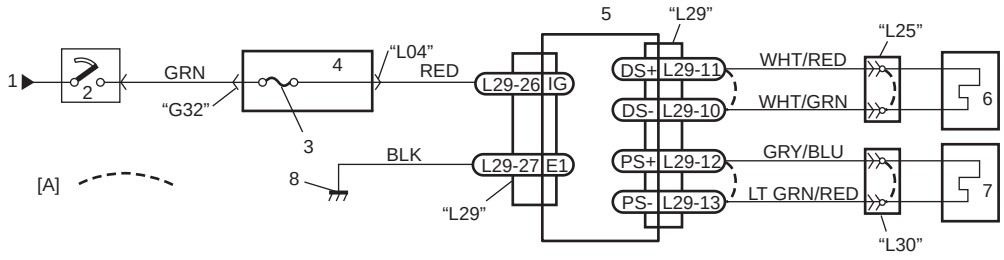
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1064 / B1068: Driver / Passenger Side-Air Bag Initiator Circuit Short to Power Circuit

S4RS0A8204075

Wiring Diagram



I4RS0A820031-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

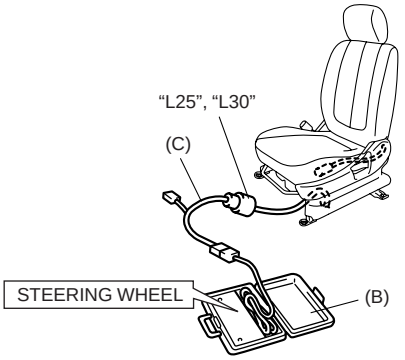
DTC Will Set when

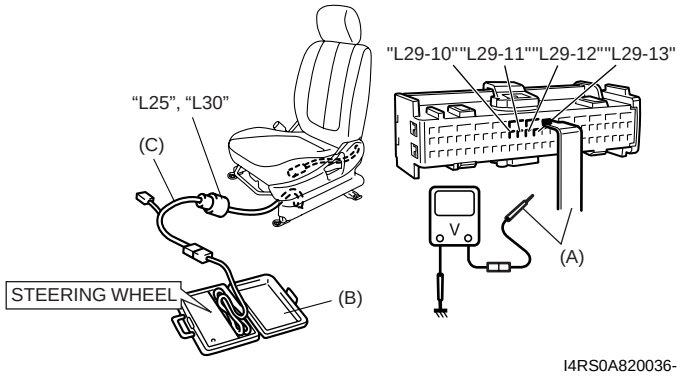
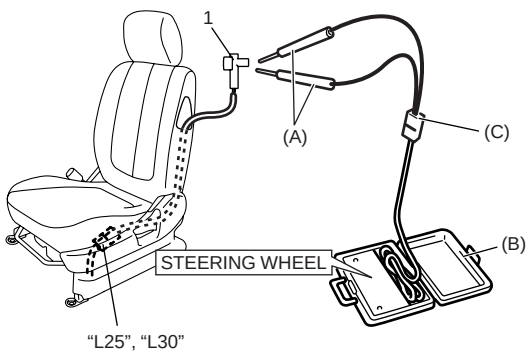
The voltage measured at side-air bag (driver or passenger) initiator circuit is above a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in “L25” or “L30” connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1. **Special tool** **(B): 09932–75010** **(C): 09932–78340**  4) Check SDM DTC. *With ignition switch ON, is DTC B1064 or B1068 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect special tools (B), (C) and SDM connector “L29”. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage between “L29-10” and body ground, and between “L29-11” and ground (for DTC B1064) or “L29-12” and body ground, and between “L29-13” and body ground (for DTC B1068) with connected special tools (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820036- *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	DTC B1064: Repair short from “WHT/RED” or “WHT/GRN” wire circuit to power circuit in floor harness. DTC B1068: Repair short from “GRY/BLU” or “LT GRN/RED” wire circuit to power circuit in floor harness.
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034- 5) Check SDM DTC. *With ignition switch ON, is DTC B1064 or B1068 still indicated?*	DTC B1064: Repair short from “WHT/RED” or “WHT/GRN” wire circuit to power circuit in seat harness. DTC B1068: Repair short from “GRY/BLU” or “LT GRN/RED” wire circuit to power circuit in seat harness.	Replace side-air bag (inflator) module referring to“Side-Air Bag (Inflator) Module Removal and Installation: ”.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1071: Forward-Sensor Performance Problem

S4RS0A8204022

DTC Will Set when

SDM receives internal fault signal or wrong ID (Part No.) signal from forward-sensor.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace forward-sensor referring to "Forward-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

DTC B1072: Forward-Sensor Communication Error

S4RS0A8204045

DTC Will Set when

Forward-sensor abnormal signal is detected by SDM.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace forward-sensor referring to "Forward-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

NOTE:

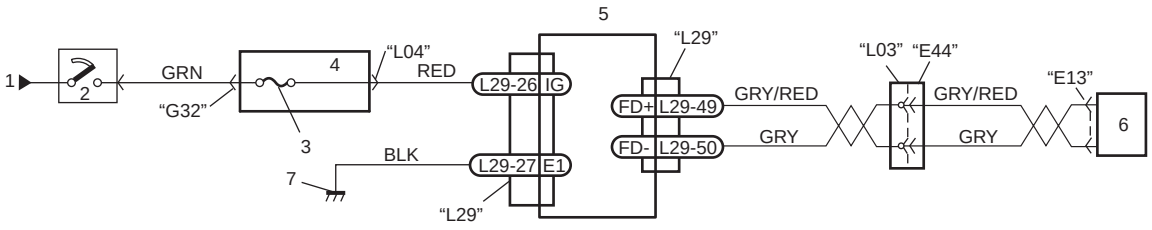
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1073: Forward-Sensor Circuit Short to Ground

S4RS0A8204076

Wiring Diagram



I4RS0A820037-

1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	
3. "A/BAG" fuse	6. Forward-sensor	

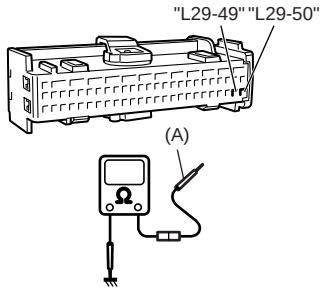
CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
Forward-sensor abnormal signal is detected by SDM.

Flow Test Description
Step 1: Check for short circuit between forward-sensor circuit and ground.
Step 2: Check if malfunction is in forward-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect forward-sensor connector “E13”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-49” and “L29-50” or terminals. 4) Measure resistance between “L29-49” terminal and body ground, “L29-50” terminal and body ground. **Special tool** **(A): 09932–76010**  I4RS0A820038- *Is each measured resistance infinity?*	Go to Step 3.	“GRY/RED” circuit or “GRY” circuit shorted to ground.
2	1) Check forward-sensor referring to “Forward-Sensor Inspection: ”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace forward-sensor referring to “Forward-Sensor Removal and Installation: ”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE:

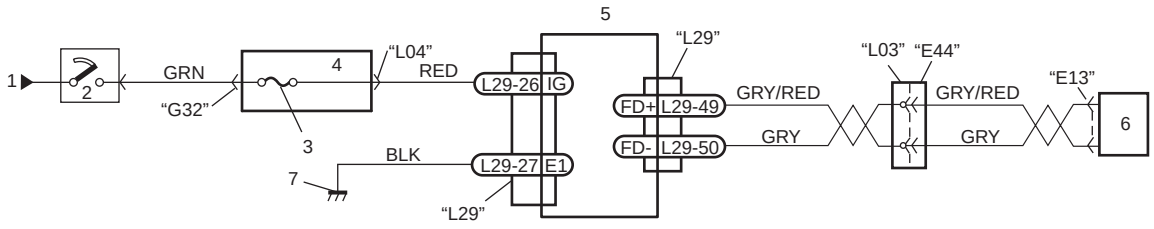
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1074: Forward-Sensor Circuit Short to Power Circuit or Open

S4RS0A8204077

Wiring Diagram



I4RS0A820037-

1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	
3. "A/BAG" fuse	6. Forward-sensor	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

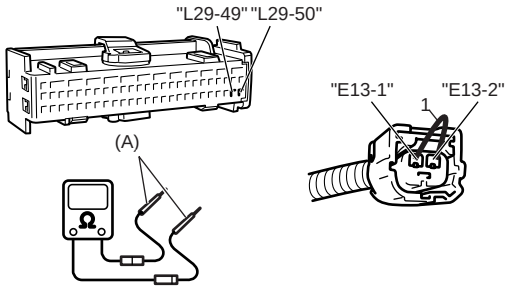
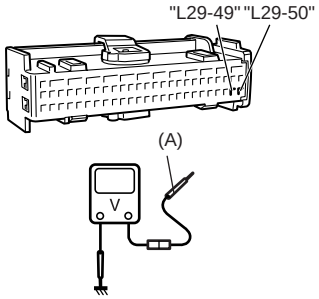
DTC Will Set when

Forward-sensor abnormal signal is detected by SDM.

Flow Test Description

Step 1: Check for open circuit in forward-sensor circuit.
Step 2: Check for short circuit between forward-sensor circuit and ground.
Step 3: Check for short circuit between forward-sensor circuit and power supply circuit.
Step 4: Check if malfunction is in forward-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect forward-sensor connector “E13”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-49” and “L29-50” or terminals. 4) Check proper connection to forward-sensor connector at terminals “E13-1” and “E13-2”. 5) Using service wire (1), connect “E13-1” terminal and “E13-2” terminal of forward-sensor connector. 6) Measure resistance between terminals “L29-49” and “L29-50” of SDM connector. **Special tool** **(A): 09932-76010**  I4RS0A820039- *Is each measured resistance 1 Ω or less?*	Go to Step 2.	High resistance or open wire in “GRY/RED” circuit or “GRY” circuit.
2	1) Disconnect service wire from “E13” connector. 2) Measure voltage between “L29-49” terminal and body ground, “L29-50” terminal and body ground.  I4RS0A820040- *With ignition switch ON, is each measured value 1 V or less?*	Go to Step 3.	“GRY/RED” circuit or “GRY” circuit shorted to power supply circuit.
3	1) Check forward-sensor referring to “Forward-Sensor Inspection: ”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace forward-sensor referring to “Forward-Sensor Removal and Installation: ”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1081 / B1091: Driver / Passenger Side-Sensor Performance Problem

S4RS0A8204078

DTC Will Set when

SDM receives internal fault signal from side-sensor.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace driver or passenger side-sensor referring to "Side-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

DTC B1082 / B1092: Driver / Passenger Side-Sensor Communication Error

S4RS0A8204079

DTC Will Set when

Side-sensor abnormal signal is detected by SDM.

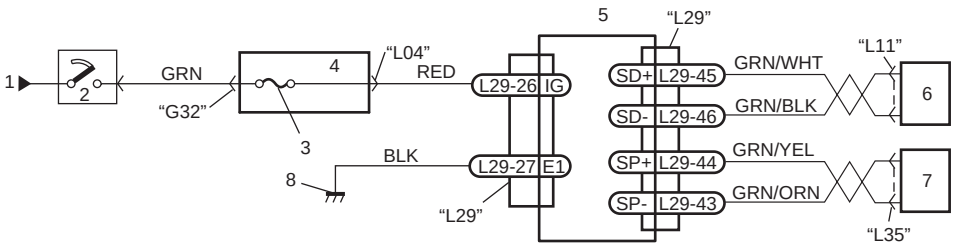
DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace driver or passenger side-sensor referring to "Side-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

DTC B1083 / B1093: Driver / Passenger Side-Sensor Circuit Short to Ground

S4RS0A8204080

Wiring Diagram



I4RS0A820041-

1. From main fuse	4. Junction block assembly	7. Passenger side-sensor
2. Ignition switch	5. SDM	8. Ground for air bag system
3. "A/BAG" fuse	6. Driver side-sensor	

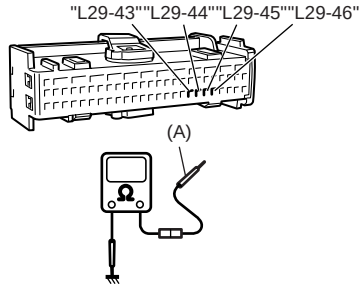
CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The resistance measured between side-sensor circuit and ground circuit is below a specified value for specified time.

Flow Test Description
Step 1: Check for short circuit between side-sensor circuit and ground.
Step 2: Check if malfunction is in side-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect side-sensor connector “L11” or “L35”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-45” and “L29-46” or terminals “L29-43” and “L29-44”. 4) Measure resistance between “L29-45” terminal and body ground, “L29-46” terminal and body ground, or “L29-43” terminal and body ground, “L29-44” terminal and body ground. **Special tool** **(A): 09932–76010**  I4RS0A820042- *Is each measured resistance infinity?*	Go to Step 3.	DTC B1083: “GRN/WHT” circuit or “GRN/BLK” circuit shorted to ground. DTC B1093: “GRN/YEL” circuit or “GRN/ORN” circuit shorted to ground.
2	1) Check side-sensor referring to “Side-Sensor Inspection: ”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace side-sensor referring to “Side-Sensor Removal and Installation: ”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE:

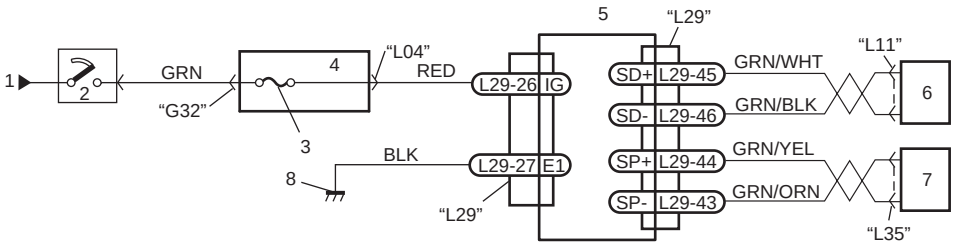
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1084 / B1094: Driver / Passenger Side-Sensor Circuit Short to Power Circuit or Open

S4RS0A8204081

Wiring Diagram



I4RS0A820041-

1. From main fuse	4. Junction block assembly	7. Passenger side-sensor
2. Ignition switch	5. SDM	8. Ground for air bag system
3. "A/BAG" fuse	6. Driver side-sensor	

CAUTION:

- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

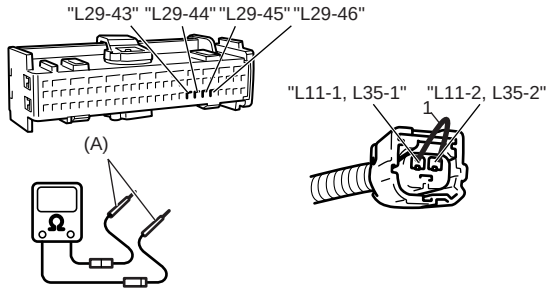
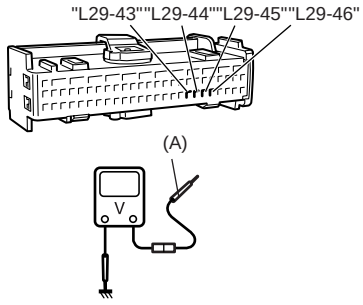
DTC Will Set when

The resistance measured between side-sensor circuit and power source circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check for open circuit in side-sensor circuit.
Step 2: Check for short circuit between side-sensor circuit and power supply circuit.
Step 3: Check if malfunction is in side-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect side-sensor connector “L11” or “L35”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-45” and “L29-46” or terminals “L29-43” and “L29-44”. 4) Check proper connection to side-sensor connector at terminals “L11-1” and “L11-2” or terminals “L35-1” and “35-2”. 5) Using service wire (1), connect “L11-1” terminal and “L11-2” terminal of driver side-sensor connector or “L35-1” terminal and “L35-2” terminal of passenger side-sensor connector. 6) Measure resistance between terminals “L29-45” and “L29-46” or between “L29-43” and “L29-44” of SDM connector. **Special tool** **(A): 09932–76010**  *Is each measured resistance 1 Ω or less?*	Go to Step 2.	DTC B1084: High resistance or open wire in “GRN/WHT” circuit or “GRN/BLK” circuit. DTC B1094: High resistance or open wire in “GRN/YEL” circuit or “GRN/ORN” circuit.
2	1) Disconnect service wire from “L11” or “L35” connector. 2) Measure voltage between “L29-45” terminal and body ground, “L29-46” terminal and body ground or “L29-43” terminal and body ground, “L29-44” terminal and body ground.  *With ignition switch ON, is each measured value 1 V or less?*	Go to Step 3.	DTC B1084: “GRN/WHT” circuit or “GRN/BLK” circuit shorted to power supply circuit. DTC B1094: “GRN/YEL” circuit or “GRN/ORN” circuit shorted to power supply circuit.
3	1) Check side-sensor referring to “Side-Sensor Inspection: ”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace side-sensor referring to “Side-Sensor Removal and Installation: ”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1085 / B1095: Wrong Side-Sensor (Driver Side / Passenger) ID

S4RS0A8204082

DTC Will Set when

SDM receives wrong ID (Part No.) signal from side-sensor.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace driver or passenger side-sensor referring to "Side-Sensor Removal and Installation: ".
3) Repeat "Air Bag Diagnostic System Check: ".

NOTE:

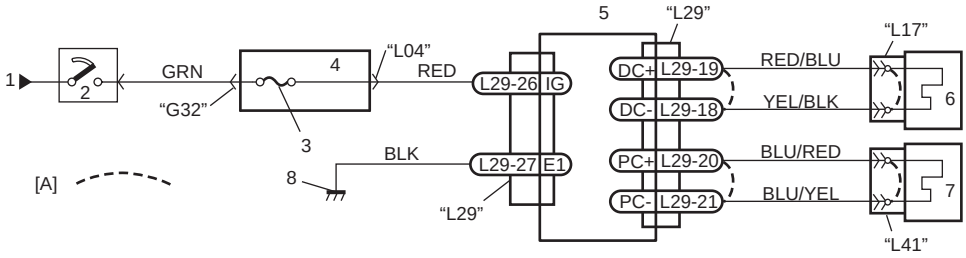
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1361 / B1365: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance High

S4RS0A8204083

Wiring Diagram



I4RS0A820095-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

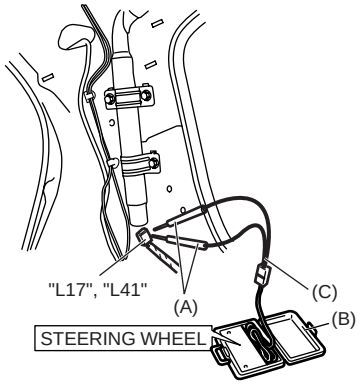
CAUTION:

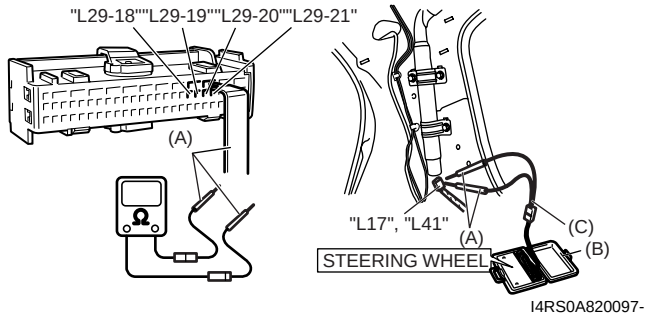
- **Be sure to perform "Air Bag Diagnostic System Check: " before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections: ".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The combined resistance of the side curtain-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is above a specified value for specified time.

Flow Test Description
Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side curtain-air bag (inflator) module at terminals in “L17” or “L41” connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820096- 4) Check SDM DTC. *With ignition switch ON, is DTC B1361 or B1365 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to “Side Curtain-Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-18” and “L29-19” or “L29-20” and “L29-21”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-18” and “L29-19” terminals (for DTC B1361) or “L29-20” and “L29-21” terminals (for DTC B1365) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820097- *Is resistance 2.82 Ω or less?*	Substitute a known-good SDM and recheck.	DTC B1361: Repair high resistance or open in “RED/BLU” or “YEL/BLK” wire circuit. DTC B1365: Repair high resistance or open in “BLU/RED” or “BLU/YEL” wire circuit.

NOTE:

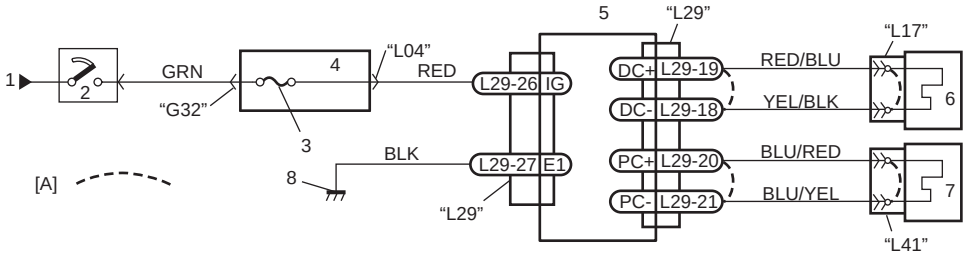
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance: ”, if any.**
- **Repeat “Air Bag Diagnostic System Check: ” to confirm that the trouble has been corrected.**

DTC B1362 / B1366: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance Low

S4RS0A8204084

Wiring Diagram



I4RS0A820095-

[A]: Shorting bar	3. “A/BAG” fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

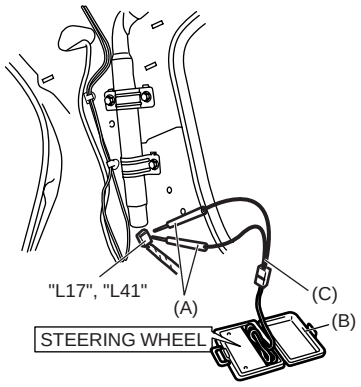
DTC Will Set when

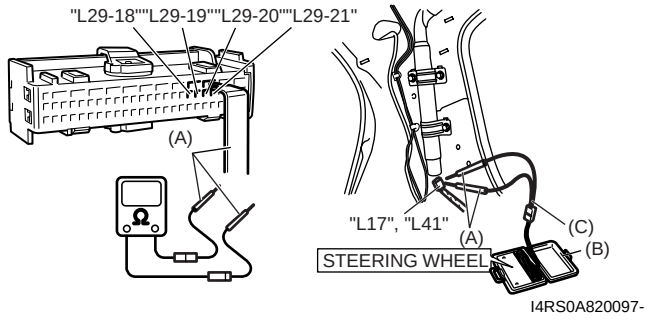
The combined resistance of the side curtain-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is below a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side curtain-air bag (inflator) module at terminals in “L17” or “L41” connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820096- 4) Check SDM DTC. *With ignition switch ON, is DTC B1362 or B1366 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to “Side Curtain-Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Check proper connection to SDM at terminals "L29-18" and "L29-19" or "L29-20" and "L29-21". 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between "L29-18" and "L29-19" terminals (for DTC B1362) or "L29-20" and "L29-21" terminals (for DTC B1366) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820097- *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	DTC B1362: Repair short from "RED/BLU" wire circuit to "YEL/BLK" wire circuit or from "RED/BLU" or "YEL/BLK" wire circuit to other wire circuit. DTC B1366: Repair short from "BLU/RED" wire circuit to "BLU/YEL" wire circuit or from "BLU/RED" or "BLU/YEL" wire circuit to other wire circuit.

NOTE:

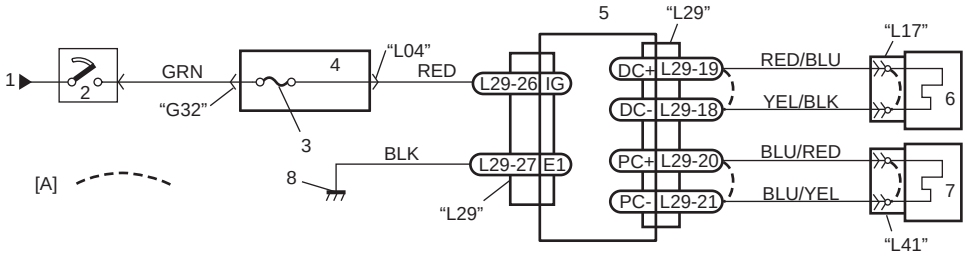
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1363 / B1367: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Ground

S4RS0A8204085

Wiring Diagram



I4RS0A820095-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

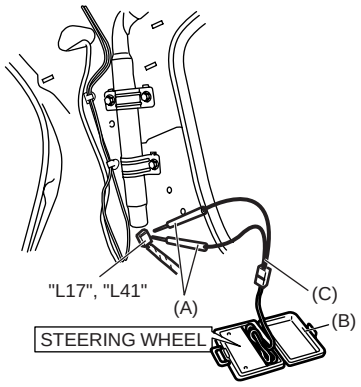
DTC Will Set when

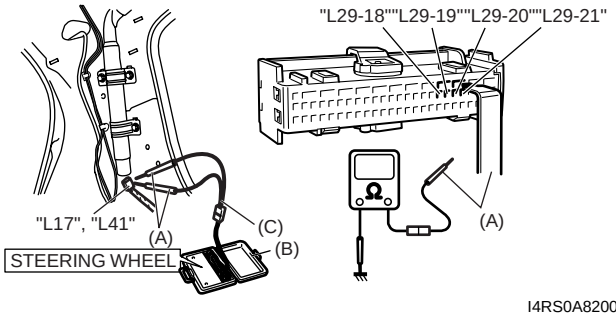
The voltage measured at side curtain-air bag (driver or passenger) initiator circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side-air bag (inflator) module at terminals in “L17” or “L41” connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820096- 4) Check SDM DTC. *With ignition switch ON, is DTC B1363 or B1367 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to “Side Curtain-Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between "L29-18" and body ground, and between "L29-19" and body ground (for DTC B1363) or "L29-20" and body ground, and between "L29-21" and body ground (for DTC B1367) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820098- *Is resistance infinity?*	Substitute a known-good SDM and recheck.	DTC B1363: Repair short from "RED/BLU" or "YEL/BLK" wire circuit to ground. DTC B1367: Repair short from "BLU/RED" or "BLU/YEL" wire circuit to ground.

NOTE:

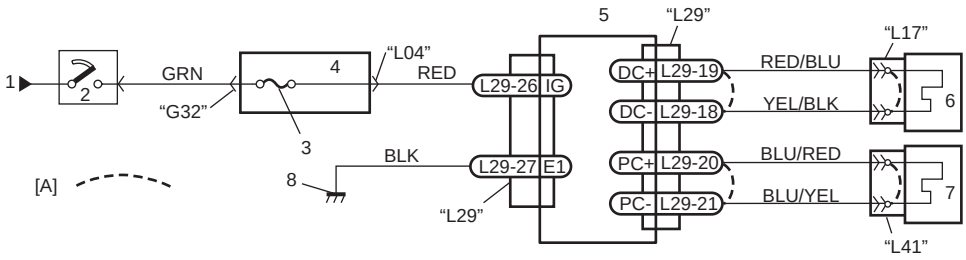
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

DTC B1364 / B1368: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Power Circuit

S4RS0A8204086

Wiring Diagram



I4RS0A820095-

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

CAUTION:

- **Be sure to perform “Air Bag Diagnostic System Check: ” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections: ”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

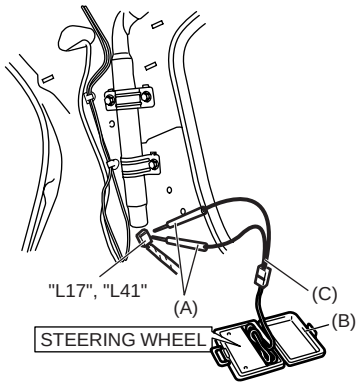
DTC Will Set when

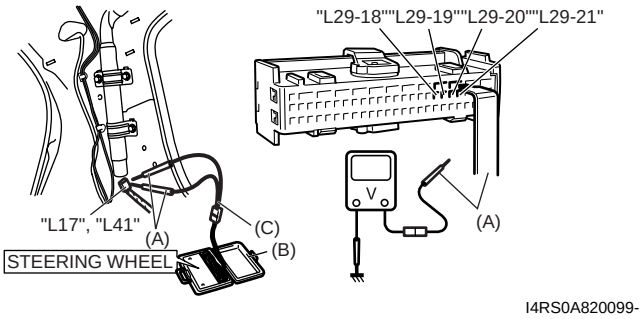
The voltage measured at side curtain-air bag (driver or passenger) initiator circuit is above a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side curtain-air bag (inflator) module at terminals in “L17” or “L41” connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820096- 4) Check SDM DTC. *With ignition switch ON, is DTC B1364 or B1368 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to “Side Curtain-Air Bag (Inflator) Module Removal and Installation: ”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage between "L29-18" and body ground, and between "L29-19" and ground (for DTC B1364) or "L29-20" and body ground, and between "L29-21" and body ground (for DTC B1368) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820099- *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	DTC B1064: Repair short from "RED/BLU" or "YEL/BLK" wire circuit to power circuit. DTC B1068: Repair short from "BLU/RED" or "BLU/YEL" wire circuit to power circuit.

NOTE:

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance: ", if any.**
- **Repeat "Air Bag Diagnostic System Check: " to confirm that the trouble has been corrected.**

Inspection of Intermittent and Poor Connections

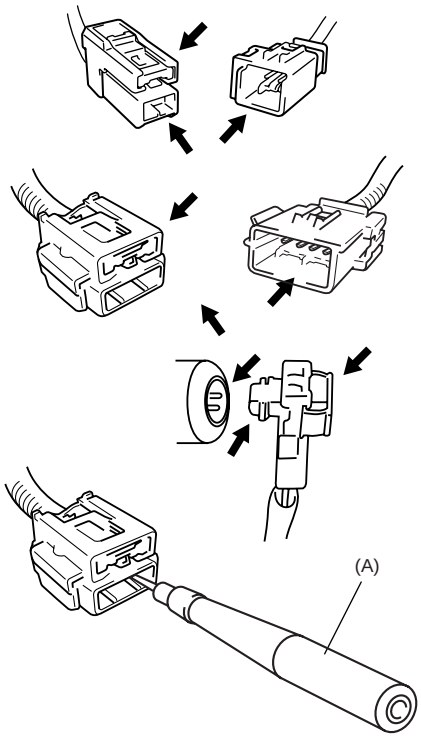
S4RS0A8204032

Most intermittents are caused by faulty electrical connections or wiring. When a check for proper connection is requested in a diagnostic flow, perform careful check of suspect circuits.
If any abnormality is found, repair or replace as a wire harness assembly.

- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.
  However, cleaning the terminal with a sand paper or the like is prohibited.
- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals.

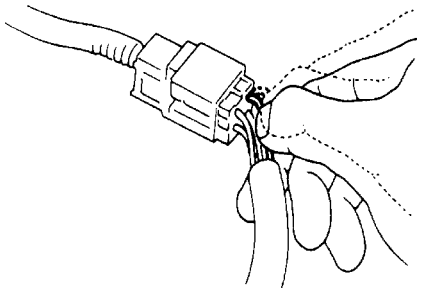
Check each connector terminal in problem circuits carefully to ensure good contact tension by using the corresponding mating terminal included in the connector test adapter kit (special tool).
If contact tension is not enough, reform the terminal to increase contact tension or replace it.

Special tool
(A): 09932-76010 (Connector test adapter kit)



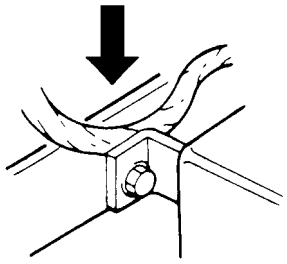
I4RS0A820045-

- Poor terminal-to-wire connection.
  Check each wire harness in problem circuits for poor connection by shaking it by hand lightly. If any abnormal condition is found, change the wire harness assembly or component parts with new ones.



IYSQ01010028-

- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wire broken inside the insulation. This condition could cause a continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are intact, resistance could be far too high.



IYSQ01820025-

Repair and Inspection Required after Accident

S4RS0A8204033

CAUTION:

- **All air bag system components, including the electrical harness (component mounting points), must be inspected after an accident. If any components are damaged or bent, they must be replaced even if air bag system activation did not occur.**
- **Never use air bag system parts from another vehicle.**
- **Do not attempt to service the parts below. Service of these parts is by replacement only.**
  - **Driver / Passenger air bag (inflator) modules**
  - **Driver / Passenger side-air bag (inflator) modules**
  - **Driver / Passenger side curtain-air bag (inflator) modules**
  - **Driver / Passenger seat belt pretensioners**
  - **Forward-sensor**
  - **Driver / Passenger side-sensors**
  - **SDM**
  - **Contact coil and combination switch assembly**
  - **Air bag wire harness in main harness, instrument panel harness and floor harness.**
- **Proper operation of the sensors and air bag system requires that any repairs to the vehicle structure return it to its original production configuration.**

CAUTION:

After detecting one time of such collision as to meet deployment conditions, the SDM must not be used.
Refer to "Air Bag Diagnostic System Check: " when checking the SDM.

Accident with Deployment / Activation – Component Replacement

When driver and passenger air bags are deployed, the following components must be replaced.

- Driver and passenger air bag (inflator) modules
- Driver and passenger seat belt pretensioners
- SDM after detecting such collision as to meet deployment conditions
- Forward-sensor
- Instrument panel

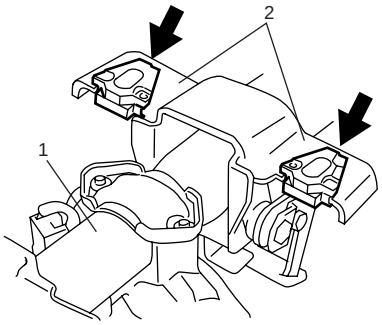
When side-air bag and side curtain-air bag are deployed, the following components must be replaced.

- Deployed side-air bag (inflator) module
- Deployed side curtain-air bag (inflator) module
- Side-sensor
- SDM

Accident with or without Deployment / Activation – Component Inspections

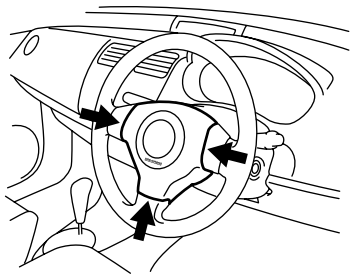
Certain air bag and restraint system components must be inspected after any crash, whether the air bag system activated or not. If any faulty condition is found in the following checks, replace faulty part.
Those components are:

- Steering column (1) and shaft joints
  - Check for length, damage and bend according to "Checking Steering Column for Accident Damage: in Section 6B".
- Steering column bracket (2) and capsules
  - Check for damage and bent.



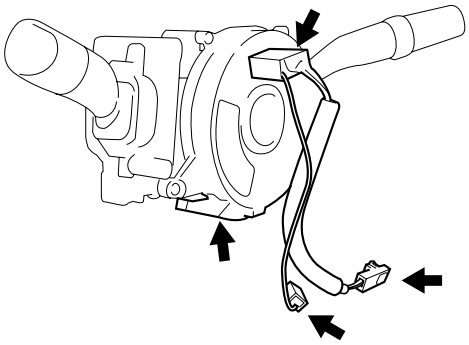
I4RS0A820046-

- Steering wheel and driver air bag (inflator) module
  - Check for damage or air bag (inflator) module fitness.
  - Check trim cover (pad surface) for cracks.
  - Check wire harness and connector for damage or tightness.



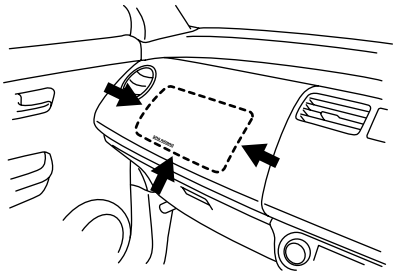
I4RS0A820047-

- Contact coil and combination switch assembly
  - Check wire harness and connectors for damage or tightness.
  - Check contact coil case for damage.



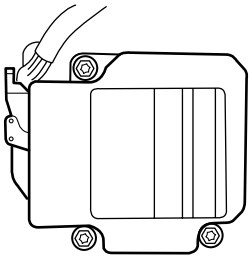
I4RS0A820048-

- Instrument panel member and reinforcement
  - Check for any distortion, bending, cracking or other damage.
  - Check instrument panel for cracks or deformities.
- Passenger air bag (inflator) module
  - Check for dents, cracks, damage or fitness.
  - Check harness and connector for damage or tightness.



I4RS0A820049-

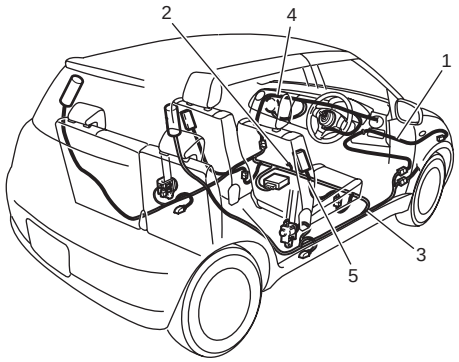
- SDM
  - Check for external damage such as deformation, scratch, crack, peeled paint, etc.
  - Check SDM for a cause in itself preventing its proper installation. (There is a gap between SDM and SDM plate, or it cannot be fixed securely.)
  - Check connector or lead wire of SDM for scorching, melting or damage.
  - Check SDM connector and terminals for tightness.
  - Check if SDM sets a DTC and is judged as malfunctioning according to the diagnostic flow.



I5RH01820092-

- Air bag wire harness and connections
  - Check for damages, deformities or poor connections.
    Refer to "Inspection of Intermittent and Poor Connections: ".

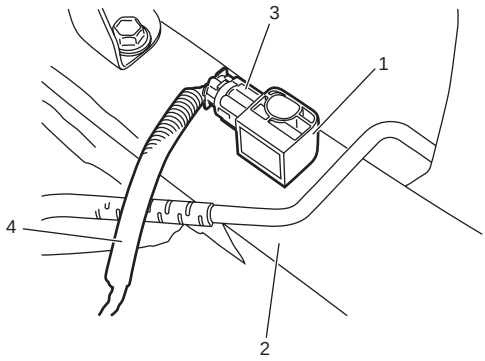
– Check wire harness clamps for tightness.
– For air bag harness including in instrument panel harness replacement, refer to “Passenger Air Bag (Inflator) Module Repair Harness Installation: ”.



I4RS0A820004-

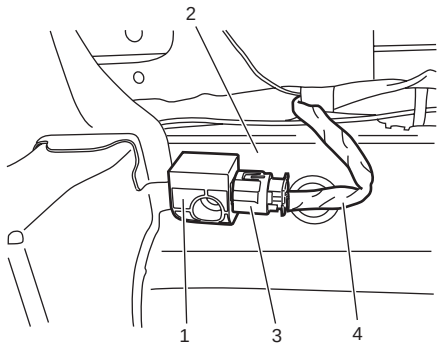
1. Main harness	4. Instrument panel harness
2. Grounding point	5. Seat harness
3. Floor harness	

- Forward-sensor
  – Check sensor (1) and front panel (2) for damage, bend or rust.
  – Check connector (3) or lead wire (4) of forward-sensor for scorching, melting or damage.



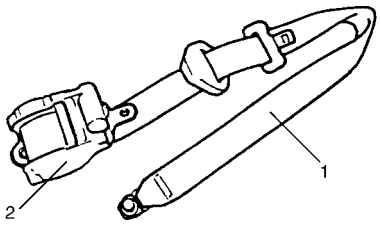
I4RS0A820050-

- Side-sensor
  – Check sensor (1) and under body (2) for dents, cracks, deformation or rust.
  – Check sensor connector (sensor side and harness side) (3) or sensor lead wire (4) for damage, crack, scorching or melting.



I4RS0A820051-

- Seat belt pretensioner
  – Check for dents, cracks, damage or fitness
  – Check harness and connector for damage or tightness.



I3JA01820043-

1. Seat belt	
2. Retractor assembly	

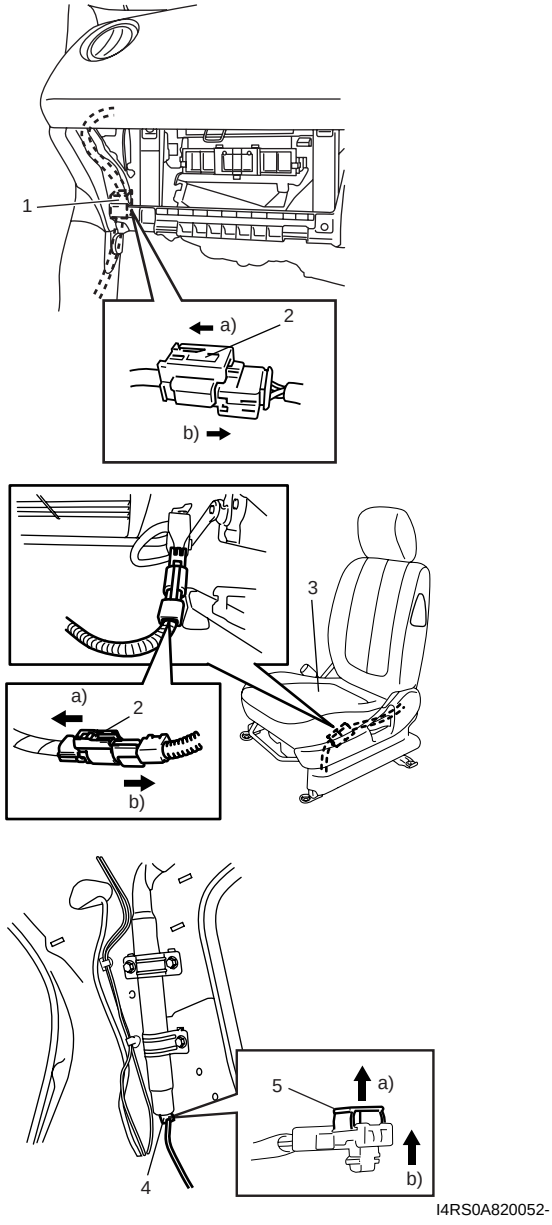
- Seat belts and mounting points
  – Refer to “Front Seat Belt Components: in Section 8A”.
- “AIR BAG” warning lamp
  – After vehicle is completely repaired, perform “Air Bag Diagnostic System Check: ”.
- Side-air bag (inflator) module
  – Check for dents, cracks, damage or fitness.
  – Check trim cover for cracks or deformities.
  – Check wire harness and connector for damage or tightness.
- Side curtain-air bag (inflator) module
  – Check for dents, cracks, damage or fitness.
  – Check harness wire harness and connector for damage or tightness.
  – Check headlining for cracks or deformation.

Repair Instructions

Disabling Air Bag System

S4RS0A8206001

1) Turn steering wheel so that vehicle's wheels (front tires) are pointing straight ahead.
2) Disconnect negative (–) cable at battery.
3) Turn ignition switch to "LOCK" position and remove key.
4) Remove "A/BAG" fuse from fuse box.
5) Pull out glove box while pushing its stopper from both right and left sides and disconnect yellow connector (1) for driver and passenger air bags as follows.
   a) Release locking of lock slider (2).
   b) After unlocked, disconnect connector.
6) If equipped with side-air bag (inflator) module, disconnect yellow connector of side-air bag (inflator) module under front seat cushion (3).
   a) Release locking of lock slider.
   b) After unlocked, disconnect connector.
7) If equipped with side curtain-air bag (inflator) module, remove quarter inner trim and disconnect black connector (4) of side curtain-air bag (inflator) module.
   a) Unlock button (5).
   b) With lock button unlocked, disconnect connector.



I4RS0A820052-

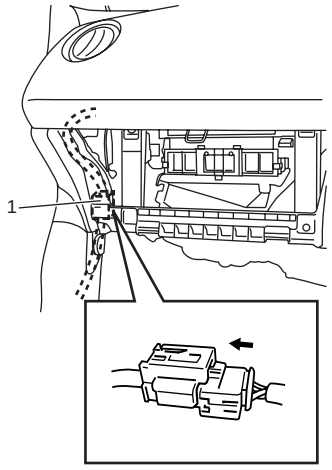
NOTE:

With "A/BAG" fuse removed and ignition switch ON, "AIR BAG" warning lamp will be ON.
This is normal operation and does not indicate air bag system malfunction.

Enabling Air Bag System

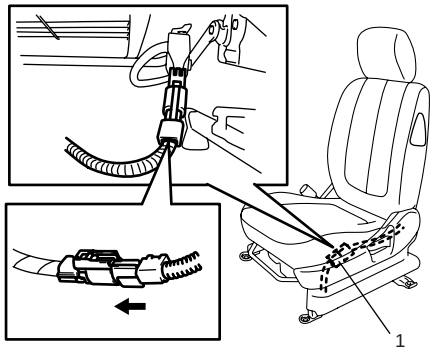
S4RS0A8206002

1) Confirm that battery negative (–) cable is disconnected.
2) Turn ignition switch to "LOCK" position and remove key.
3) Connect yellow connector (1) of passenger air bag (inflator) module by pushing connector till click is heard from it.



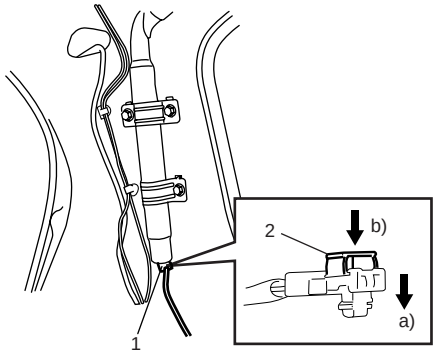
I4RS0A820053-

4) Install glove box.
5) If equipped with side-air bag (inflator) module, connect yellow connector (1) of side-air bag (inflator) module by pushing connector till click is heard from it.



I4RS0A820054-

6) If equipped with side curtain-air bag (inflator) module, connect black connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820055-

7) Install “A/BAG” fuse to fuse box.
8) Connect negative (–) cable at battery.
9) Turn ignition switch to ON position and verify that “AIR BAG” warning lamp flashes 6 times and then turns OFF. If it does not operate as described, perform “Air Bag Diagnostic System Check: ”.

SDM Removal and Installation

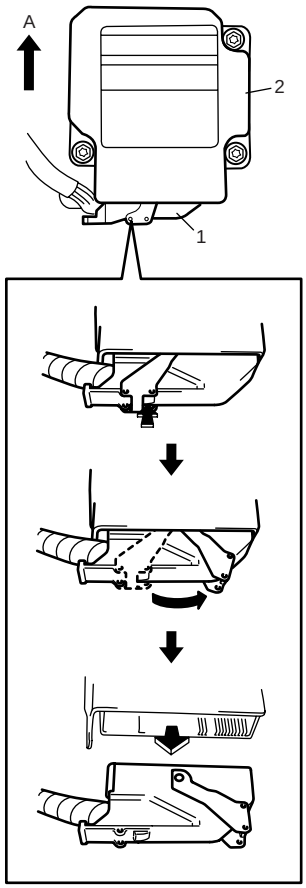
S4RS0A8206003

WARNING:

During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).
Be sure to read “Precautions on Service and Diagnosis of Air Bag System: ” before starting to work and observe every precaution during work. Neglecting them may result in personal injury or inactivation of the air bag system when necessary.

Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System: ”.
3) Remove center console box referring to “Console Box Components: in Section 9H”.
4) Disconnect SDM connector (1) from SDM (2).
5) Remove SDM (2) from vehicle.



I4RS0A820056-

A: Forward

Installation

1) Check that none of the following faulty conditions exists.
   - Bend, scratch, deformity in vehicle body where SDM is mounted.
   - Foreign matter or rust on mating surface of vehicle body where SDM is mounted.
2) Install SDM (2) to vehicle.

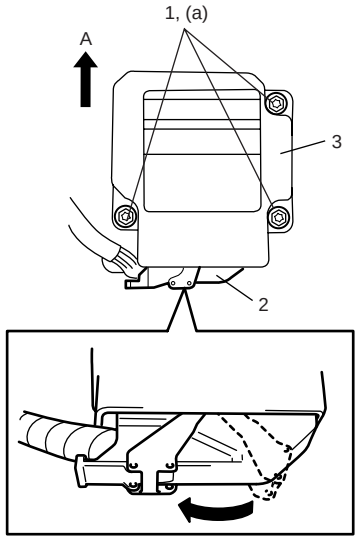
CAUTION:

Ensure that arrow on the SDM is pointing toward the front of the vehicle.

3) Tighten SDM bolts (1) to specified torque.

Tightening torque
SDM bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

4) Connect SDM connector (2) to SDM (3) securely.



I4RS0A820107-

A: Forward

5) Install center console box upper cover.
6) Enable air bag system referring to “Enabling Air Bag System: ”.
7) Connect negative cable at battery.

SDM Inspection

S4RS0A8206004

WARNING:

During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).
Be sure to read “Precautions on Service and Diagnosis of Air Bag System: ” before starting to work and observe every precaution during work. Neglecting them may result in personal injury or inactivation of the air bag system when necessary.

CAUTION:

- **Do not connect a tester whatever type it may be.**
- **Never repair or disassemble SDM.**
- **If SDM has been dropped, it should be replaced.**

If any faulty condition is found in the following checks, replace.

- Check SDM and SDM plate for dents, cracks or deformation.
- Check SDM connector for damage, cracks or lock mechanism.
- Check SDM terminal for bend, corrosion or rust.

Driver Air Bag (Inflator) Module Removal and Installation

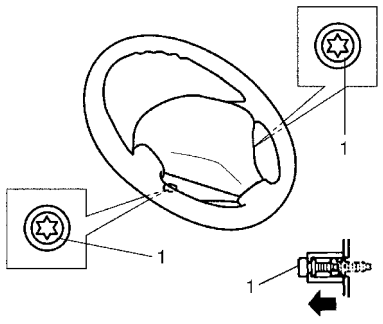
S4RS0A8206005

WARNING:

When handling an air bag (inflator) module, be sure to read “Precautions on Handling and Storage of Air Bag System Components: ” and observe each instruction. Failure to follow them could cause a damage to the air bag (inflator) module or result in personal injury.

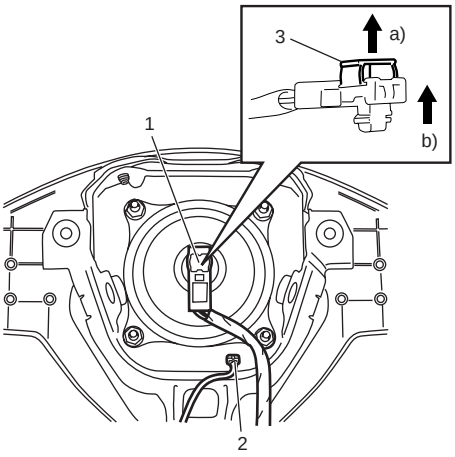
Removal

1) Disconnect negative cable at battery.
2) Disable air bag system. Refer to “Disabling Air Bag System: ”.
3) Loosen driver air bag (inflator) module mounting bolts (1) till it turns freely, pull them out and fix them to bolt clamps.



I3JA01820031-

4) Remove air bag (inflator) module from steering wheel.
5) Disconnect driver air bag (inflator) module connector (1) of driver air bag (inflator) module and horn connector (2) as shown in figure.
   a) Unlock lock button (3).
   b) With lock button unlocked, disconnect connector.



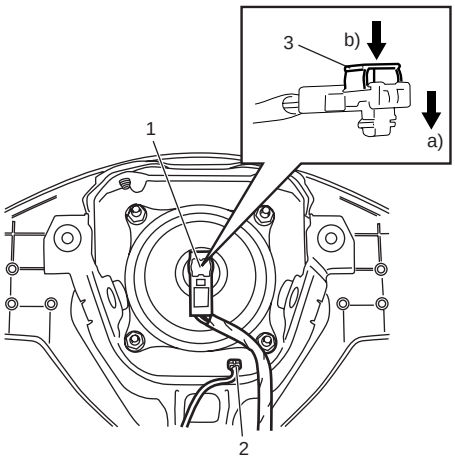
I4RS0A820057-

WARNING:

Special care is necessary when handling and storing a live (undeployed) air bag (inflator) module. Observe "Precautions on Handling and Storage of Air Bag System Components: ". Otherwise, personal injury may result.

Installation

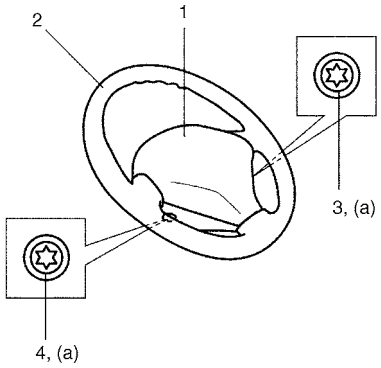
1) Connect horn connector (1) securely.
2) Connect driver air bag (inflator) module connector (2) to driver air bag (inflator) module (3) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button.



I4RS0A820058-

3) Install driver air bag (inflator) module (1) to steering wheel (2), taking care so that no part of wire harness is caught between them.
4) Make sure that clearance between module (1) and steering wheel (2) is uniform all the way.
5) Tighten driver air bag (inflator) module mounting bolt (left side) (3) to specified torque first and then driver air bag (inflator) module mounting bolt (right side) (4) to specified torque.

Tightening torque
Driver air bag (inflator) module mounting bolt
(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



I5RH01820103-

6) Enable air bag system. Refer to "Enabling Air Bag System: ".
7) Connect negative cable at battery.

Driver Air Bag (Inflator) Module Inspection

S4RS0A8206006

WARNING:

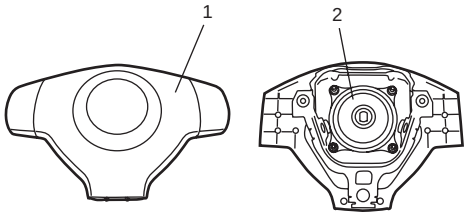
Never disassemble air bag (inflator) module or measure its resistance. Otherwise, personal injury may result.

CAUTION:

If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module visually and if any of the following is found, replace it with a new one.

- Air bag being deployed
- Trim cover (pad surface) (1) being cracked
- Inflator case (2) being damaged or having been exposed to strong impact (dropped)
- Bend or deformity of air bag (inflator) module bracket.



I4RS0A820059-

Passenger Air Bag (Inflator) Module Removal and Installation

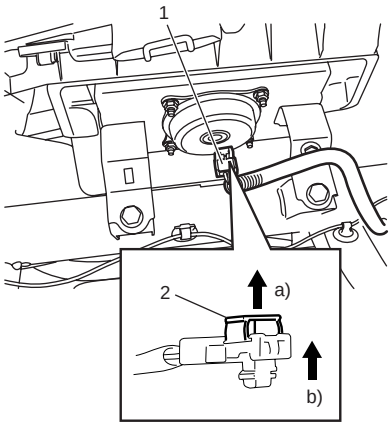
S4RS0A8206007

WARNING:

- **Never attempt to disassemble or repair the passenger air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: ", "Precautions on Handling and Storage of Air Bag System Components: " and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

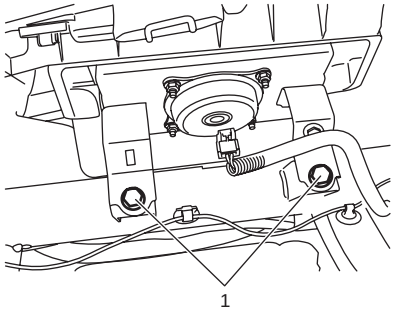
Removal

1) Disable air bag system. Refer to "Disabling Air Bag System: ".
2) Disconnect passenger air bag (inflator) module connector (1) as shown in figure.
   a) Unlock lock button (2).
   b) With lock button unlocked, disconnect connector.



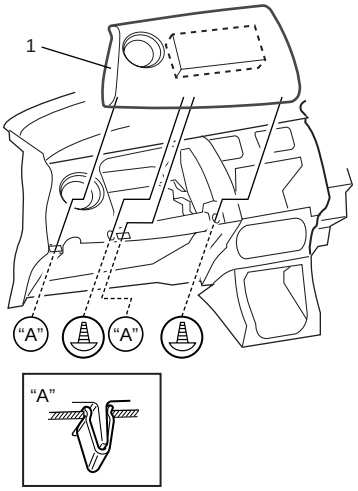
I4RS0A820060-

3) Remove passenger air bag (inflator) module attaching bolts (1).



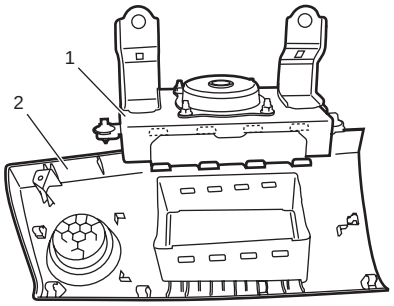
I4RS0A820061-

4) Remove passenger air bag (inflator) module with air bag hole cover (1) from instrument panel as shown.



I4RS0A820062-

5) Remove passenger air bag (inflator) module (1) from air bag hole cover (2).



I4RS0A820063-

WARNING:

- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you.**
  Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.
- **As the live passenger air bag (inflator) module must be kept with its bag (trim cover) facing up while being stored or left standing, place it on the workbench with a slit facing down or use the workbench vise to hold it securely at its lower mounting bracket. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Precautions on Handling and Storage of Air Bag System Components: " for handling and storing it.**

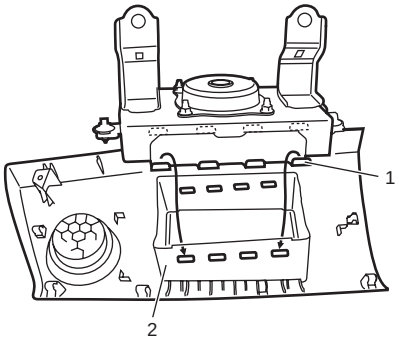
Otherwise, personal injury may result.

Installation

1) Install passenger air bag (inflator) module to air bag hole cover (2).

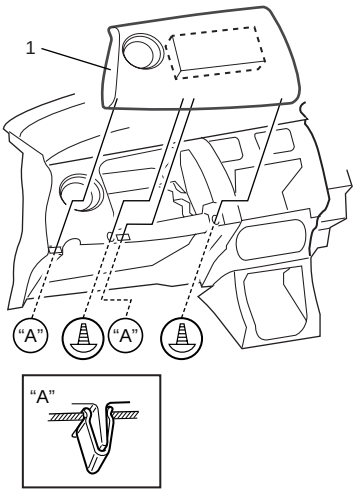
CAUTION:

Confirm claw (1) of passenger air bag (inflator) module hangs in air bag hole cover (2).



I4RS0A820064-

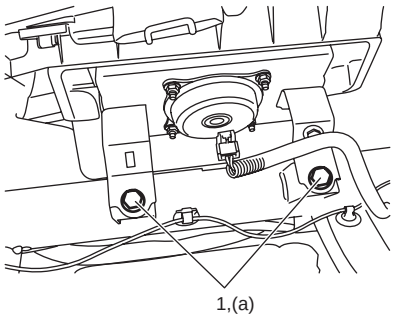
2) Install passenger air bag (inflator) module with air bag hole cover (1) to instrument panel as shown.



I4RS0A820062-

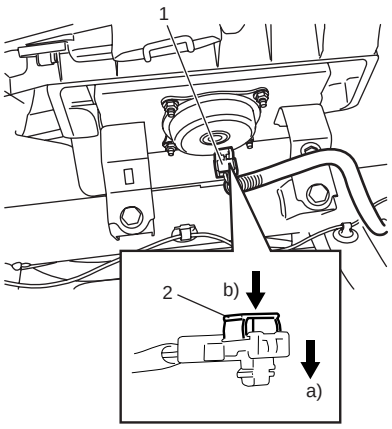
3) Tighten passenger air bag (inflator) module attaching bolts (1) to specified torque.

Tightening torque
Passenger air bag (inflator) module attaching bolt (a): 23 N·m (2.3 kg-m, 16.5 lb-ft)



I4RS0A820065-

4) Connect passenger air bag (inflator) module connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820066-

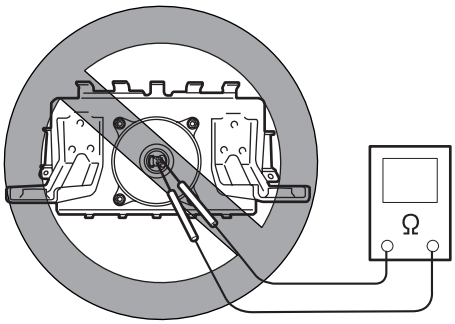
5) Enable air bag system. Refer to "Enabling Air Bag System: ".

Passenger Air Bag (Inflator) Module Inspection

S4RS0A8206008

WARNING:

- **Never measure resistance of passenger air bag (inflator) module or disassemble it. Otherwise personal injury may result.**
- **Never attempt to disassemble or repair the passenger air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: ", "Precautions on Handling and Storage of Air Bag System Components: " and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



I3RH0A820071-

CAUTION:

If air bag (Inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for the following symptoms and if any one of them is found, replace with a new one.

- Air bag has deployed.
- Wire harness or connector is damaged.
- Air bag (inflator) module is damaged or a strong impact was applied to it.
- Bend or deformity of air bag (inflator) module bracket.

Side-Air Bag (Inflator) Module Removal and Installation

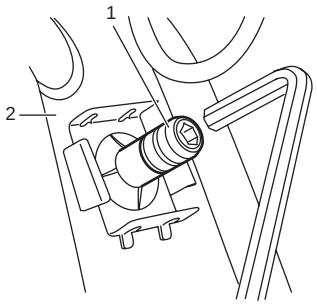
S4RS0A8206021

WARNING:

- **Never attempt to disassemble or repair the side-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: ", "Precautions on Handling and Storage of Air Bag System Components: " and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

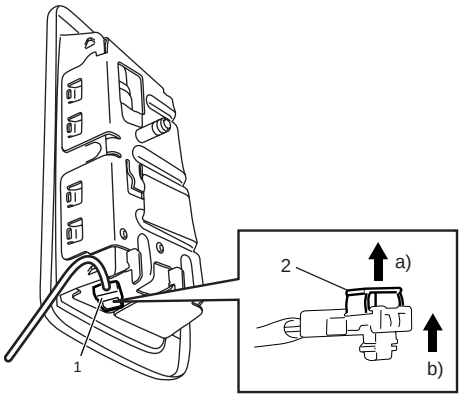
Removal

1) Disable air bag system. Refer to "Disabling Air Bag System: ".
2) Roll up the seat surface of the seat back.
3) Remove sleeve lock nut (1) from seat back (2).



I4RS0A820067-

4) Remove side-air bag (inflator) module from seat back.
5) Disconnect side-air bag (inflator) module connector (1) as shown in figure.
   a) Unlock lock button (2).
   b) With lock button unlocked, disconnect connector.



I4RS0A820068-

WARNING:

- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you.**
  Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.
- **As the live side-air bag (inflator) module must be kept with its bag (trim cover) facing up while being stored or left standing. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Precautions on Handling and Storage of Air Bag System Components: " for handling and storing it.**

Otherwise, personal injury may result.

CAUTION:

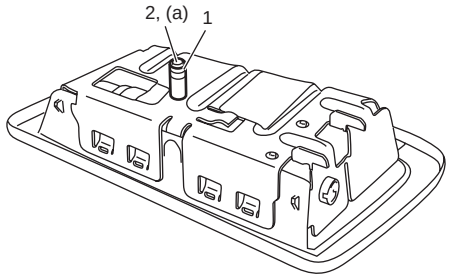
Do not damage the sleeve. Otherwise, the side-air bag cannot be correctly installed to seat back.

Installation

1) Confirm sleeve (1) is surely installed in side-air bag (inflator) module.
2) Tighten sleeve lock nut (2) to specified torque.

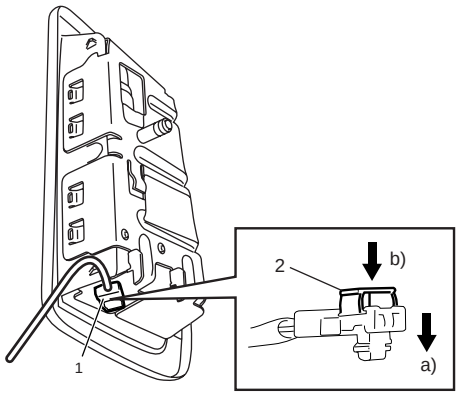
   Tightening torque
   Sleeve lock nut (a): 2.5 N·m (0.25 kg-m, 2.0 lb-ft)

3) Install new clip to seat back.



I4RS0A820073-

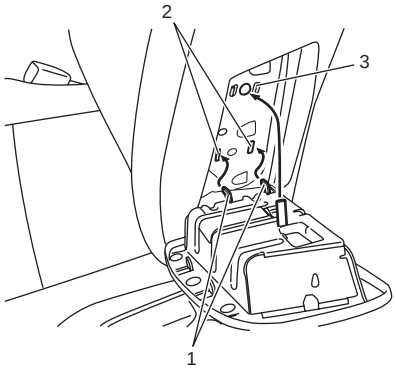
4) Connect side-air bag (inflator) module connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820070-

5) Insert claw (1) of side-air bag (inflator) module on installation hole (2).
6) Push side-air bag (inflator) module into clip (3) with specified force.

   Side-air bag (inflator) module installation force
   Pushing force: 180 N



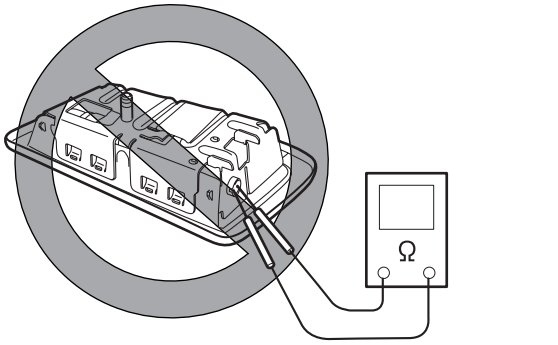
I4RS0A820074-

Side-Air Bag (Inflator) Inspection

S4RS0A8206022

WARNING:

- **Never attempt to disassemble or repair the side-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



I4RS0A820075-

CAUTION:

If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for the following symptoms and if any one of them is found, replace with a new one.

- Air bag has deployed.
- There is a crack in trim cover (pad surface).
- Wire harness or connector is damaged.
- Air bag (inflator) module is damaged or a strong impact was applied to it.
- Bend or deformity of air bag (inflator) module bracket.

Side Curtain-Air Bag (Inflator) Module Removal and Installation

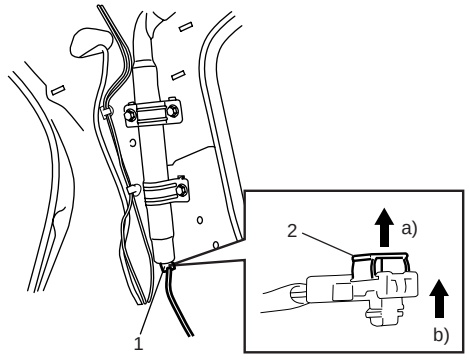
S4RS0A8206025

WARNING:

- **Never attempt to disassemble or repair the side curtain-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System: ", "Precautions on Handling and Storage of Air Bag System Components: " and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner: " before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

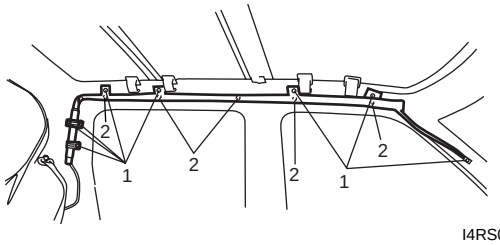
Removal

1) Disable air bag system. Refer to "Disabling Air Bag System: ".
2) Remove head lining referring to "Head Lining Removal and Installation: in Section 9H".
3) Disconnect side curtain-air bag (inflator) module connector (1) as shown in figure.
   a) Unlock lock button (2).
   b) With lock button unlocked, disconnect connector.



I4RS0A820077-

4) Remove side curtain-air bag (inflator) module fixing bolts (1) and clips (2).



I4RS0A820076-

5) Remove side curtain-air bag (inflator) module.

WARNING:

- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you.**
  Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.
- **As the live curtain air bag (inflator) module must be kept with its bag facing up while being stored or left standing. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Precautions on Handling and Storage of Air Bag System Components: " for handling and storing it.**

Otherwise, personal injury may result.

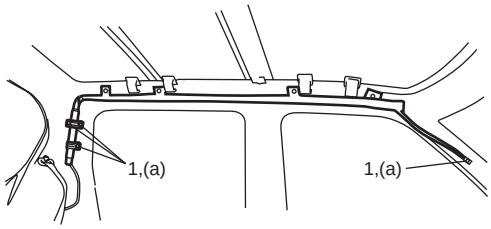
Installation

WARNING:

Do not install side curtain-air bag (inflator) module while twisted or bended. Otherwise, side curtain-air bag (inflator) module may not deploy and injury may result.

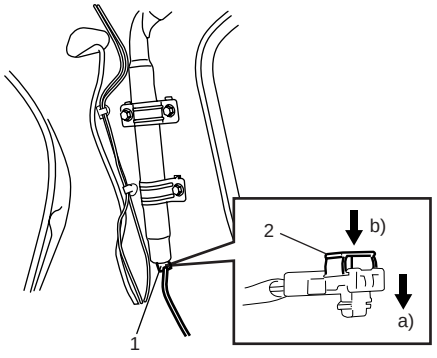
1) Install side curtain-air bag (inflator) module (1) with clips and new bolts.
2) Tighten side curtain-air bag (inflator) module attaching bolts (1) to specified torque.

Tightening torque
Side curtain-air bag (inflator) module attaching bolts (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



I4RS0A820110-

3) Connect side curtain-air bag (inflator) module connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820055-

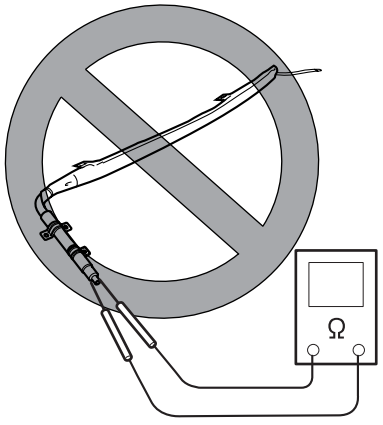
4) Install head lining referring to “Head Lining Removal and Installation: in Section 9H”.
5) Enable air bag system. Refer to “Enabling Air Bag System: ”.

Side Curtain-Air Bag (Inflator) Module Inspection

S4RS0A8206026

WARNING:

- **Never measure resistance of side curtain-air bag (inflator) module or disassemble it. Otherwise personal injury may result.**
- **Never attempt to disassemble or repair the side curtain-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read “Precautions on Service and Diagnosis of Air Bag System: ”, “Precautions on Handling and Storage of Air Bag System Components: ” and “Precautions on Disposal of Air Bag and Seat Belt Pretensioner: ” before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



I4RS0A820078-

CAUTION:

If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for the following symptoms and if any one of them is found, replace with a new one.

- Air bag has deployed.
- Inflator case being damaged or having been exposed to strong impact (dropped).

Forward-Sensor Removal and Installation

S4RS0A8206009

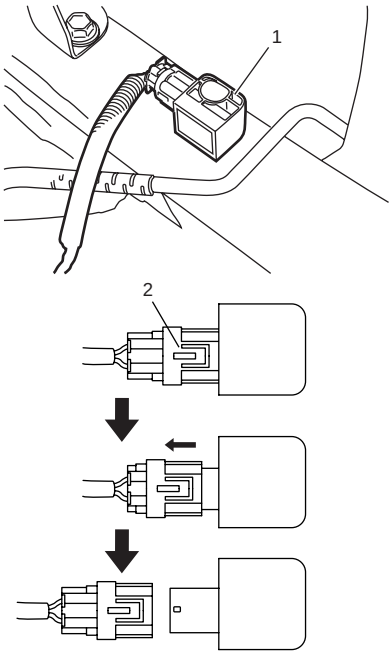
WARNING:

During service procedures, be very careful when handling a sensor.

- **Never strike or jar a sensor.**
- **A sensor and mounting bracket bolts must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

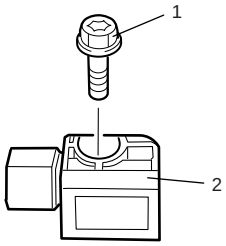
Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System: ”.
3) Disconnect forward-sensor connector sliding connector outer (2) as shown.



I4RS0A820079-

4) Remove forward-sensor bolt (1) and forward-sensor (2).



I5RH01820119-

Installation

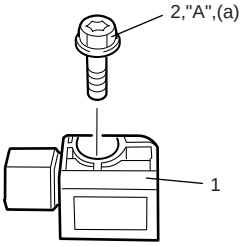
CAUTION:

Proper operation of forward-sensor requires sensor be rigidly attached to vehicle structure and that the arrow on sensor be pointing toward the front of the vehicle.

1) Check that none of the following faulty conditions exists.
   - Bend, deformity or rust of front panel.
   - Foreign matter on mating surface of sensor.
2) Apply thread lock cement to mounting bolts thread. Install forward-sensor (1) on front panel and tighten mounting bolt (2) to specified torque.

   "A": Thread lock cement 99000–32100

   Tightening torque
   Forward-sensor mounting bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



I5RH01820120-

3) Connect forward-sensor connector by pushing connector till click is heard from it.
4) Connect negative cable at battery.
5) Enable air bag system referring to "Enabling Air Bag System: ".

Forward-Sensor Inspection

S4RS0A8206010

WARNING:

During service procedures, be very careful when handling a sensor.
- **Never strike or jar a sensor.**
- **A sensor and mounting bracket bolts must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

CAUTION:

- **Never disassemble forward-sensor.**
- **Sensor should be replaced when it was dropped from a height of 90 cm (3 ft) or more.**

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust.

Side-Sensor Removal and Installation

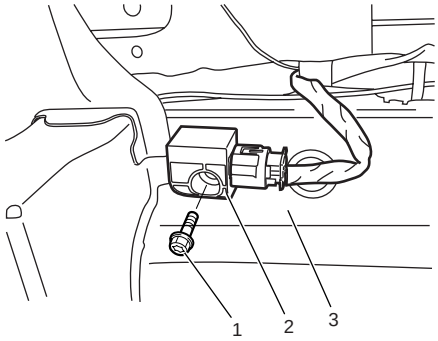
S4RS0A8206023

WARNING:

During service procedures, be very careful when handling a sensor.
- **Never strike or jar a sensor.**
- **A sensor bolt must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

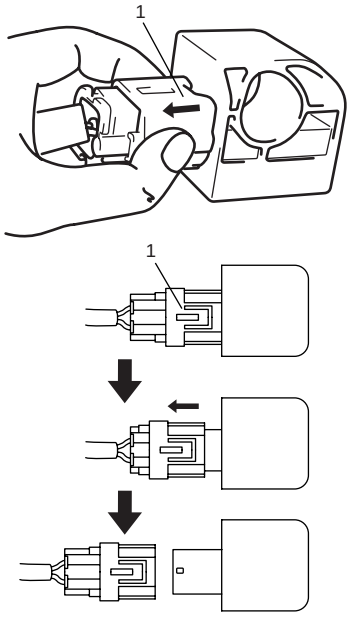
Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system. Refer to "Disabling Air Bag System: ".
3) Remove center pillar lower trim and side sill scuff.
4) Turn up floor carpet at front seat side.
5) Remove side-sensor bolt (1), and side-sensor (2) from under body (3).



I4RS0A820080-

6) Disconnect side-sensor connector sliding connector outer (1) as shown.



I4RS0A820109-

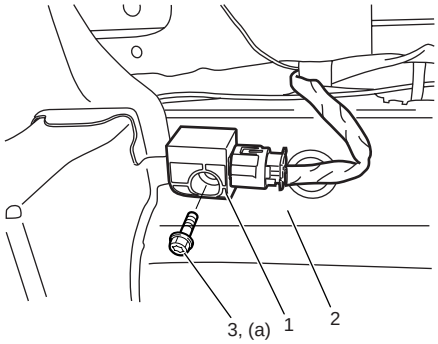
Installation

CAUTION:

Proper operation of side-sensor requires sensor be rigidly attached to specified position.

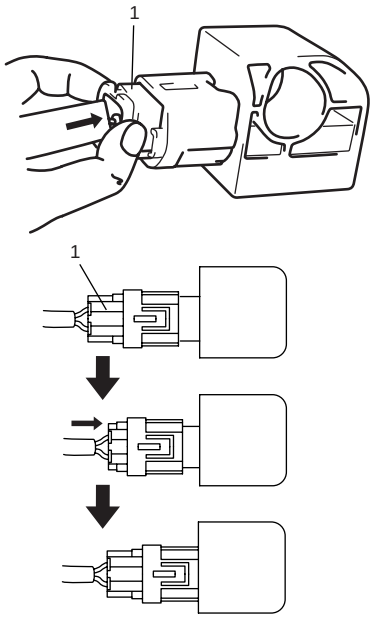
1) Check that none of following faulty conditions exists.
   - Bend, deformity or rust of under body.
   - Foreign matter on mating surface of sensor.
2) Install side-sensor (1) on under body (2) and tighten side-sensor bolt (3) to specified torque.

Tightening torque
Side-sensor bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



I4RS0A820081-

3) Connect side-sensor connector pushing connector inner (1) as shown.



I4RS0A820106-

4) Connect negative cable at battery.
5) Enable air bag system. Refer to “Enabling Air Bag System: ”.

Side-Sensor Inspection

S4RS0A8206024

WARNING:

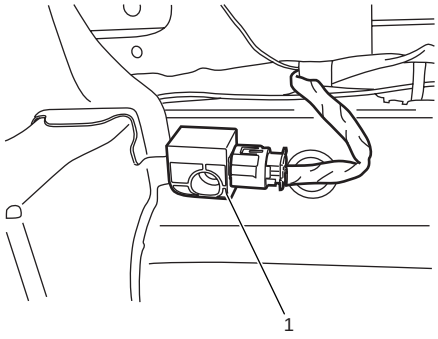
During service procedures, be very careful when handling a sensor.

- **Never strike or jar a sensor.**
- **A sensor and mounting bracket bolts must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

CAUTION:

- **Never disassemble side-sensor.**
- **Sensor should be replaced when it was dropped from a height of 90 cm (3 ft) or more.**

- Check sensor (1) for dents, crack, deformation.
- Check sensor connector (sensor side and harness side), lock mechanism or sensor lead wire for damage, crack, scorching or melting.
- Check connector terminals for bent, corrosion or rust. If any faulty condition is found in above checks, replace.

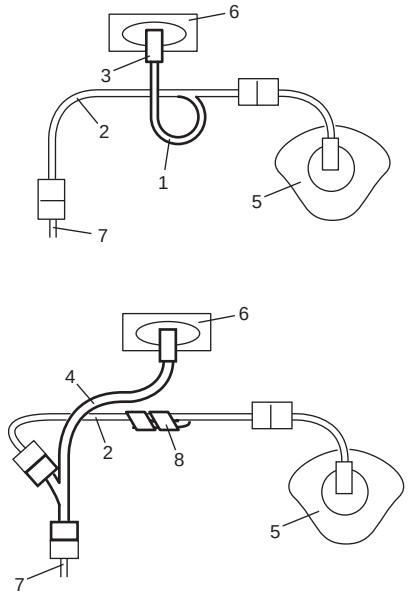


I4RS0A820082-

Passenger Air Bag (Inflator) Module Repair Harness Installation

S4RS0A8206027

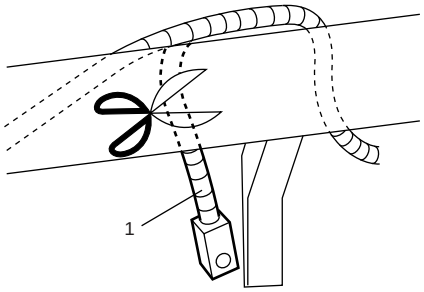
Replace passenger air bag (inflator) module repair harness (4) according to the following procedure when the harness (1) connected with passenger air bag (inflator) module of the air bag harness included in instrument panel harness (2) and passenger air bag (inflator) module connector (3) is damaged.



I4RS0A820103-

5. Driver air bag (inflator) module	7. Floor harness
6. Passenger air bag (inflator) module	8. Vinyl tape

1) Disable air bag system. Refer to “Disabling Air Bag System: ”.
2) Disconnect “L32” connector from floor harness located near the glove box.
3) Cut off passenger air bag (inflator) module harness (1) included in instrument panel harness (2) as shown, and then fasten it to instrument panel harness with vinyl tape for avoiding interference with other parts.



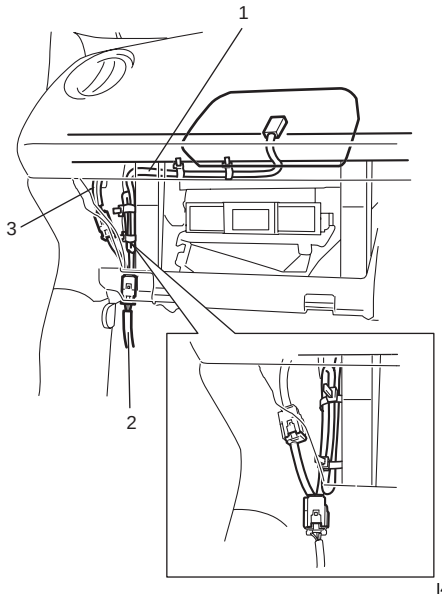
I4RS0A820083-

4) Install passenger air bag (inflator) module repair harness (1) to floor harness (2), instrument panel harness (3) and passenger air bag (inflator) module.

CAUTION:

To avoid interference with other parts, fasten the repair harness to instrument wire harness with a clamp or vinyl tape as shown in figure.

5) Connect each connector securely till click is heard.



I4RS0A820085-

Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal

S4RS0A8206013

WARNING:

Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which may cause personal injury. Do not dispose of live (undeployed) air bag (inflator) modules and seat belt pretensioners. Because undeployed air bag (inflator) module / inactivated seat belt pretensioner must not be disposed of through normal refuse channels. Undeployed air bag (inflator) module and inactivated seat belt pretensioner contain substances that can cause severe illness or personal injury if sealed container is damaged during disposal.

Air bag (inflator) module / seat belt pretensioner can be deployed / activated inside or outside of vehicle. Deployment / Activation method used depends upon final disposition of vehicle. Review the following instructions in order to determine which will work best in a given situation.

Deployment / Activation Outside of Vehicle: When you intend to return the vehicle to service, deploy the air bag (inflator) module(s) and/or activate seat belt pretensioner(s) outside of the vehicle.

Deployment / Activation Inside of Vehicle: When the vehicle will be destroyed, or salvaged for component parts, deploy the air bag module(s) and/or activate seat belt pretensioner(s) installed on vehicle.

WARNING:

The following precautions must be observed for this work. Failure to observe any of them may result in personal injury.

- **Procedure should be followed strictly as described here.**
- **Be sure to read “Precautions on Service and Diagnosis of Air Bag System: ” beforehand.**
- **To avoid accidental deployment / activation, this work should be performed by no more than one person.**
- **Since smoke is produced when air bag (inflator) module is deployed and pretensioner is activated, select well-ventilated area.**
- **Air bag (inflator) module and seat belt pretensioner will immediately deploy / activate when 12 volts vehicle battery is connected to it. Wear safety glasses throughout this entire deployment / activation and disposal procedure.**
- **Wear suitable ear protection when deploying air bag (inflator) module / activating seat belt pretensioner. Also, advise those who are in area close to deployment / activation site to wear suitable ear protection.**
- **Do not deploy / activate two or more air bag system components (air bag (inflator) modules and seat belt pretensioners) at the same time.**
- **Never connect deployment harness to any 12 volts vehicle battery before connecting deployment harness to air bag (inflator) module and seat belt pretensioner. Deployment harness shall remain shorted and not be connected to 12 volts vehicle battery till you are ready to deploy air bag (inflator) module or activate seat belt pretensioner.**

Deployment / Activation Outside of Vehicle
When you intend to return the vehicle to service, deploy the air bag (inflator) module(s) or activate seat belt pretensioner(s) outside of the vehicle.

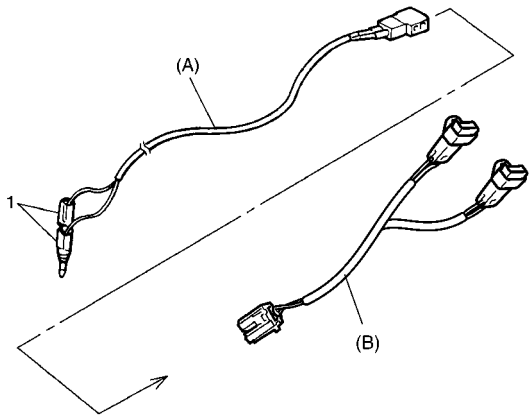
1) Turn ignition switch to LOCK position and remove key.
2) Wear safety glasses during this deployment / activation procedure.
3) Check that there is no open, short or damage in special tools (deployment harness (A) and adapter cable (B)). If any faulty is found, do not use it and be sure to use new special tool.

   Special tool
   (A): 09932-75031
   (B): 09932–76510

4) Short two deployment harness leads (1) together by fully seating one banana plug into the other.

   WARNING:

   Deployment harness (A) shall remain shorted and not be connected to 12 volts vehicle battery till you are ready to deploy air bag module or activate seat belt pretensioner.



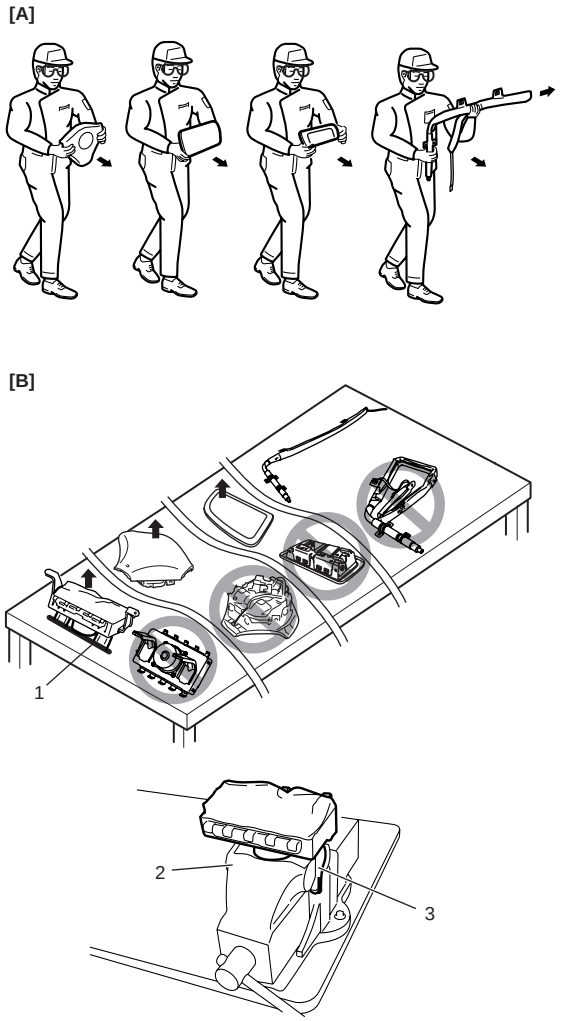
I4RS0A820084-

5) Remove air bag (inflator) module(s) or seat belt pretensioner(s) from vehicle referring to “Driver Air Bag (Inflator) Module Removal and Installation: ”, “Passenger Air Bag (Inflator) Module Removal and Installation: ”or “Front Seat Belt Removal and Installation: in Section 8A”.

WARNING:

- **For handing and storage of live air bag (inflator) module, select place where ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Always carry live air bag (inflator) module with trim cover away from you.**
- **When storing live air bag (inflator) module or when leaving live air bag (inflator) module unattended on bench or other surface, always face trim cover up and away from surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit (1) or use the workbench vise (2) to hold it securely at its lower mounting bracket (3). It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules. This is necessary so that free space is provided to allow air bag (inflator) module to expand in the unlikely event of accidental deployment.**

Failure to follow procedures may result in personal injury.



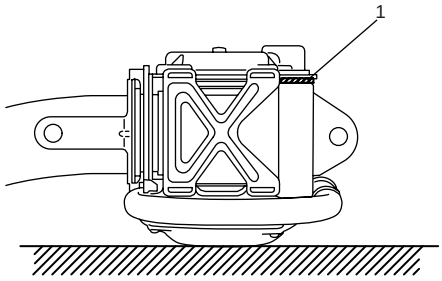
I4RS0A820086-

[A]:	Always carry air bag (inflator) module with trim cover (air bag opening) away from body.
[B]:	Always place air bag (inflator) module on workbench with trim cover (air bag opening) up, away from loose objects.
2.	Lower mounting bracket
3.	Workbench vise

WARNING:

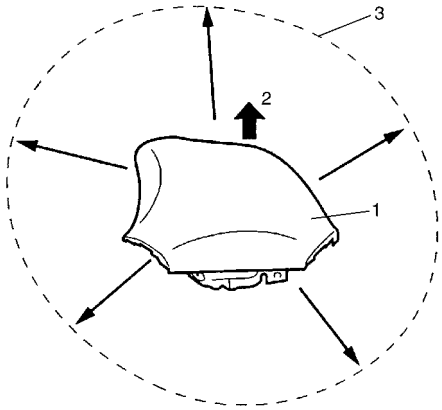
- **For handling and storage of seat belt pretensioner, select place where ambient temperature is below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Never carry seat belt pretensioner by webbing.**
- **When placing seat belt pretensioner on workbench or other surface, be sure to lay it with its exhaust hole (1) side facing up. It is also prohibited to put something on seat belt pretensioner.**

Otherwise, personal injury may result.



I4JA01822118-

6) Set air bag (inflator) module or seat belt pretensioner as follows.
   - For driver air bag (inflator) module
     a. Clear space (3) on ground about 185 cm (6 ft) in diameter where driver air bag (inflator) module (1) is set for deployment. Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where there is no activity and sufficient ventilation is provided. Ensure no loose or flammable object exists within deployment area.
     b. Place driver air bag (inflator) module (1) with its vinyl trim cover facing up (2) on ground in step a.



I3JA01820036-

   - For passenger air bag (inflator) module
     a. Clear space (3) on ground about 185 cm (6 ft) in diameter where passenger air bag (inflator) module (1) is set for deployment. Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where there is no activity and sufficient ventilation is provided. Ensure no loose or flammable object exists within deployment area.
     b. Place deployment fixture (A) on ground in step a.

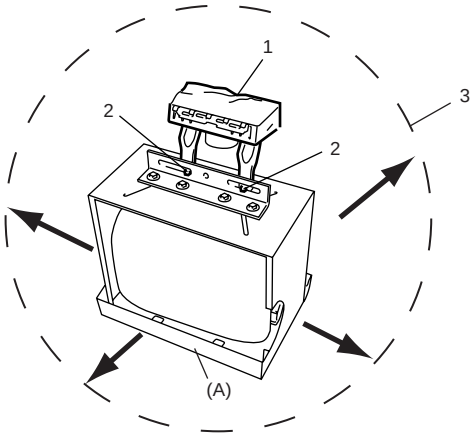
Special tool
(A): 09932-75041

c. Fill plastic reservoir in deployment fixture (A) with water or sand. This is necessary to provide sufficient stabilization of fixture during deployment.

d. Attach passenger air bag (inflator) module (1) in deployment fixture (A) securely using M8 bolt (2).

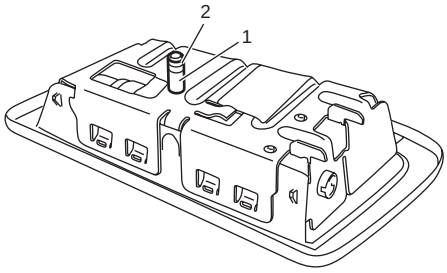
CAUTION:

Be sure to use M8 size and 7T strength bolt for fixing passenger air bag (inflator) module (1) to deployment fixture (A).



I4RS0A820087-

- For side-air bag (inflator) module
  a. Remove sleeve (1) and sleeve lock nut (2), if equipped.



I4RS0A820088-

b. Clear space (3) on ground about 185 cm (6 ft) in diameter where side-air bag (inflator) module for deployment. Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, space on shop floor where there is no activity and provide sufficient ventilation. Ensure no loose or flammable objects are within deployment area.

c. Place deployment fixture (A) on ground.

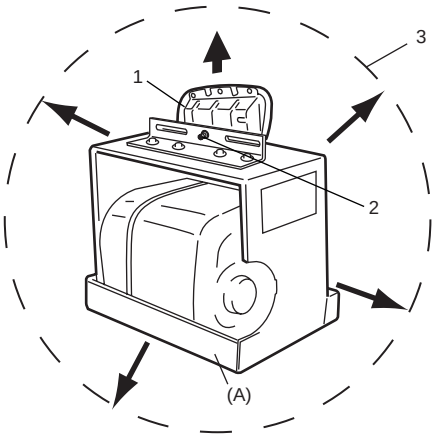
Special tool
(A): 09932–75041

d. Fill plastic reservoir in deployment fixture (A) with water or sand. This is necessary to provide sufficient stabilization of fixture during deployment.

e. Attach side-air bag (inflator) module (1) in deployment fixture using mounting attachment, sleeve lock nut and washer (2).

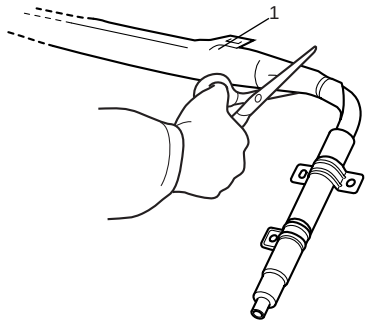
NOTE:

Make sure that deploying direction faces as shown in figure against mounting attachment.



I4RS0A820089-

- For side curtain-air bag (inflator) module
  a. Cut off bag (1) of side curtain-air bag (inflator) module.



I4RS0A820090-

b. Tie side curtain-air bag inflator (1) to tire (3) with wire harness (2) as shown.

Wire harness specifications
Stripped wire harness section 1.25 mm^2 (0.0019 in.^{2}) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

CAUTION:

Make sure that wire harness is tight. It is very dangerous if looseness in wire harness results in side curtain-air bag inflator flying off due to shock from inflator deploying.

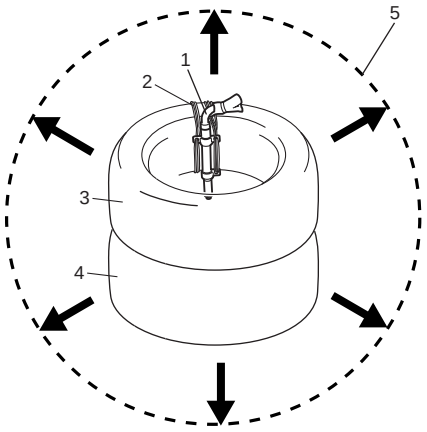
NOTE:

Wind wire harness (2) around at least 3 times.

c. Clear space (5) on ground about 185 cm (6 ft) in diameter where side curtain-air bag (inflator) module (1) is set for deployment.

Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where there is no activity and sufficient ventilation is provided. Ensure no loose or flammable object exists within activation area.

d. Pile tire with side curtain-air bag (inflator) module on tire (4).



I4RS0A820091-

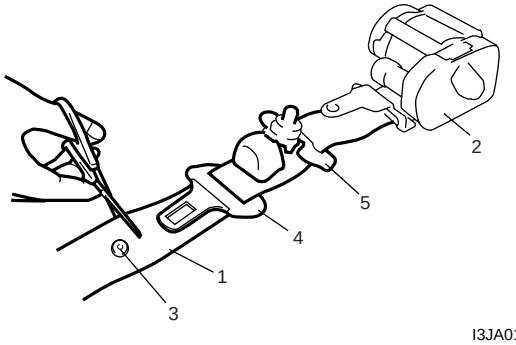
- For seat belt pretensioner
  a. Cut webbing (1) at tongue plate stopper (3) of seat belt pretensioner (2) side as shown.

NOTE:

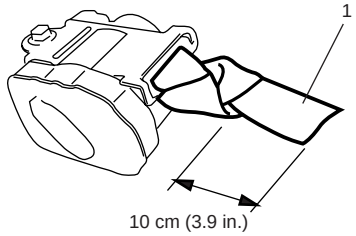
Hold seat belt pretensioner (2) vertically in the same condition as it is installed. Otherwise, webbing can't be pulled out.

b. Remove tongue plate (4) and shoulder anchor (5) from webbing.

c. Tie webbing (1) tightly at 10 cm (3.9 in.) from cutting edge as shown.



I3JA01820037-



I4RS0A820104-

d. Tie seat belt pretensioner (2) with wire harness (3) to wheel-installed tire (4) as shown.

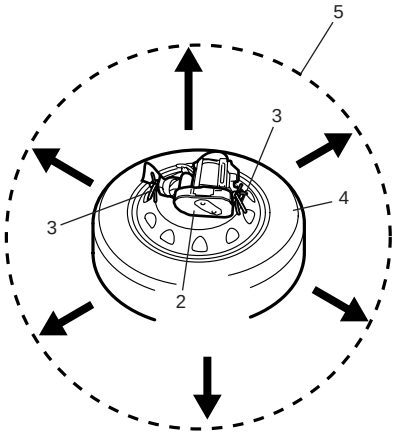
Wire harness specifications
Stripped wire harness section 1.25 mm^2 (0.0019 in.^{2}) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

NOTE:

Wind wire harness (3) around at least 3 times.

e. Clear space (5) on ground about 185 cm (6 ft) in diameter where seat belt pretensioner (2) is to be activated. Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where there is no activity and sufficient ventilation is provided. Ensure no loose or flammable object exists within activation area.

f. Place wheel-installed tire (4) with seat belt pretensioner (2) on ground in step e.



I4RS0A820105-

1. Webbing

7) Stretch deployment harness (A) from air bag (inflator) module or seat belt pretensioner to its full length 10 m (33 ft).

Special tool
(A): 09932-75031

8) Place 12 volts vehicle battery (1) near the shorted end of deployment harness (A).

9) Check that area around air bag (inflator) module or seat belt pretensioner is clear of all people and loose or flammable objects.

10) Connect adapter cable (B) as follows.

Special tool
(B): 09932–76510

- For driver air bag (inflator) module [A]
  Check that driver air bag (inflator) module is placed with its vinyl trim cover facing up, and connect adapter cable (B) to driver air bag (inflator) module.

- For passenger air bag (inflator) module [B]
  Check that passenger air bag (inflator) module is firmly and properly secured on deployment fixture (special tool), and connect adapter cable (B) to passenger air bag (inflator) module.
- For side-air bag (inflator) module [C]
  Verify that side-air bag (inflator) module is firmly and properly on deployment fixture (special tool), and connect adapter cable (B) to side-air bag (inflator) module.
- For side curtain-air bag (inflator) module [D]
  a. Connect adapter cable (B) to side curtain-air bag (inflator) module.
  b. Pile 2 tires (2) and wheel-installed tire (3) on top of tire with side curtain-air bag (inflator) (4), and tie them with wire harness (5) as shown.

  Wire harness specifications
  Stripped wire harness section 1.25 mm² (0.0019 in.²) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

NOTE:

Wind wire harness (5) around at least 2 times.

- For seat belt pretensioner [E]
  a. Connect adapter cable (B) to seat belt pretensioner.
  b. Pile 2 wheel-installed tires (3) on top of tire with seat belt pretensioner (6), and tie them with wire harness (5) as shown.

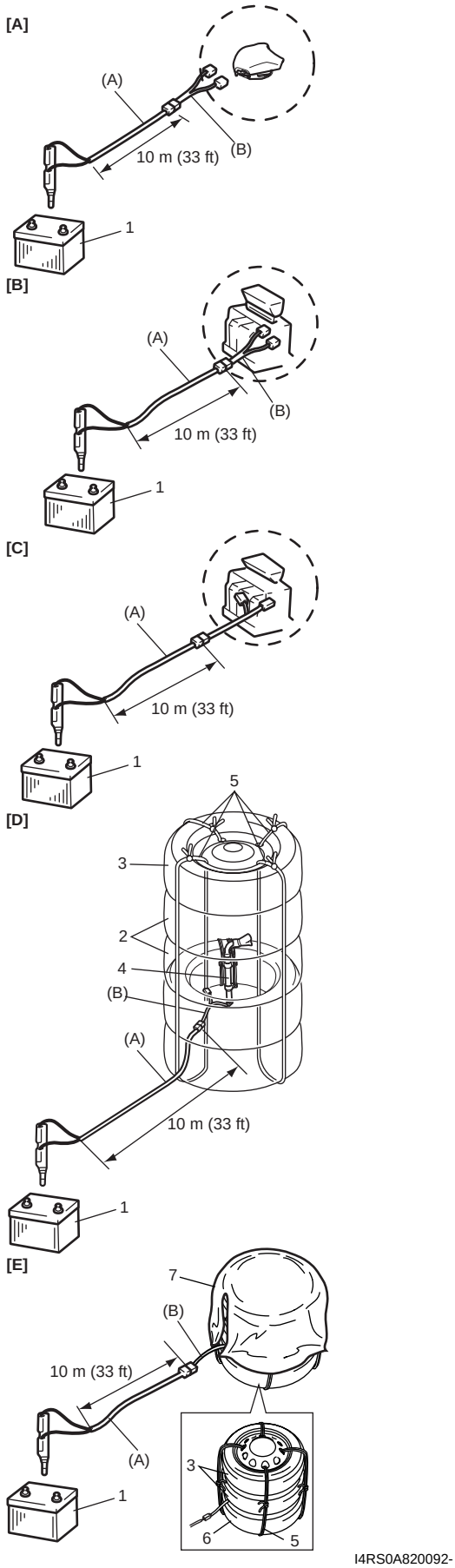
  Wire harness specifications
  Stripped wire harness section 1.25 mm² (0.0019 in.²) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

NOTE:

Wind wire harness (5) around at least 2 times.

  c. Drape blanket (7) over those tires.

11) Connect adapter cable (B) to deployment harness (A) connector and lock connectors with lock lever.



I4RS0A820092-

12) Notify all people in immediate area that you intend to deploy / activate air bag (inflator) module or seat belt pretensioner.

NOTE:

- **When air bag (inflator) module deploys and seat belt pretensioner activates, rapid gas expansion will create substantial report. Wear suitable ear protection. Notify all people in immediate area that you intend to deploy air bag (inflator) module or activate seat belt pretensioner and suitable ear protection should be worn.**
- **When driver air bag (inflator) module deploys, driver air bag (inflator) module may jump about 30 cm (1 ft) vertically. This is normal reaction to force of rapid gas expansion inside of drive air bag (inflator) module.**
- **After air bag (inflator) module has been deployed, surface of air bag (inflator) may contain powdery residue. This powder consists primarily of cornstarch (used to lubricate bag (inflator) as it inflates) and byproducts of chemical reaction.**

WARNING:

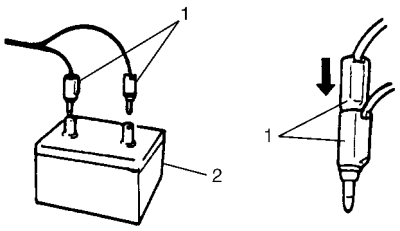
- **Do not place deployed air bag (inflator) module and activated seat belt pretensioner near any flammable objects.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module and activated seat belt pretensioner.**
- **Wait for about 30 minutes before touching any metal surface of air bag (inflater) module or seat belt pretensioner module. Disregarding these precautions may cause fire or personal injury.**

Failure to follow procedures may result in fire or personal injury.

13) Separate two banana plugs (1) on deployment harness.

14) Connect deployment harness to 12 volts vehicle battery (2). This will immediately deploy or activate air bag (inflator) module or seat belt pretensioner.

15) Disconnect deployment harness from 12 volts vehicle battery (2) and short two deployment harness leads together by fully seating one banana plug into the other.



I2RH01820069-

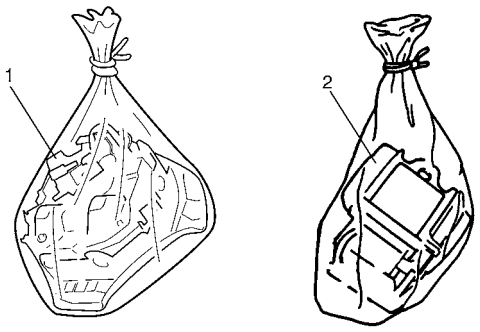
16) In the unlikely event that air bag (inflator) module or seat belt pretensioner did not deploy / activate after following these procedures, proceed immediately with Step 22) through 25). If air bag (inflator) module or seat belt pretensioner did deploy or activate, proceed with Steps 18) through 21).

17) Put on pair of shop gloves to protect your hands from possible irritation and heat when handling deployed air bag (inflator) module or activated seat belt pretensioner.

18) Disconnect adapter cable (special tool) from air bag (inflator) module or seat belt pretensioner as soon as possible. This will prevent adapter cable (special tool) from damage due to possible contact with hot air bag (inflator) module or hot seat belt pretensioner.

19) Check adapter cable as follows.
    - For air bag (inflator) module
      Be sure to check air bag (inflator) module adapter cable (special tool) for damage after deployment and replace it with new adapter cable (special tool), if it is damaged.
    - For seat belt pretensioner
      Be sure to check seat belt pretensioner adapter cable (special tool) for damage after seat belt pretensioner is activated. Replace it with spare connector (special tool) or new adapter, if necessary.

20) Dispose of deployed air bag (inflator) module (1) or activated seat belt pretensioner (2) through normal refuse channels after it has cooled for at least 30 minutes and tightly seal air bag (inflator) module (1) or seat belt pretensioner (2) in strong vinyl bag. Refer to “Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal: ” for details.



I3JA01820116-

21) Wash your hands with mild soap and water afterward.

NOTE:

Remaining steps are to be followed in the unlikely event that air bag (inflator) module did not deploy or seat belt pretensioner did not activate.

22) Ensure that deployment harness has been disconnected from 12 volts vehicle battery and that its two banana plugs have been shorted together by fully seating one banana plug into the other.
23) Disconnect deployment harness and adapter cable from air bag (inflator) module or seat belt pretensioner.
24) Temporarily store undeployed air bag (inflator) module referring to “Precautions on Service and Diagnosis of Air Bag System: ” for details.
25) Contact your local distributor for further assistance.

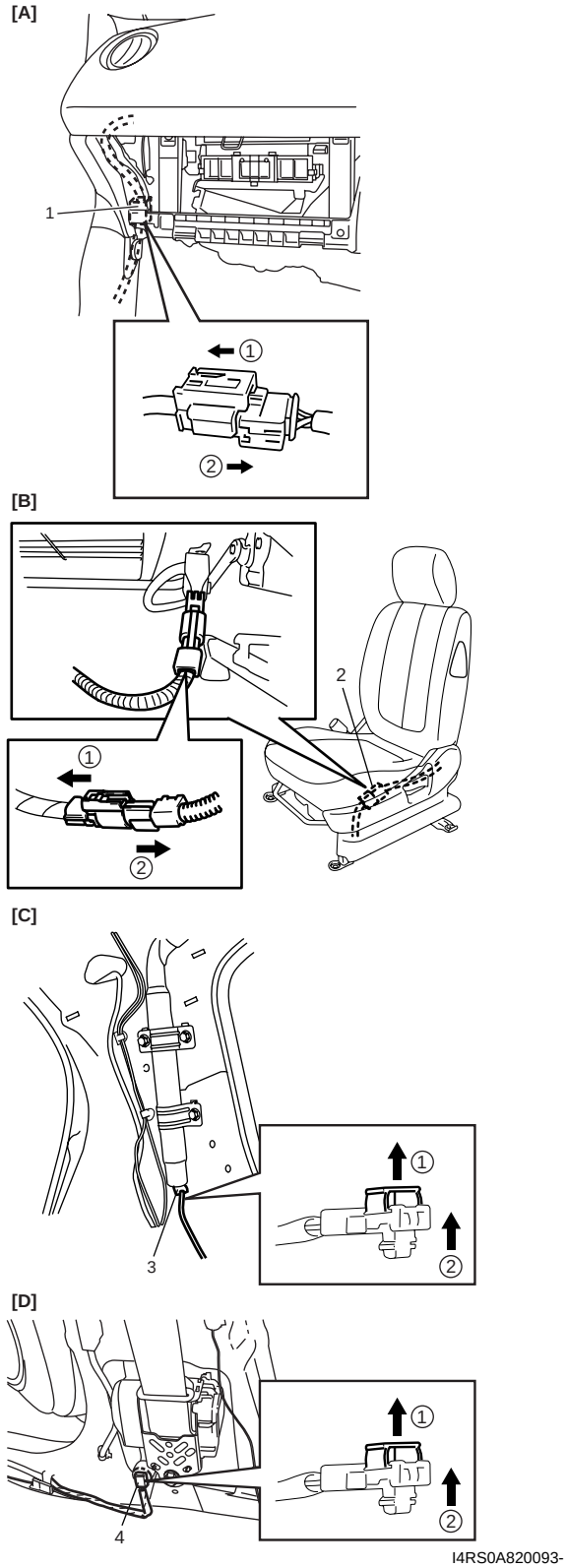
Deployment / Activation Inside of Vehicle

When the vehicle will be destroyed, or salvaged for component parts, deploy the air bag modules and/or activate seat belt pretensioners installed on vehicle.

NOTE:

If equipped with the seat belt pretensioners, activate both side of seat belt pretensioners at the same time when using special tool (C).

1) Turn ignition switch to LOCK position, remove key and put on safety glasses.
2) Remove all loose objects from front seats and instrument panel.
3) Disconnect air bag (inflator) module or seat belt pretensioner connector as follows.
   - For driver and passenger air bag (inflator) module [A]
     Remove glove box from instrument panel and disconnect driver and passenger air bag (inflator) module connector (1).
   - For side-air bag (inflator) module [B]
     Disconnect side-air bag (inflator) module connectors (2) under front seat cushion.
   - For side curtain-air bag (inflator) module [C]
     Remove rear pillar trim and disconnect side curtain-air bag (inflator) module connectors (3).
   - For seat belt pretensioners (right and left) [D]
     Remove both side (driver and passenger side) center pillar lower trim and disconnect seat belt pretensioner connectors (4).
4) Confirm that each air bag (inflator) module and/or seat belt pretensioners is securely mounted.



I4RS0A820093-

5) Check that there is no open, short or damage in special tools (deployment harness (A), adapter cable (B) and (C)). If any faulty condition is found, do not use it and be sure to use new special tool. And connect adapter cable (B), (C) or (D) to deployment harness (A) and lock connectors with lock slider.

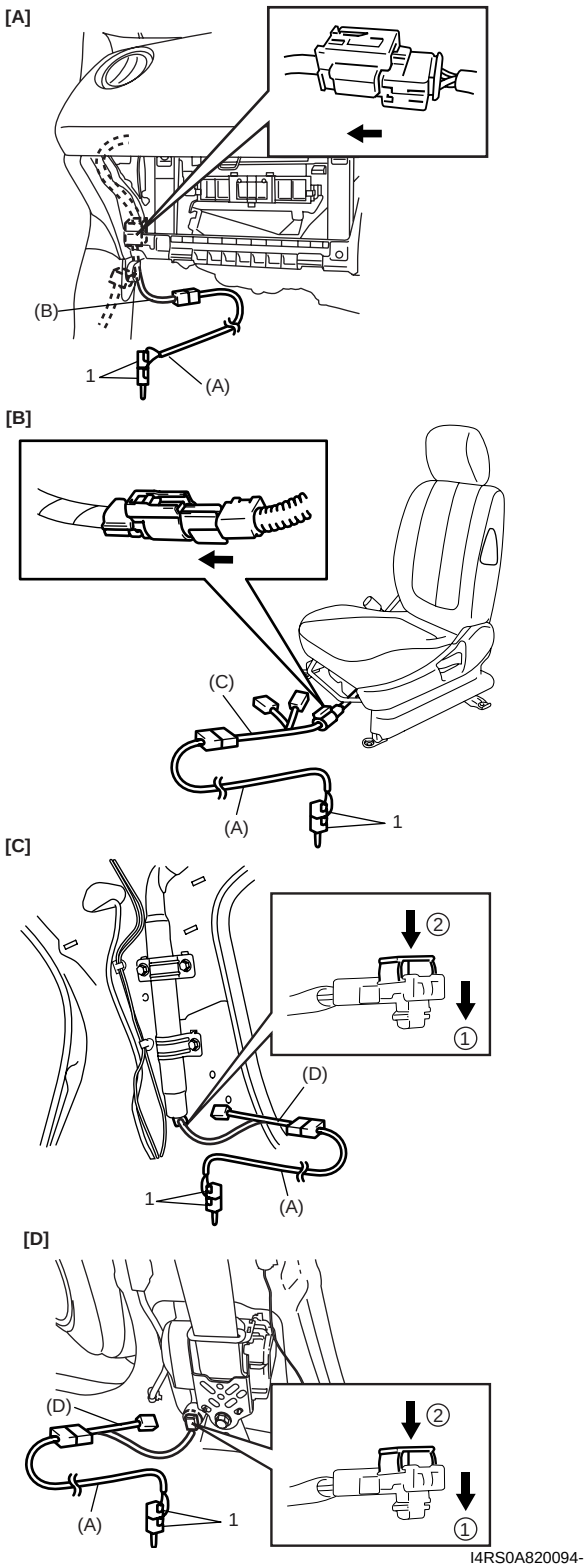
Special tool
(A): 09932-75031
(B): 09932–77310
(C): 09932–78332
(D): 09932–76510

6) Short two deployment harness leads together by fully seating one banana plug into the other.

WARNING:

Deployment harness (A) shall remain shorted and not be connected to 12 volts vehicle battery until you are ready to deploy air bag (inflator) module or activate seat belt pretensioner.

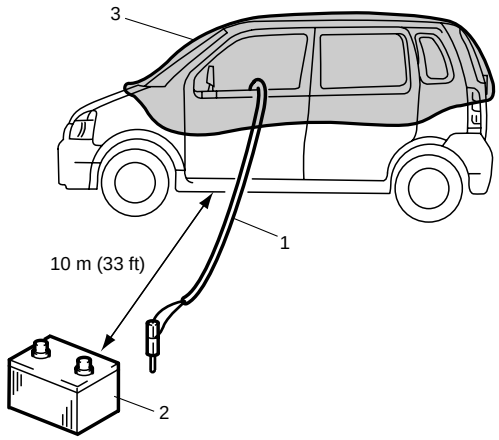
7) Connect adapter cable (B) or (C) in series with deployment harness (A) to air bag (inflator) module or seat belt pretensioner as follows.
   - For driver and passenger air bag (inflator) module [A]
     Connect adapter cable (B) in series with deployment harness (A) and push adapter cable (B) connector to air bag (inflator) module connector till click can be heard.
   - For side-air bag (inflator) module [B]
     Connect adapter cable (C) in series with deployment harness (A) and push adapter cable (C) connector to side bag (inflator) module connector till click can be heard.
   - For side curtain-air bag (inflator) module [C]
     Connect adapter cable (D) in series with deployment harness (A) to curtain bag (inflator) module and lock connector with lock part.
   - For seat belt pretensioners [D]
     Connect adapter cable (D) in series with deployment harness (A) to seat belt pretensioner and lock connector with lock part.



I4RS0A820094-

8) Route deployment harness (1) out of vehicle.
9) Check that inside of vehicle and area surrounding vehicle are clear of all people and loose or flammable objects.
10) Stretch deployment harness (1) to its full length 10 m (33 ft).
11) Place 12 volts vehicle battery (2) near shorted end of deployment harness (1).

12) Completely cover windshield area and front door window openings with drop cloth, a blanket or any similar item. This reduces possibility of injury due to possible fragmentation of vehicle's glass or interior.



I2RH01820073-

13) Notify all people in immediate area that you intend to deploy air bag (inflator) module or activate seat belt pretensioners.

NOTE:

- **When air bag (inflator) module deploys or seat belt pretensioners activate, rapid gas expansion will create substantial report. Wear suitable ear protection. Notify all people in immediate area that you intend to deploy air bag (inflator) module or to activate seat belt pretensioner and suitable ear protection should be worn.**
- **After air bag (inflator) module has been deployed, surface of air bag may contain powdery residue. This powder consists primarily of cornstarch (used to lubricate air bag (inflator) module as it inflates) and by-products of chemical reaction.**

WARNING:

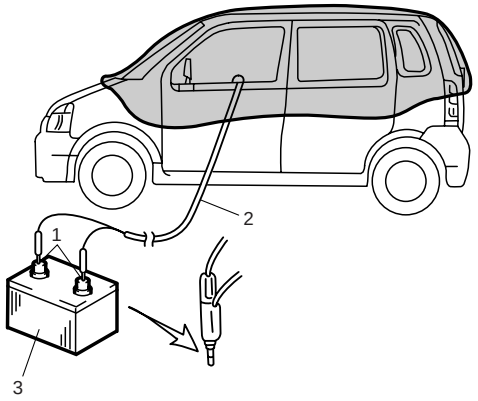
- **Do not place deployed air bag (inflator) module and activated seat belt pretensioners near any flammable objects.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module and activated seat belt pretensioners.**
- **Wait for about 30 minutes before touching any metal surface of air bag (inflater) module or seat belt pretensioner modules. Disregarding these precautions may cause fire or personal injury.**

Failure to follow procedures may result in fire or personal injury.

14) Separate two banana plugs (1) on deployment harness (2).

15) Connect deployment harness (2) to 12 volts vehicle battery (3). This will immediately deploy or activate air bag (inflator) module or seat belt pretensioners.

16) Disconnect deployment harness (2) from 12 volts vehicle battery (3) and short two deployment harness leads together by fully seating one banana plug into the other.



I2RH01820074-

17) Repeat Steps 3) through 16) to deploy / activate air bag (inflator) modules and seat belt pretensioners which has not been deployed / activated, if any.

18) In the unlikely event that air bag (inflator) module and seat belt pretensioners after following these procedures, proceed immediately with Step 24) through 26). If air bag (inflator) module and seat belt pretensioners did deploy / activate, proceed with Steps 19) through 23).

19) Carefully remove drop cloth from vehicle and clean off any fragments or discard it entirely.

20) Put on pair of shop gloves to protect your hands from possible irritation and heat when handling deployed air bag (inflator) module and activated seat belt pretensioners.

21) Disconnect adapter cable (special tool) from air bag (inflator) module or seat belt pretensioner as soon as possible. This will prevent adapter cable (special tool) from damage due to possible contact with hot air bag (inflator) module or hot seat belt pretensioner.

22) Check adapter cable connector as follows. Adapter cable connector (special tool) is designed to be reused. However it should be inspected for damage after deployment and replaced if necessary.

23) With air bag (inflator) modules deployed and seat belt pretensioners activated, vehicle may be scrapped in the same manner as non-air bag system / seat belt pretensioner equipped vehicle.

NOTE:

Remaining steps are to be followed in the unlikely event that air bag (inflator) module did not deploy or seat belt pretensioner did not activate.

24) Remove undeployed air bag (inflator) module(s) and/or inactivated seat belt pretensioner(s) from vehicle. For driver air bag (inflator) module, refer to “Driver Air Bag (Inflator) Module Removal and Installation: ”. For passenger air bag (inflator) module, refer to “Passenger Air Bag (Inflator) Module Removal and Installation: ”. For seat belt pretensioner, refer to “Front Seat Belt Removal and Installation: in Section 8A”.
25) Temporarily store undeployed air bag (inflator) module referring to “Precautions on Service and Diagnosis of Air Bag System: ” for details.
26) Contact your local distributor for further assistance.

Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal

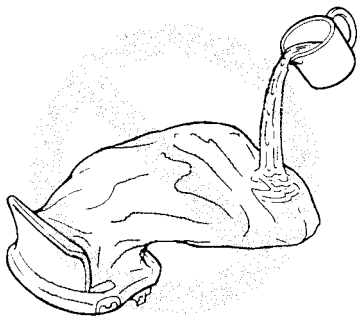
S4RS0A8206012

WARNING:

Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which may cause personal injury. The undeployed air bag (inflator) module and the inactivated seat belt pretensioner must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module and the inactivated seat belt pretensioner contains substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

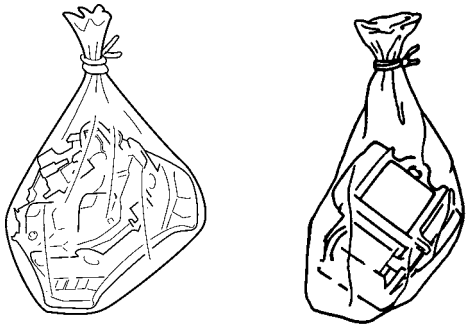
Deployed air bag (inflator) module and the activated seat belt pretensioner can be disposed of through normal refuse channels just like any other parts. For their disposal, however, the following points should be noted.

- The air bag (inflator) module and the seat belt pretensioner immediately after deployment / activation is very hot. Wait for 30 minutes to cool it off before handling it.
- Never apply water, oil, etc. to deployed air bag (inflator) module and the activated seat belt pretensioner to cool it off and be careful so that water, oil etc. does not get on the deployed air bag (inflator) module and the activated seat belt pretensioner.



IYSQ01820095-

- After the air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and by-products of the chemical reaction. As with many service procedures, you should wear gloves and safety glasses.
- When disposing of the deployed air bag (inflator) module and the activated seat belt pretensioner, be sure to seal it in a vinyl bag.



I3JA01820119-

- When air bag (inflator) module and seat belt pretensioner have been deployed / activated inside the vehicle which is going to be scrapped, leave them as installed to the vehicle.
- Be sure to wash your hands with mild soap and water after handling them.

Specifications

Tightening Torque Specifications

S4RS0A8207001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
SDM bolt	9	0.9	6.5	☞
Driver air bag (inflator) module mounting bolt	9	0.9	6.5	☞
Passenger air bag (inflator) module attaching bolt	23	2.3	16.5	☞
Sleeve lock nut	2.5	0.25	2.0	☞
Side curtain-air bag (inflator) module attaching bolts	11	1.1	8.0	☞
Forward-sensor mounting bolt	9	0.9	6.5	☞
Side-sensor bolt	9	0.9	6.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Air Bag System Components, Wiring and Connectors Location: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Use of Special Tools

S4RS0A8208003

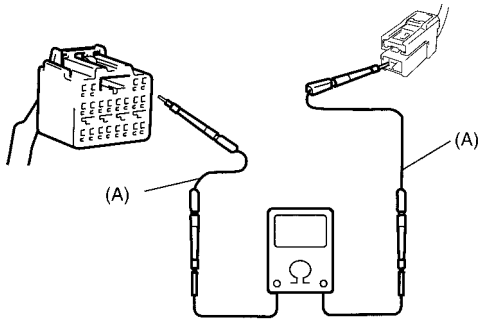
WARNING:

To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified. Do not use a non-powered probe type tester.
Instructions must be followed carefully, otherwise personal injury may result.

You should be familiar with the tools listed under the heading “Special Tool”. You should be able to measure voltage and resistance. You should be familiar with proper use of a scan tool such as Air Bag Driver / Passenger Load Tool, Connector Test Adapter Kit and the Digital Multimeter.

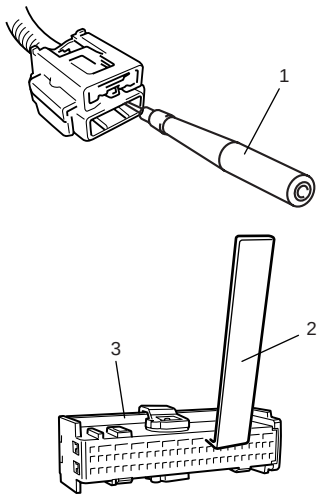
Special tool
(A): 09932-76010 (Connector Test Adapter Kit)

This must be used whenever a diagnostic procedure requests checking or probing a terminal.
Using the appropriate adapter in the special tool will ensure that no damage to the terminal will occur from the multimeter probe, such as spreading or bending.



I3JA01820041-

The adapter (1) will also give an idea of whether or not contact tension is sufficient, helping to find an open or intermittent open due to poor terminal contact. An SDM short bar release tool (2) is included in the connector test adapter kit. Inserting it into the SDM connector (3) will releases the shorting bar.



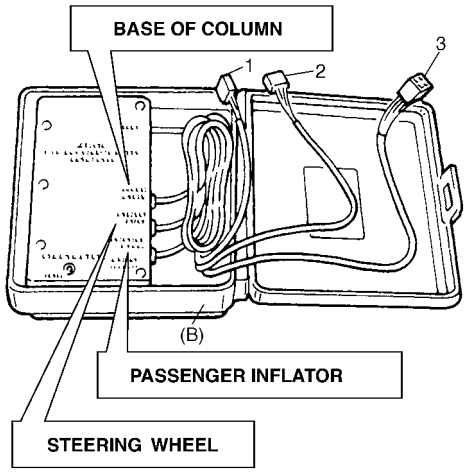
I4RS0A820108-

Special tool
(B): 09932-75010 (Air bag driver / passenger load tool)

This tool is used as a diagnostic aid and safety device to prevent inadvertent air bag (inflator) module deployment. The load tool has three connectors attached to its case which are electrically functional and serve as resistive load substitutions.
No more than two connectors are used at any time.
One of connectors (“STEERING WHEEL”) is used to substitute the load of the followings.

- Driver air bag (inflator) module when it is connected at the top of the column to the contact coil assembly.
- Passenger air bag (inflator) module when it is connected to the air bag harness connector in instrument panel harness for passenger air bag (inflator) module.
- Each of driver and passenger seat belt pretensioners when it is connected to air bag harness connector in instrument panel harness for driver and passenger seat belt pretensioners.
- Side-air bag (inflator) module when it is connected to the floor harness connector for side-air bag (inflator) module.
- Side curtain-air bag (inflator) module when it is connected to the floor harness connector for side curtain-air bag (inflator) module.

Another connector (“BASE OF COLUMN”) is used to substitute the load of the driver air bag (inflator) module and the contact coil assembly when it is connected at the base of the column to the air bag wire harness.
The third connector (“PASSENGER INFLATOR”) is not used.
By substituting the resistance of the load tool when called for, a determination can be made as to whether an inflator circuit component is causing system malfunction and which component is causing the malfunction.
The load tool should be used only when specifically called for in the diagnostic procedures.



I1JA01820004-

1.	Connector for contact coil and driver air bag (inflator) module (Located near the base of the steering column)
2.	Connector for driver, passenger air bag (inflator) module, side-air bag (inflator) module and driver and passenger seat belt pretensioners
3.	Not used

Recommended Service Material

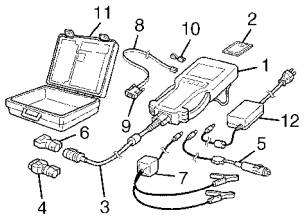
S4RS0A8208004

Material	SUZUKI recommended product or Specification		Note
Thread lock cement	Thread Lock Cement Super 1332B	P/No.: 99000–32100	☞

Special Tool

S4RS0A8208005

09932–75010 Air bag load tool ☞ / ☞ / ☞ /

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞		

Section 9

Body, Cab and Accessories

CONTENTS

Precautions 9-1
Precautions 9-1
Precautions on Body, Cab and Accessories 9-1
Precautions for Body Service 9-1
Fastener Caution for Body Service 9-1

Wiring Systems 9A-1
Precautions 9A-1
Cautions in Body Electrical System Servicing 9A-1
Precautions for Wiring System 9A-1
General Description 9A-2
Applicable model 9A-2
Abbreviations 9A-2
Wire / Connector Color Symbols 9A-3
Symbols and Marks 9A-3
How to Read Connector Layout Diagram 9A-5
How to Read Connector Codes and Terminal Nos. 9A-6
How to Read Ground Point 9A-8
How to Read Power Supply Diagram 9A-9
How to Read System Circuit Diagram 9A-9
Connector Layout Diagram 9A-11
Connector Layout Diagram 9A-11
Engine Compartment 9A-11
A: Battery cable / C: Engine harness 9A-11
E: Main harness 9A-12
Instrument Panel 9A-13
E: Main harness and power steering wire 9A-13
G: Instrument panel harness 9A-14
Door, Roof 9A-15
J: Front and rear door wire and rear door joint wire / K: Roof wire 9A-15
Floor 9A-16
L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire 9A-16
Rear 9A-18
O: Rear end door harness, Rear defogger wire 9A-18
Ground Point 9A-19
Ground (earth) Point 9A-19
Power Supply Diagram 9A-20
Power Supply Diagram 9A-20
Fuses and the Protected Parts 9A-21
Fuses in Main Fuse Box 9A-22
Individual Circuit Fuse Box No. 1 ..... 9A-22
Individual Circuit Fuse Box No. 2 (In J/B) 9A-23
Junction Block (J/B) Connector / Fuse Layout 9A-25
BCM side 9A-25
Fuse side 9A-26
Junction Block Inner Circuit (Overview) 9A-27
Junction Block Inner Circuit (Detail) 9A-28
System Circuit Diagram 9A-33
System Circuit Diagram 9A-33
A-1 Cranking System Circuit Diagram 9A-34
A-2 Charging System Circuit Diagram 9A-35
A-3 Ignition System Circuit Diagram 9A-36
A-4 Cooling System Circuit Diagram 9A-37
A-5 Engine and A/C Control System Circuit Diagram 9A-38
A-6 A/T Control System Circuit Diagram 9A-43
A-7 Immobilizer System Circuit Diagram 9A-45
A-8 Body Control System Circuit Diagram 9A-46
B-1 Windshield Wiper and Washer Circuit Diagram 9A-50
B-2 Rear Wiper and Washer Circuit Diagram 9A-51
B-3 Rear Defogger Circuit Diagram 9A-52
B-4 Power Window Circuit Diagram 9A-53
B-5 Power Door Lock Circuit Diagram 9A-55
B-6 Power Mirror Circuit Diagram 9A-57
B-7 Horn Circuit Diagram 9A-58
C-1 Combination Meter Circuit Diagram (Meter) 9A-59
C-2 Combination Meter Circuit Diagram (Indicator) 9A-60
C-3 Combination Meter Circuit Diagram (Warning Light) 9A-61
D-1 Headlight System Circuit Diagram 9A-63
D-2 Position, Tail and Licence Plate Light System Circuit Diagram 9A-64
D-3 Front Fog Light System Circuit Diagram 9A-65
D-4 Illumination Light System Circuit Diagram 9A-66
D-5 Interior Light System Circuit Diagram 9A-67
D-6 Turn Signal and Hazard Warning Light System Circuit Diagram 9A-68
D-7 Brake Light System Circuit Diagram 9A-70
D-8 Back-Up Light System Circuit Diagram 9A-71
E-1 Heater System Circuit Diagram 9A-72
F-1 Air-Bag System Circuit Diagram 9A-74
F-2 Anti-Lock Brake System Circuit Diagram 9A-76
F-3 Power Steering System Circuit Diagram 9A-78
G-1 Audio System Circuit Diagram 9A-80
G-2 Multi Information Display / Accessory Socket System Circuit Diagram 9A-81
List of Connectors 9A-82
List of Connectors 9A-82

C Connector 9A-82
E Connector 9A-83
G Connector 9A-84
J Connector 9A-86
K Connector 9A-87
L Connector 9A-87
O Connector 9A-88
R Connector 9A-88

Lighting Systems 9B-1

Component Location 9B-1
Lighting System Location 9B-1
Interior Light System Location 9B-2
Diagnostic Information and Procedures 9B-2
Headlight Symptom Diagnosis 9B-2
Turn Signal and Hazard Warning Light Symptom Diagnosis 9B-3
Clearance, Tail and License Plate Light Symptom Diagnosis 9B-3
Back-Up Light Symptom Diagnosis 9B-4
Stop (Brake) Lamp Symptom Diagnosis 9B-4
Front Fog Light Symptom Diagnosis (If Equipped) 9B-4
Interior Light Symptom Diagnosis 9B-5
Repair Instructions 9B-5
Headlight Housing Removal and Installation 9B-5
Headlight Bulb Replacement 9B-6
Headlight Aiming Adjustment with Screen 9B-6
Headlight Switch (in Lighting Switch) Removal and Installation 9B-7
Headlight Switch (in Lighting Switch) Inspection 9B-8
Hazard Warning Switch Removal and Installation 9B-8
Hazard Warning Switch Inspection 9B-8
Stop (Brake) Lamp Switch Inspection 9B-9
Turn Signal Light Switch (in Lighting Switch) Removal and Installation 9B-9
Turn Signal Light Switch (in Lighting Switch) Inspection 9B-9
Turn Signal and Hazard Warning Relay Removal and Installation 9B-9
Turn Signal and Hazard Warning Relay Inspection 9B-9
License Lamp Assembly Removal and Installation 9B-10
Front Fog Light Assembly Removal and Installation 9B-10
Front Fog Light Bulb Replacement 9B-11
Front Fog Light Switch Inspection 9B-11
Front Fog Light Relay Inspection 9B-11
Front Fog Light Aiming Adjustment with Screen 9B-12

Instrumentation / Driver Info. / Horn 9C-1

General Description 9C-1
CAN Communication Data of Combination Meter 9C-1
Schematic and Routing Diagram 9C-2
Combination Meter Circuit Diagram 9C-2
Component Location 9C-3
Audio System Component Location 9C-3
Diagnostic Information and Procedures 9C-4
Speedometer and VSS Symptom Diagnosis 9C-4
Tacho meter Symptom Diagnosis 9C-4
Engine Coolant Temperature (ECT) Meter Symptom Diagnosis 9C-4
Fuel Meter Symptom Diagnosis 9C-4
Low Fuel Warning Light Symptom Diagnosis 9C-5
Oil Pressure Warning Light Symptom Diagnosis 9C-5
Brake and Parking Brake Warning Light Symptom Diagnosis 9C-6
Seat Belt Reminder Light Symptom Diagnosis (If Equipped) 9C-6
A/T Shift Position Indicator (A/T Vehicle Only) Symptom Diagnosis 9C-6
Charge Warning Light Symptom Diagnosis 9C-7
Main Beam (High Beam) Indicator Symptom Diagnosis 9C-7
Warning Buzzer Circuit Symptom Diagnosis 9C-7
Cigarette Lighter Symptom Diagnosis (If Equipped) 9C-7
Horn Symptom Diagnosis 9C-8
Information Display Symptom Diagnosis (If Equipped) 9C-8
Audio System Symptom Diagnosis (If Equipped) 9C-9
Remote Audio Control Switch (If Equipped) Symptom Diagnosis 9C-10
Repair Instructions 9C-10
Ignition Switch Removal and Installation 9C-10
Ignition Switch Inspection 9C-11
Combination Meter Removal and Installation 9C-11
Fuel Level Sensor Removal and Installation 9C-11
Fuel Level Sensor Inspection 9C-11
Oil Pressure Switch Removal and Installation 9C-12
Oil Pressure Switch Inspection 9C-12
VSS Removal and Installation 9C-12
VSS Inspection 9C-12
Engine Coolant Temperature (ECT) Sensor Inspection 9C-12
Brake Fluid Level Switch Inspection 9C-12
Parking Brake Switch Inspection 9C-13
Door Switch (Front / Rear Door) Inspection 9C-13
Rear End Door Switch Inspection 9C-13
Outside Air Temperature Sensor Removal and Installation 9C-13
Outside Air Temperature Sensor Inspection 9C-14
Instrument Panel Removal and Installation 9C-14
Information Display Removal and Installation 9C-15
Radio Assembly Removal and Installation 9C-16
Front Speaker Removal and Installation 9C-16
Rear Speaker Removal and Installation 9C-16
Horn Removal and Installation 9C-16

Horn Inspection 9C-17
Horn Relay Inspection 9C-17
Antenna Amplifier Removal and Installation 9C-17
Remote Audio Control Switch Inspection 9C-17
Specifications 9C-18
Tightening Torque Specifications 9C-18

Wipers / Washers 9D-1

Diagnostic Information and Procedures 9D-1
Front Wiper and Washer Symptom Diagnosis 9D-1
Rear Wiper and Washer (If Equipped) Symptom Diagnosis 9D-1
Repair Instructions 9D-2
Wipers and Washers Components 9D-2
Washer Tank and Washer Pump Removal and Installation 9D-3
Washer Pump Inspection 9D-3
Windshield Wiper Removal and Installation 9D-4
Windshield Wiper Motor Inspection 9D-4
Rear Wiper (If Equipped) Removal and Installation 9D-5
Rear Wiper Motor (If Equipped) Inspection 9D-6
Windshield Wiper and Washer Switch Removal and Installation 9D-7
Windshield Wiper and Washer Switch Inspection 9D-7
Rear Wiper and Washer Switch Removal and Installation 9D-8
Rear Wiper and Washer Switch Inspection 9D-9
Rear Wiper Relay Removal and Installation 9D-9
Rear Wiper Relay Inspection 9D-9
Specifications 9D-9
Tightening Torque Specifications 9D-9

Glass / Windows / Mirrors 9E-1

General Description 9E-1
Rear End Door Window Defogger System Description 9E-1
Windshield Construction 9E-1
Diagnostic Information and Procedures 9E-2
Rear End door Window Defogger Symptom Diagnosis 9E-2
Power Window Control System Symptom Diagnosis 9E-2
Power Door Mirror Control System (If Equipped) Symptom Diagnosis 9E-3
Repair Instructions 9E-3
Windshield Removal and Installation 9E-3
Front Door Window Components 9E-6
Front Door Glass Removal and Installation 9E-7
Front Door Window Regulator Removal and Installation 9E-8
Front Door Window Regulator Inspection 9E-8
Rear Door Window Components 9E-9
Rear Door Glass Removal and Installation 9E-9
Rear Door Window Regulator Removal and Installation 9E-10
Rear Door Window Regulator Inspection 9E-11
Rear End Door Window Components 9E-11
Rear End Door Glass Removal and Installation 9E-11
Rear End Door Window Defogger Switch Inspection 9E-12
Rear End Door Window Defogger Relay Inspection 9E-12
Rear End Door Window Defogger Wire Inspection 9E-13
Rear End Door Window Defogger Wire Repair 9E-13
Power Window Main Switch Inspection 9E-14
Power Window Sub Switch Inspection 9E-15
Door Mirror Components 9E-15
Door Mirror Removal and Installation 9E-16
Power Door Mirror Switch Inspection 9E-16
Power Door Mirror Actuator Inspection 9E-16
Special Tools and Equipment 9E-16
Recommended Service Material 9E-16

Security and Locks 9F-1

General Description 9F-1
Key Coding Construction 9F-1
Rear End Door Opener System Description 9F-1
Component Location 9F-2
Power Door Lock and Keyless Entry System Component Location 9F-2
Diagnostic Information and Procedures 9F-3
Power Door Lock System Symptom Diagnosis 9F-3
Power Door Lock System Operation Inspection 9F-3
Keyless Entry System Symptom Diagnosis 9F-4
Keyless Entry System Operation Inspection 9F-4
Rear End Door Opener System Symptom Diagnosis 9F-5
Rear End Door Opener System Operation Inspection 9F-5
Repair Instructions 9F-5
Front Door Lock Assembly Components 9F-5
Front Door Lock Assembly Removal and Installation 9F-6
Front Door Lock Assembly Inspection 9F-7
Power Door Lock Switch Inspection 9F-7
Door Key Cylinder Switch Inspection 9F-8
Power Door Lock Actuator Inspection 9F-8
Rear Door Lock Assembly Components 9F-9
Rear Door Lock Assembly Removal and Installation 9F-9
Rear Door Lock Assembly Inspection 9F-9
Rear End Door Lock Assembly Components 9F-10
Rear End Door Lock Assembly Removal and Installation 9F-10
Rear End Door Lock Assembly Inspection 9F-11
Rear End Door Opener Switch Inspection 9F-11
Replacement of Transmitter Battery 9F-11
Programming Transmitter Code 9F-12

Keyless Entry Receiver Removal and Installation 9F-12
Keyless Entry Receiver and Its Circuit Inspection 9F-13
Specifications 9F-14
Tightening Torque Specifications 9F-14
Special Tools and Equipment 9F-14
Recommended Service Material 9F-14

Seats 9G-1
Repair Instructions 9G-1
Front Seat Components 9G-1
Front Seat Removal and Installation 9G-1
Rear Seat Components 9G-2
Rear Seat Removal and Installation 9G-2
Specifications 9G-2
Tightening Torque Specifications 9G-2

Interior Trim 9H-1
Repair Instructions 9H-1
Floor Carpet Removal and Installation 9H-1
Head Lining Removal and Installation 9H-1
Console Box Components 9H-2
Roof Molding Components 9H-3
Splash Guard (If Equipped) Components 9H-3
Specifications 9H-4
Tightening Torque Specifications 9H-4

Hood / Fenders / Doors 9J-1
Repair Instructions 9J-1
Hood Removal and Installation 9J-1
Hood Inspection and Adjustment 9J-1
Front Fender Components 9J-2
Front Fender Removal and Installation 9J-2
Front Door Assembly Components 9J-3
Front Door Assembly Removal and Installation 9J-3
Rear Door Assembly Components 9J-4
Rear Door Assembly Removal and Installation 9J-5
Rear End Door Assembly Components 9J-5
Rear End Door Assembly Removal and Installation 9J-5
Specifications 9J-7
Tightening Torque Specifications 9J-7
Special Tools and Equipment 9J-7
Recommended Service Material 9J-7

Body Structure 9K-1
Repair Instructions 9K-1
Front Bumper and Rear Bumper Components 9K-1
Cowl Top Components 9K-2
Specifications 9K-3
Body Dimensions 9K-3
Panel Clearance 9K-10

Paint / Coatings 9L-1
General Description 9L-1
Anti-Corrosion Treatment Construction 9L-1
Plastic Parts Finishing 9L-1
Component Location 9L-2
Sealant Application Areas 9L-2
Under Coating Application Areas 9L-7
Anti-Corrosion Compound Application Area 9L-9

Exterior Trim 9M-1
Repair Instructions 9M-1
Roof Molding Components 9M-1
Splash Guard (If Equipped) Components 9M-2

Precautions

Precautions

Precautions on Body, Cab and Accessories

S4RS0A9000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Fastener Caution
Refer to “Fastener Caution: in Section 00”.

Precautions for Body Service
Refer to “Precautions for Body Service: ”.

Fastener Caution for Body Service:
Refer to “Fastener Caution for Body Service: ”.

Cautions in Body Electrical System Servicing
Refer to “Cautions in Body Electrical System Servicing: in Section 9A”.

Precautions for Wiring System
Refer to “Precautions for Wiring System: in Section 9A”.

Precautions for Body Service

S4RS0A9000002

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:
When servicing vehicle body, if shock may be applied to air bag system component parts, remove those parts beforehand.

Fastener Caution for Body Service

S4RS0A9000003

CAUTION:

- **Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number of with an equivalent part if replacement become necessary.**
- **Do not use a replacement part of lesser quality or substitute a design. Torque values must be used as specified during reassembly to assure proper retention of these parts.**

Wiring Systems

Precautions

Cautions in Body Electrical System Servicing

S4RS0A9100001

When performing works related to electric systems, observe the cautions described in “Precautions for Electrical Circuit Service: in Section 00” for the purpose of protection of electrical parts and prevention of a fire from occurrence.

Precautions for Wiring System

S4RS0A9100002

WARNING:

(For the vehicles with the Supplemental Restraint System (Air Bags) and/or the Seat Belt Pretensioner System)
Service on or around the air bag system / Seat belt pretensioner system components or their wiring must be performed only by an authorized SUZUKI dealer. Observe all the warnings of the “Air Bag System” and disable the systems before performing the service. Failure to follow the Warnings could result in unintended activation of the systems or could render the systems inoperative. Either of these two conditions may result in severe injury.

CAUTION:

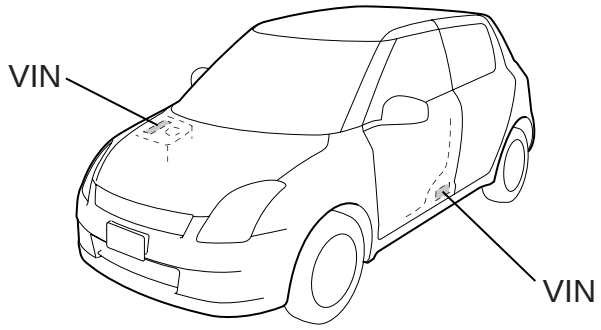
To prevent damage to the electrical/ electronic parts (especially computers or semi-conductors) or to prevent fire:

- When disconnecting the battery terminals, be sure to 1: turn off the ignition switch and all other switches, 2: disconnect the negative (–) terminal wire and then 3: disconnect the positive (+) terminal wire. Connect the wires in the reverse order of disconnecting.
- When disconnecting the connectors, be sure to unlock the connector lock (if equipped) and then pull the connector shells to detach them. Do not pull the wires.
- Connect the connectors by holding the connector shells. Make sure they are securely locked.
- Install the wiring harness securely without any slack.
- When installing parts, make sure the wiring harness is not interfered with or pinched by them.
- Avoid routing the wiring harness near or around a sharp corner or edge of the vehicle body or parts as much as possible. If necessary, protect the wiring harness by winding tape or the like around on it.
- When replacing a fuse, make sure to use the specified capacity fuse. Using a fuse with a larger capacity can cause damage to the electrical parts or a fire.
- Do not handle electrical/ electronic parts (computer, relay, etc.) roughly or drop them.
- Do not expose electrical/ electronic parts to high temperature (Approximately 80 °C (176 °F) or higher) or water.
- Be sure to insert the tester probe (or, if necessary, an appropriate needle or wire designed for the inspection work) into the back side (wiring harness side) of the connector for inspection not to damage or deform the terminal of the connector.

General Description

Applicable model

S4RS0A9101001



(M15A Engine)
JSAEZC2100100001~

I4RS0A910901-

Abbreviations

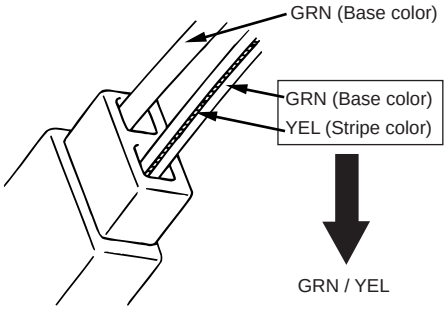
S4RS0A9101002

Abbreviation	Full term	Abbreviation	Full term
2WD	2 wheel drive vehicles	ILL	Illumination
4WD	4 wheel drive vehicles	IND	Indicator
A/B	Air bag	INT	Intermittent
A/C	Air conditioning	ISC	Idle speed control
A/T	Automatic transaxle	J/B	Junction block
ACC	Accessory	J/C	Joint connector
BCM	Body control module	L	Left
CKP	Crank shaft position	LED	Light emitting diode
CMP	Cam shaft position	LHD	Left hand drive vehicle
COMB	Combination	LO	Low
DLC	Data link connector	MAP	Manifold absolute pressure
DRL	Daytime running light	M/T	Manual transaxle
DSL	Diesel engine	O/D	Over drive
ECM	Engine control module	P/N	Power/Normal
ECT	Engine coolant temperature	P/S	Power steering
EGR	Exhaust gas recirculation	PSP	Power steering pressure
EVAP	Evaporative	R	Right
FWD	Forward	RHD	Right hand drive vehicle
HI	High	SDM	Sensing and diagnostic module
IAC	Idle air control	ST	Starter
IAT	Intake air temperature	TCC	Torque converter clutch
ICM	Immobilizer control module	TCM	Transmission control module
IF EQPD	If equipped	VSS	Vehicle speed sensor
IG	Ignition	VSV	Vacuum switching valve
IG COIL	Ignition coil	5 dr	5 door

Wire / Connector Color Symbols

S4RS0A9101003

Symbol	Wire / connector Color	Symbol	Wire / connector Color
BLK	Black	ORN	Orange
BLU	Blue	RED	Red
BRN	Brown	WHT	White
GRN	Green	YEL	Yellow
GRY	Gray	PNK	Pink
LT BLU	Light blue	PPL	Purple
LT GRN	Light green	N	Natural

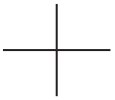
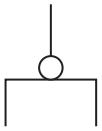
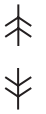
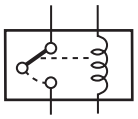
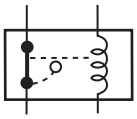


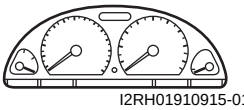
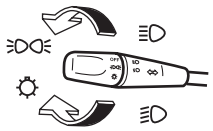
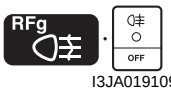
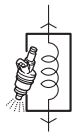
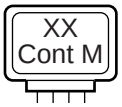
I2RH01910941-

Symbols and Marks

S4RS0A9101004

Battery	Ground		Normal fuse	Slow blow fuse
I2RH01910910-01	IYSQ01910915-01	IYSQ01910916-01	IYSQ01910917-01	IYSQ01910918-01
Circuit breaker	Coil, Solenoid	Heater	Bulb	
IYSQ01910919-01	IYSQ01910920-01	IYSQ01910921-01	IYSQ01910922-01	IYSQ01910923-01
Cigarette lighter	Motor	Pump	Horn	Speaker
IYSQ01910924-01	IYSQ01910925-01	IYSQ01910926-01	I2RH01910911-01	IYSQ01910928-01
Buzzer	Chime	Condenser	Thermistor	Reed switch
IYSQ01910929-01	IYSQ01910930-01	IYSQ01910931-01	IYSQ01910932-01	IYSQ01910933-01
Resistance	Variable resistance		Transistor	
IYSQ01910934-01	IYSQ01910935-01	IYSQ01910936-01	IYSQ01910937-01 NPN	IYSQ01910938-01 PNP

Photo transistor	Diode	Zener diode	Light emitting diode	Photo diode
IYSQ01910939-01	IYSQ01910940-01	IYSQ01910941-01	IYSQ01910942-01	IYSQ01910943-01
Piezoelectric element	Harness		Ring terminal	Connector
IYSQ01910944-01	IYSQ01910945-01 Connected	 IYSQ01910946-01 Not connected	 IYSQ01910947-01	 IYSQ01910948-01
Relay				
 IYSQ01910949-01 Normal open	 IYSQ01910950-01 Normal closed			
Switch				
IYSQ01910951-01 Open switch	IYSQ01910952-01 Closed switch			

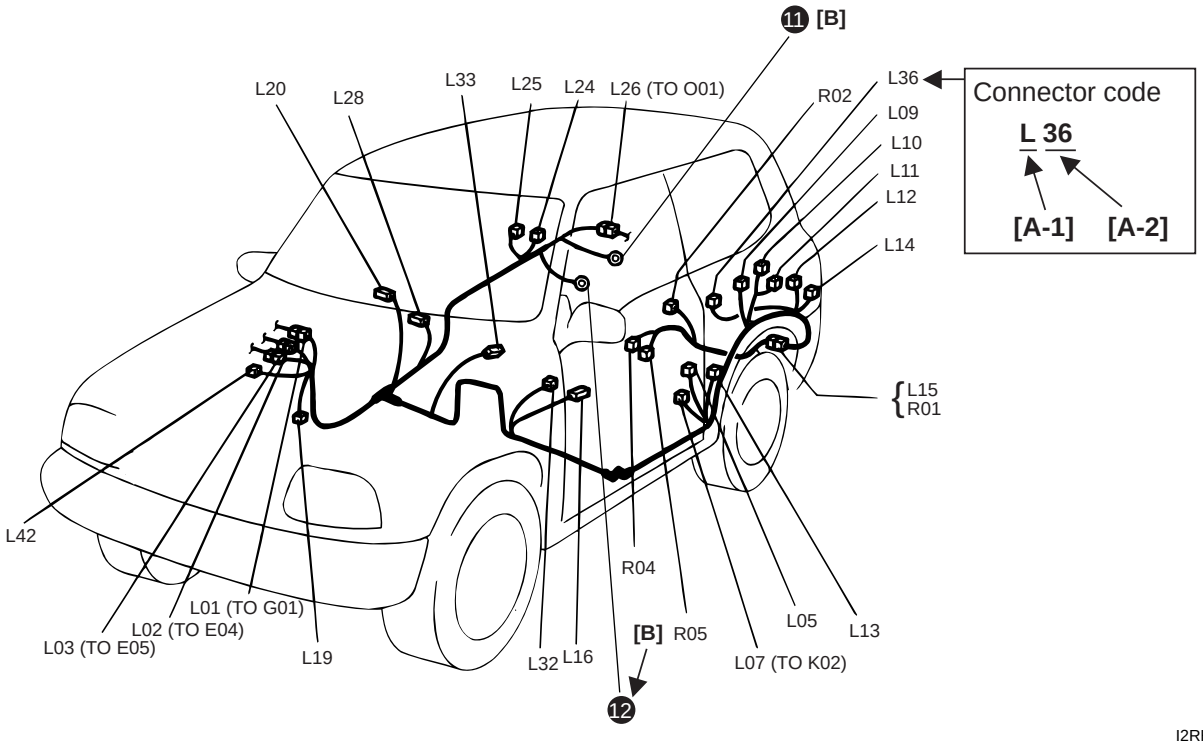
Ignition switch	Keyless entry	Immobilizer system	Combination meter	Lighting switch
I2RH01910912-01	I3JA01910902-01	I3JA01910903-01	 I2RH01910915-01	 I2RH01910916-01
Headlight leveling	Hazard warning light	Front fog light	Rear fog light	Spark plug
I3JA01910904-01	I3JA01910905-01	I3JA01910906-01	 I3JA01910907-01	I2RH01910921-01
Radiator fan	Fuel pump	Injector	XX control module	Windshield wiper
I2RH01910922-01	I3JA01910908-01	 I2RH01910924-01	 I2RH01910925-01	I3JA01910909-01
Windshield washer	Rear wiper	Rear washer	Rear defogger	Power window
I3JA01910910-01	I3JA01910911-01	I3JA01910912-01	I2RH01910930-01	I3JA01910913-01
Power door lock	Power mirror	A/B	Pretensioner	Passenger side
I3JA01910914-01	I3JA01910915-01	I3JA01910916-01	I3JA01910917-01	I3JA01910918-01
Driver side	Seat heater	A/C	Power steering	Side air-bag (R)
I3JA01910919-01	I2RH01910938-01	I3JA01910920-01	I3JA01910921-01	I4JA01910901-01

Side air-bag (L)	Glow plug			
I4JA01910902-01	I4JA01910903-01			

How to Read Connector Layout Diagram

S4RS0A9101005

[A-1]: Harness symbol and corresponding harness name
A: Battery harness
B: A/C harness
C: Engine harness
D: Injector harness
E: Main harness, Oil pressure switch wire, Console wire
G: Instrument panel harness
J: Side door wire (Power window)
K: Interior light harness, Rear speaker wire, Roof wire
L: Floor harness, G sensor wire (Fuel pump harness)
M: Rear bumper harness
O: Rear end door harness
Q: Air bag/Pretensioner harness
R: (Fuel pump wire)
[A-2]: Connector Number
[B]: Ground point No.



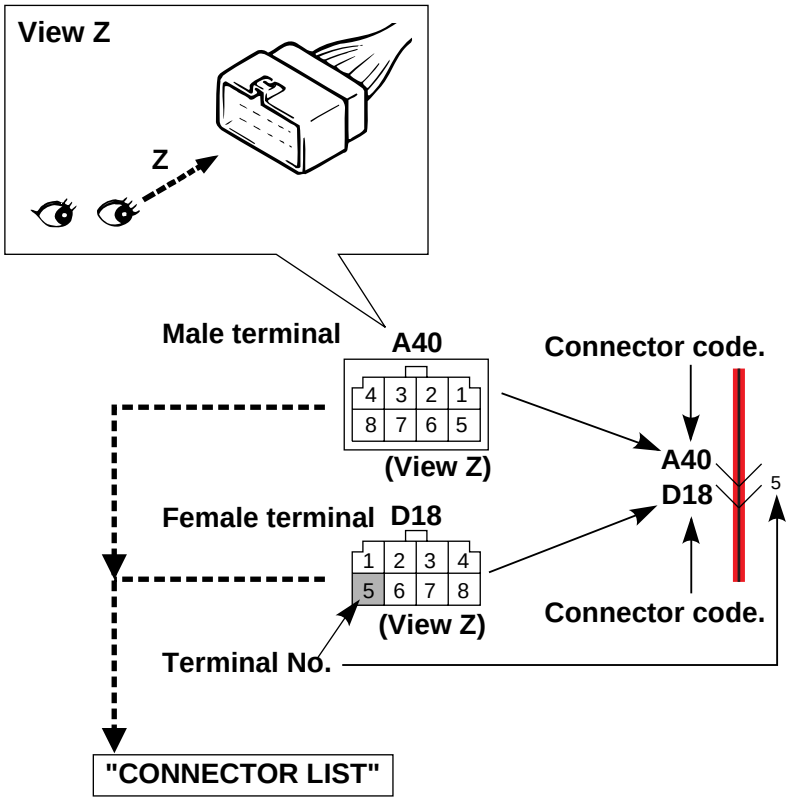
I2RH01910901-

How to Read Connector Codes and Terminal Nos.

S4RS0A9101006

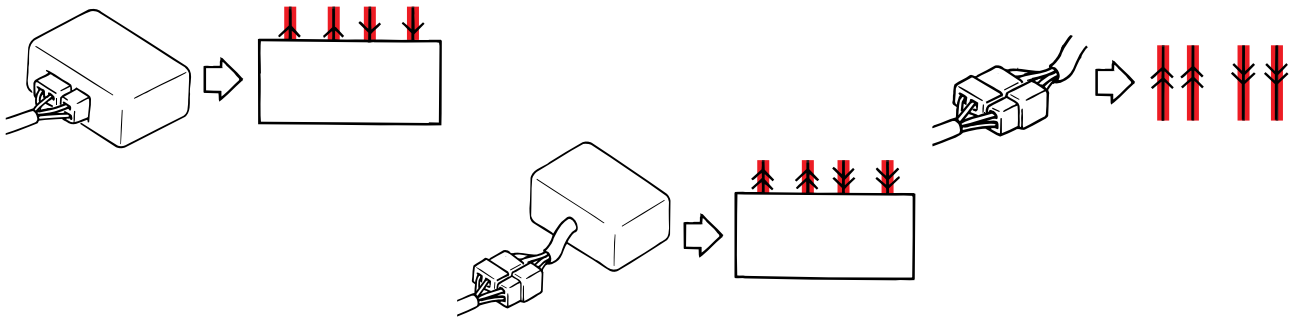
1) Connector code/Terminal No./Terminal layout

- The connector shape and terminal layout shown in this manual are those when viewed from “Z” in the illustration.
  Refer to “List of Connectors: ”.



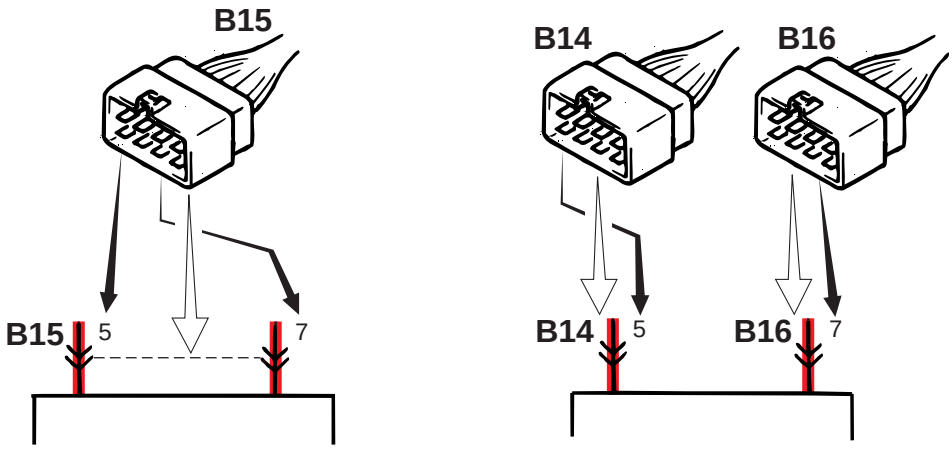
I2RH01910902-

2) Connector type



I2RH01910903-

3) Terminals in one connector (Broken line) (B15)/Terminals in different connectors (B14, B16)

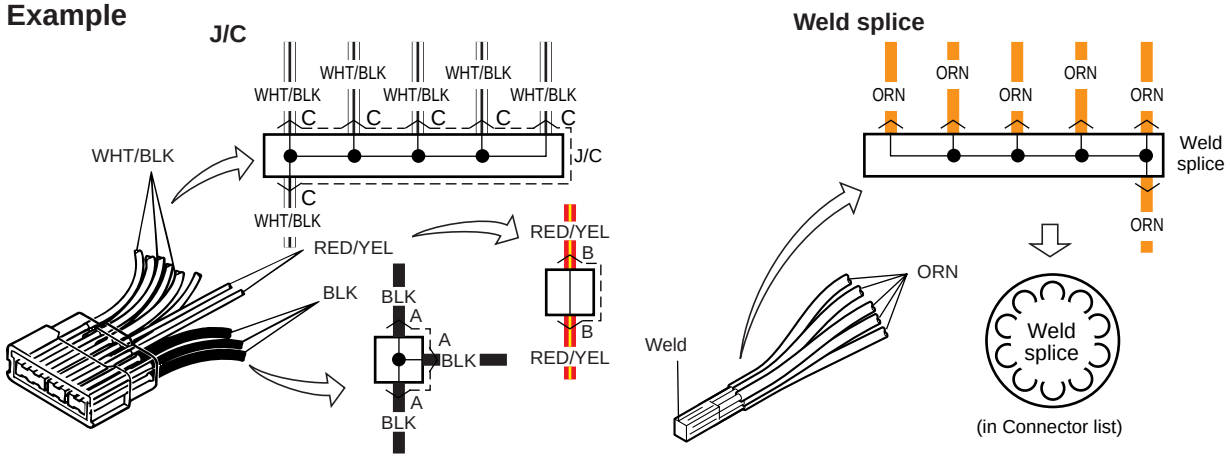


I2RH01910904-

4) Joint connector (J/C)

- The joint connector (J/C) connects several different wires with the same wire color at one place instead of connecting them by welding or caulking one by one. It is not an ordinary connector but a part of the continuous wire in the harness.

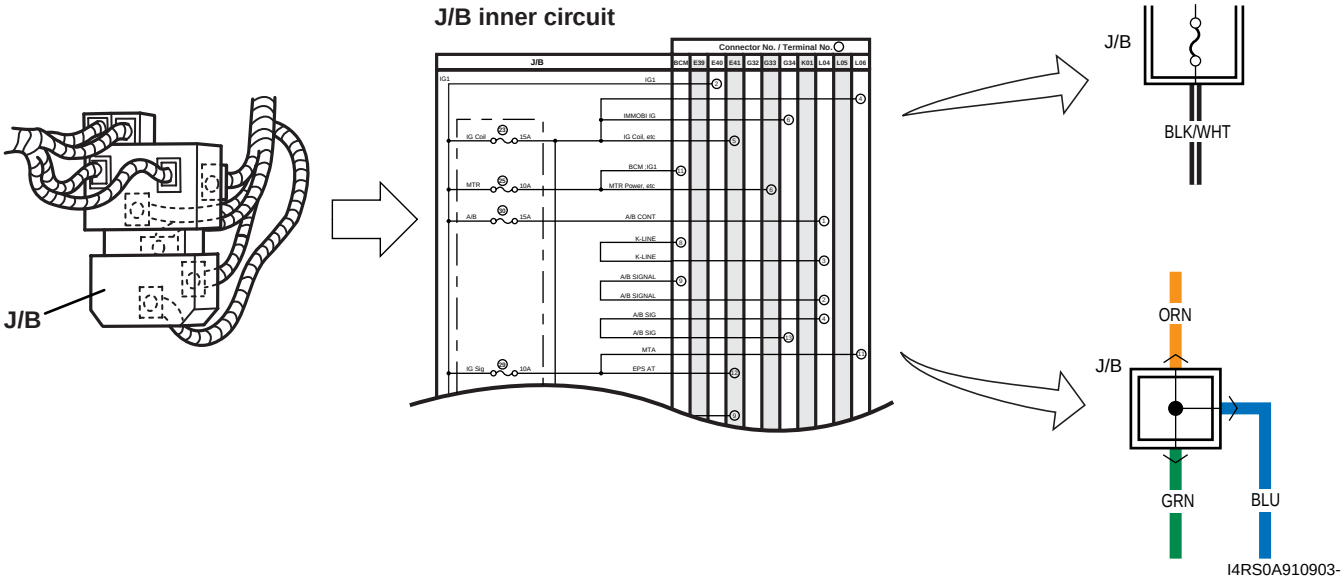
Example



I4RS0A910902-

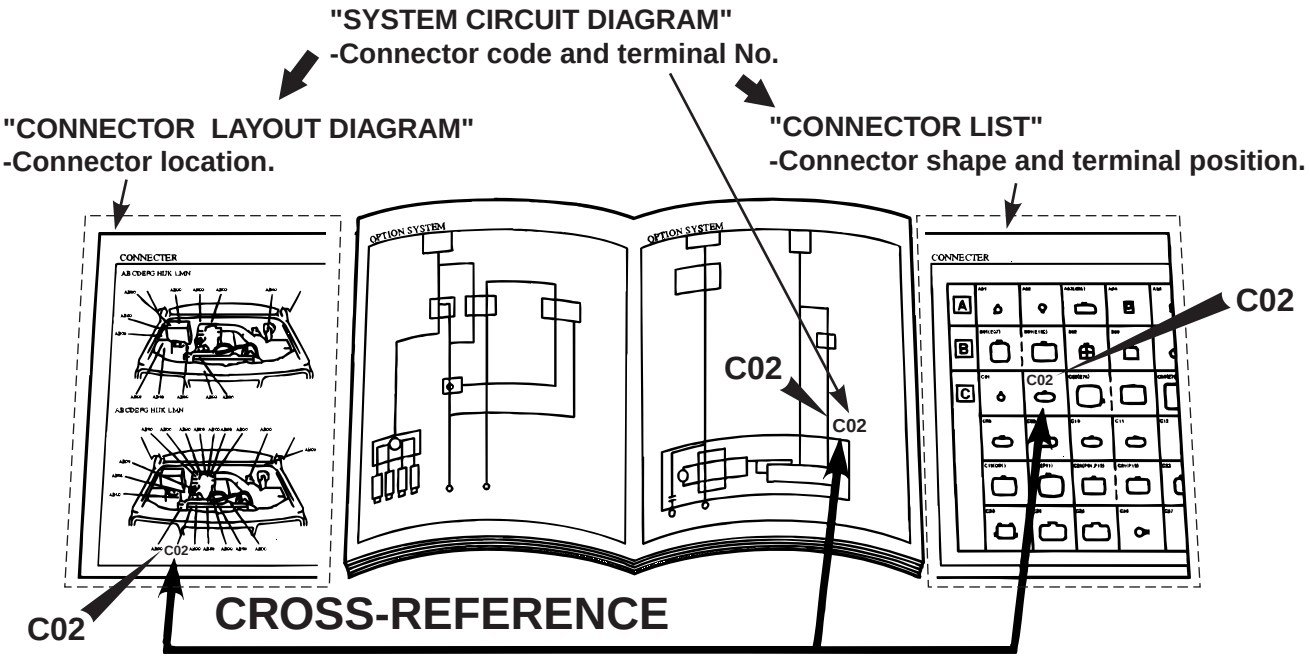
5) Junction block (J/B)

Example



I4RS0A910903-

6) Connector location, shape and terminal No.
Refer to “Connector Layout Diagram: ”.
Refer to “System Circuit Diagram: ”.
Refer to “List of Connectors: ”.

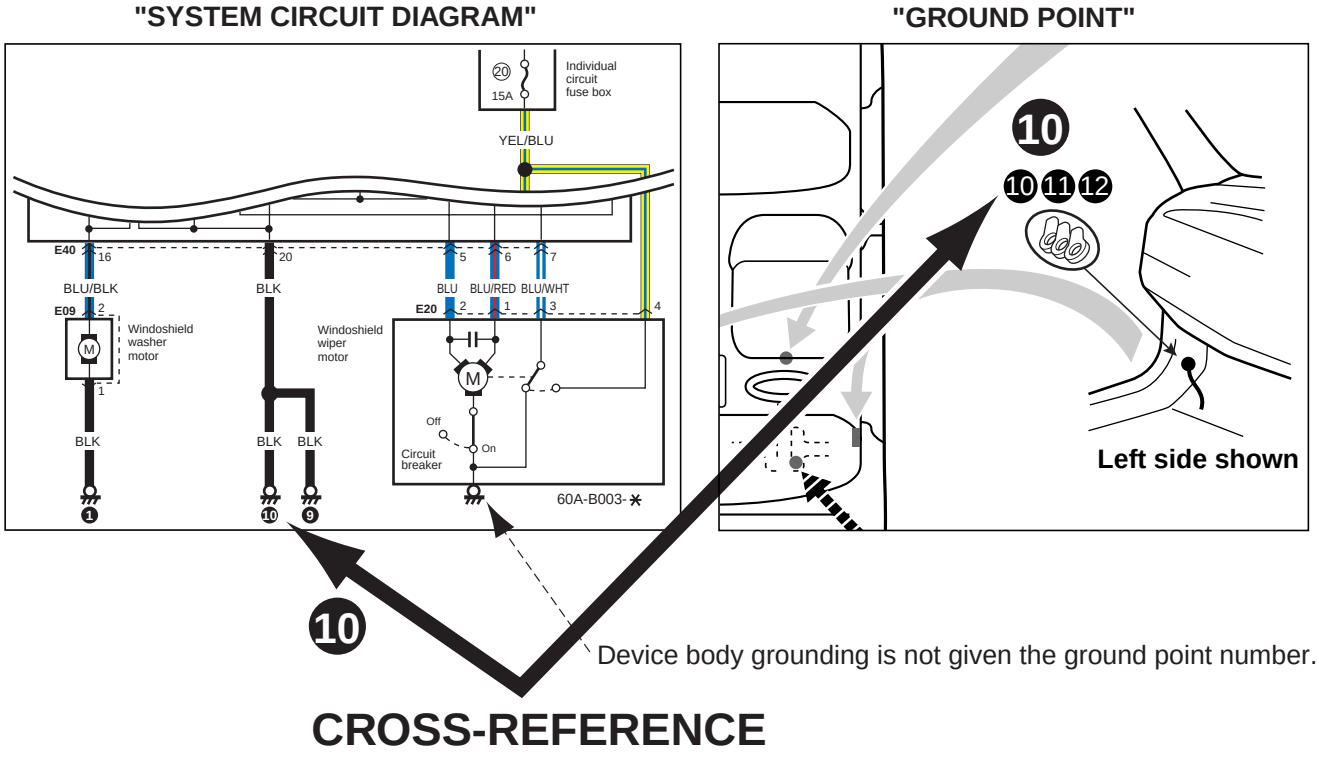


I2RH01910906-

How to Read Ground Point

S4RS0A9101007

Refer to “System Circuit Diagram: ”.
Refer to “Ground (earth) Point: ”.

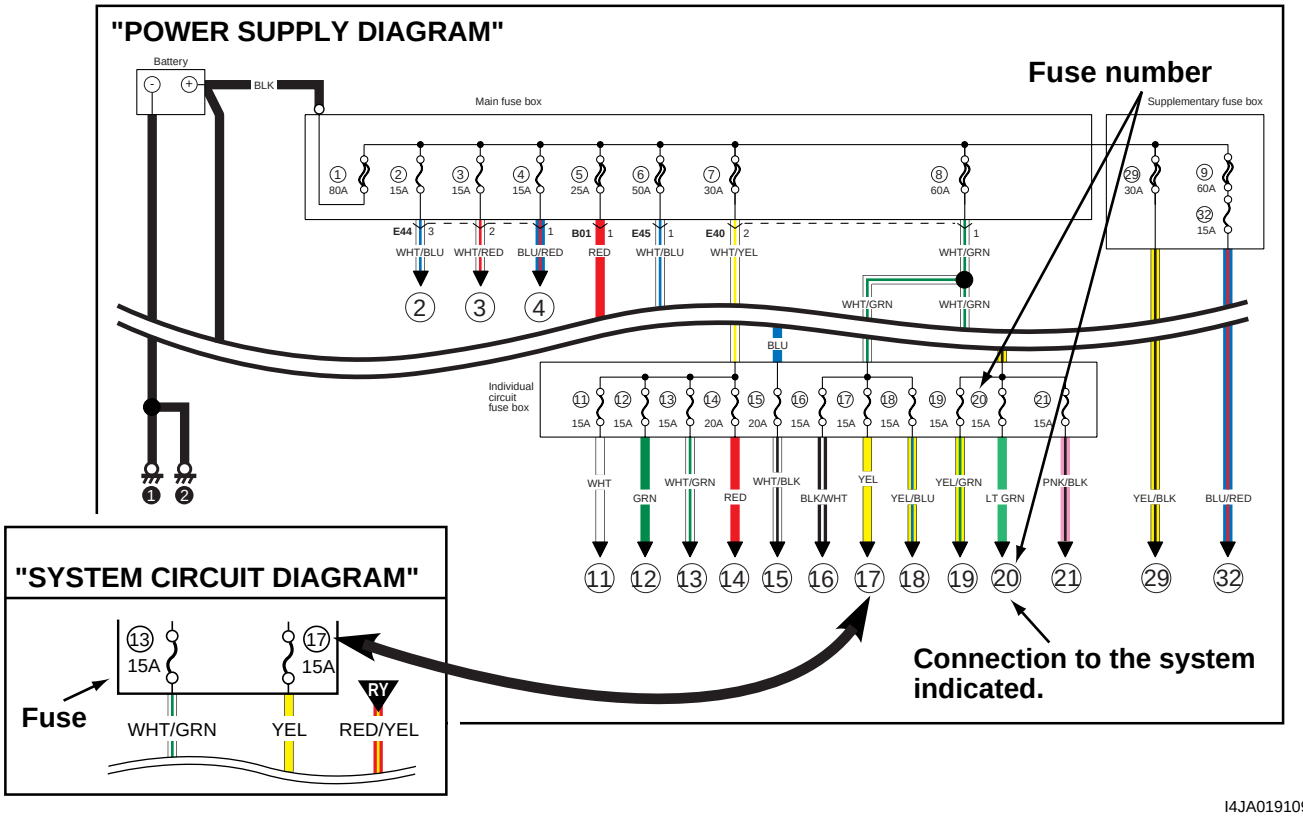


I4JA01910985-

How to Read Power Supply Diagram

S4RS0A9101008

Refer to “Power Supply Diagram: ”.
Refer to “System Circuit Diagram: ”.



I4JA01910986-

How to Read System Circuit Diagram

S4RS0A9101009

The circuit diagram is designed so the current flows from the top of the diagram (power source) to the bottom of the diagram (ground) as if giving an image of water flow.

[A]: Fuse No.
[B]: Circuit jumping page / direction

NOTE:

This means “Jump to the page directed with the arrow(s) by their number.
(For example:” Two arrows directing left” means” Jump to two pages before”.)
You will find the same symbol with the arrows directing opposite in the referenced page. The circuit continues between the symbols.

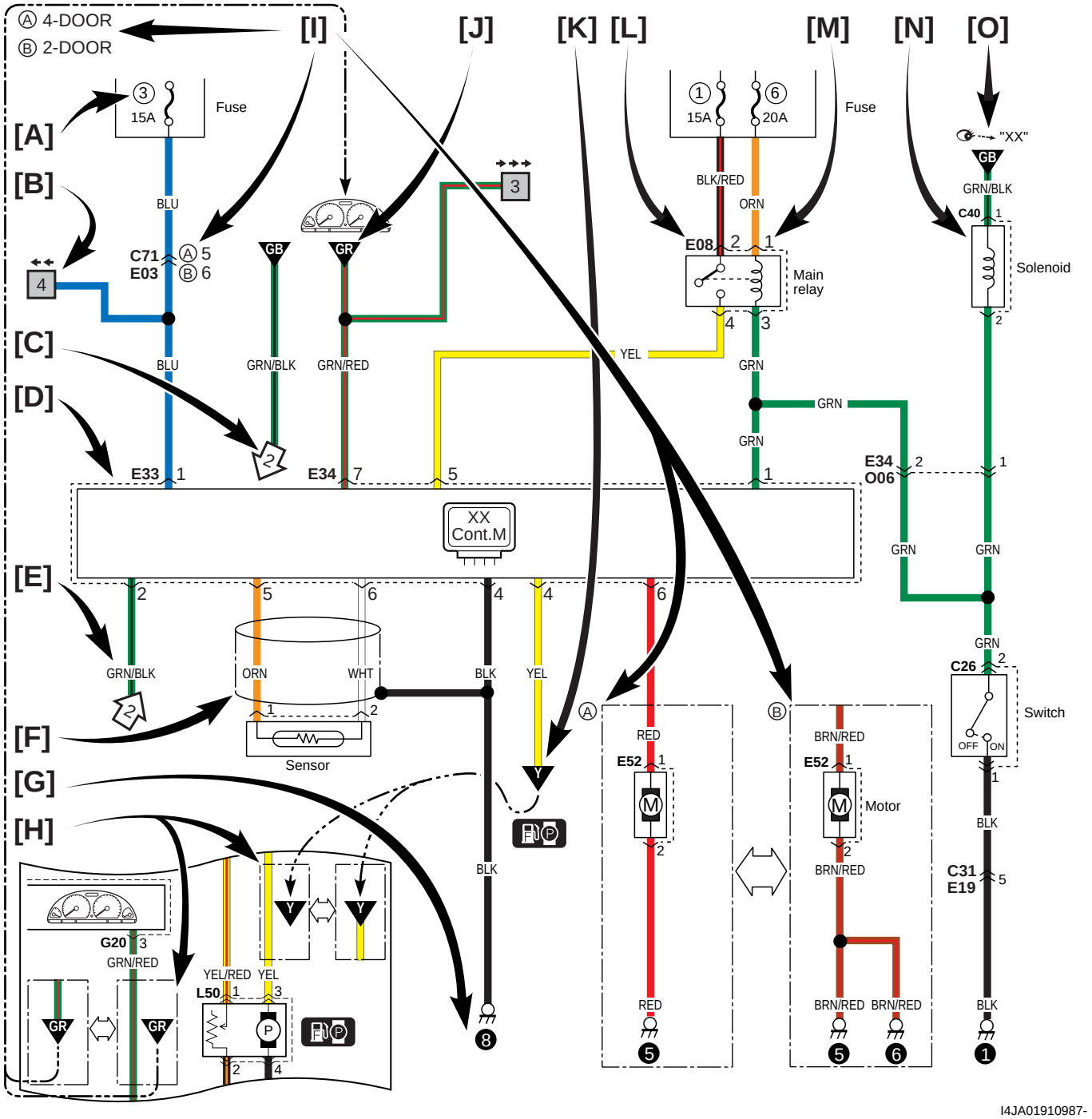
[C]: Circuit jumping point / direction

NOTE:

The circuit continues to the same symbol with opposite direction within the page.
You will find the other symbol in the direction of the arrow.

[D]: Terminals-in-one-connector mark
[E]: Wire color
[F]: Shield wire
[G]: Ground point
[H]: “From” or “To” (With ID letter (s))
[I]: Specification variation
The white arrow between A and B means “or”.
[J]: “From” (With ID letter (s))
[K] “To” (With ID letter (s))
[L]: Connector code

[M]: Terminal No.
[N]: Symbol mark
[O]: “SEE” mark



Connector Layout Diagram

Connector Layout Diagram

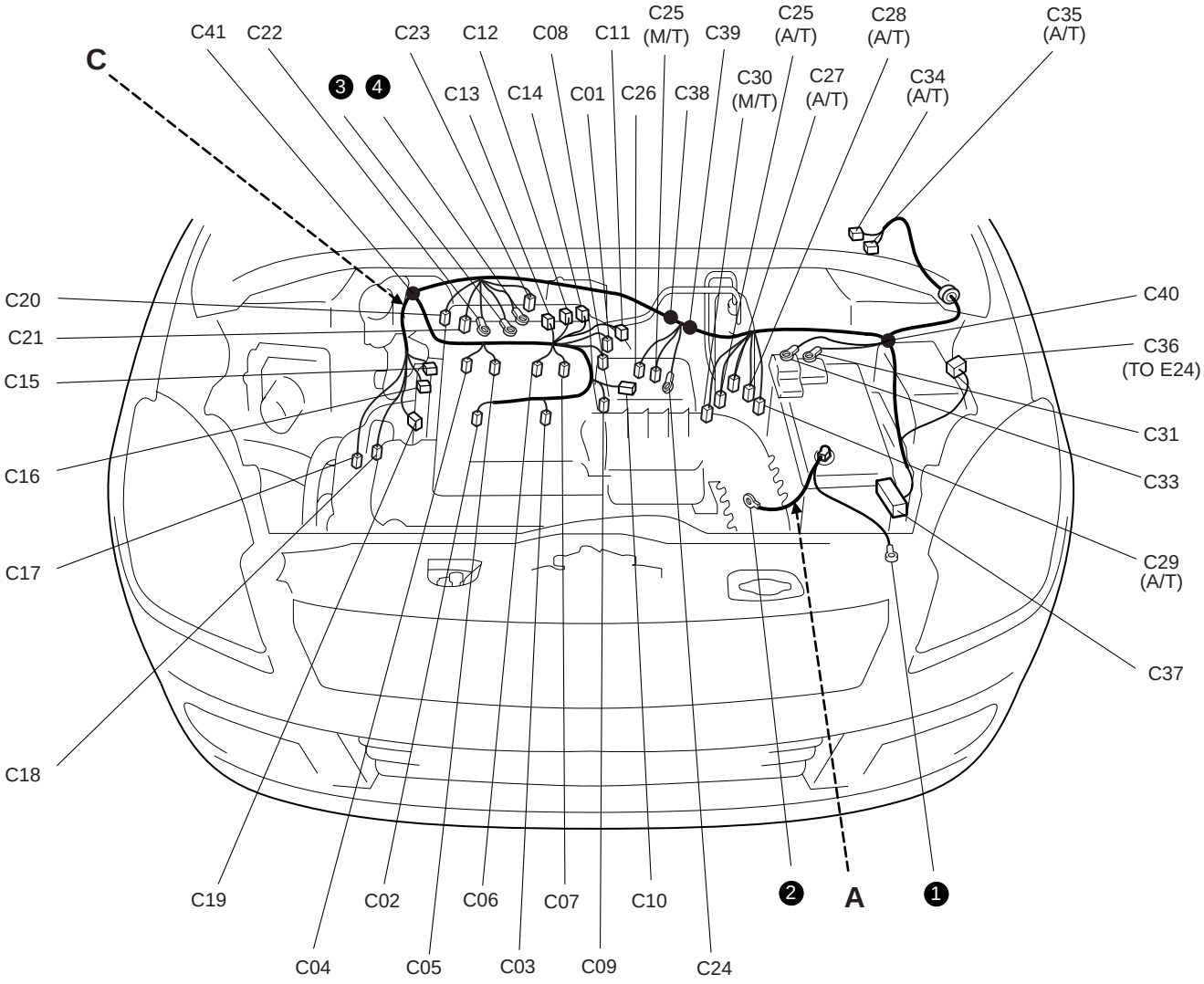
S4RS0A910A001

Refer to “Engine Compartment: ”.
Refer to “Instrument Panel: ”.
Refer to “Door, Roof: ”.
Refer to “Floor: ”.
Refer to “Rear: ”.

Engine Compartment

S4RS0A910A002

A: Battery cable / C: Engine harness



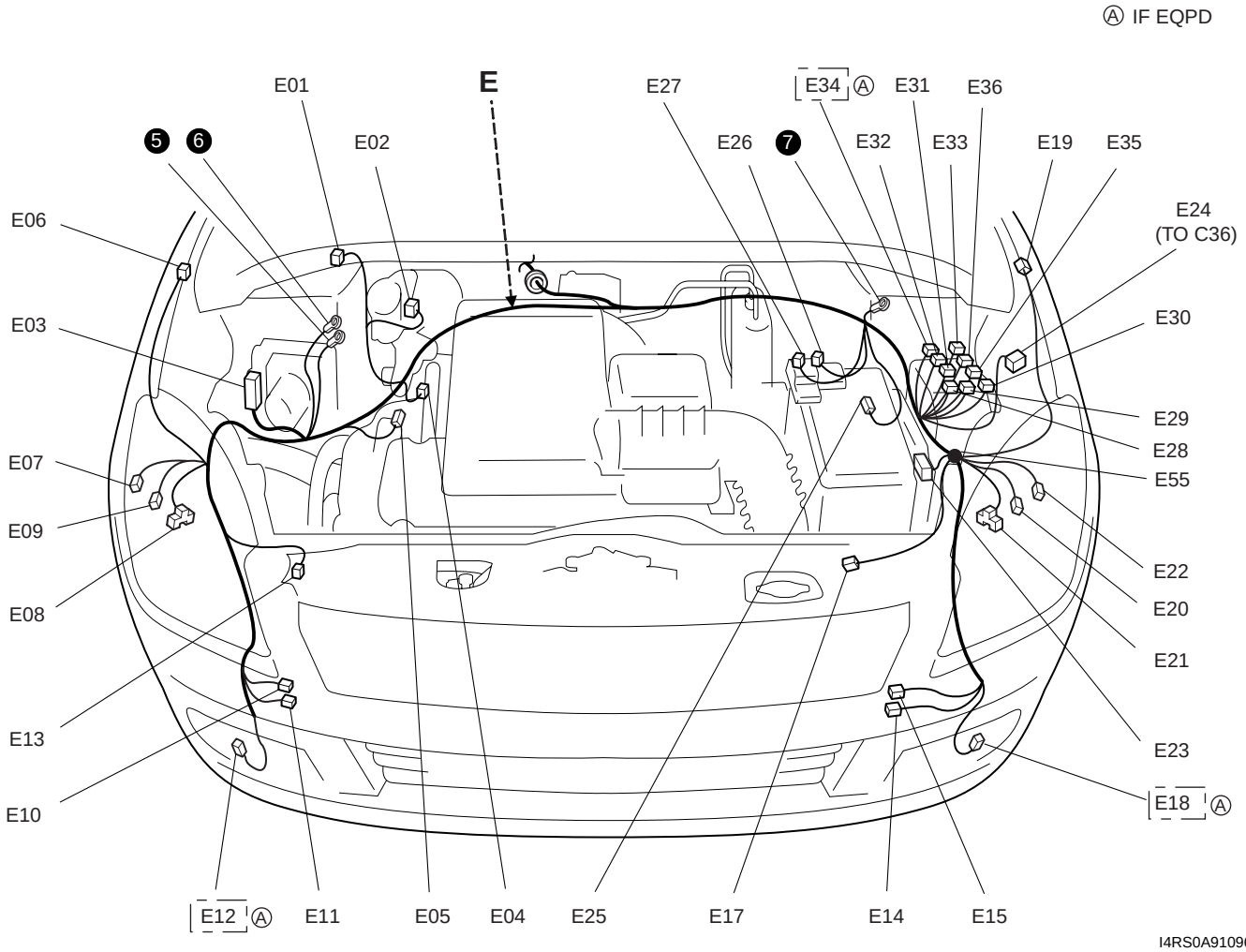
I4RS0A910964-

C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/GRY	IAC valve	C21/GRY	Generator #1
C02/GRY	IG Coil #1	C22/-	Generator #2
C03/GRY	IG Coil #2	C23/BLK	Starting motor #1
C04/GRY	Injector #1	C24/-	Starting motor #2
C05/GRY	Injector #2	C25/GRY	Vehicle speed sensor
C06/GRY	Injector #3	C26/GRY	Knock sensor
C07/GRY	Injector #4	C27/BLU (A/T)	Input sensor
C08/BLK	CMP sensor	C28/GRY (A/T)	Trans axle range sensor

No./Color	Connective position	No./Color	Connective position
C09/GRN	ECT sensor	C29/GRY (A/T)	Shift solenoid
C10/GRY	EGR stepper motor	C30/BLK (M/T)	Back-up light switch
C11/BLK	Throttle position sensor	C31/-	Main fuse box
C12/BLK	MAP sensor	C33/-	Main fuse box
C13/BLK	MAF sensor	C34/N (A/T)	TCM
C14/BLK	EVAP canister vent valve	C35/N (A/T)	TCM
C15/GRY	Heated oxygen sensor #1	C36/N	Main harness (To E24)
C16/GRN	Heated oxygen sensor #2	C37/GRY	ECM
C17/BLK	A/C compressor	C38/-	Weld splice
C18/N	Oil pressure sensor	C39/-	Weld splice
C19/BLU	VVT solenoid	C40/-	Weld splice
C20/GRY	CKP sensor	C41/-	Weld splice

E: Main harness



E: Main harness

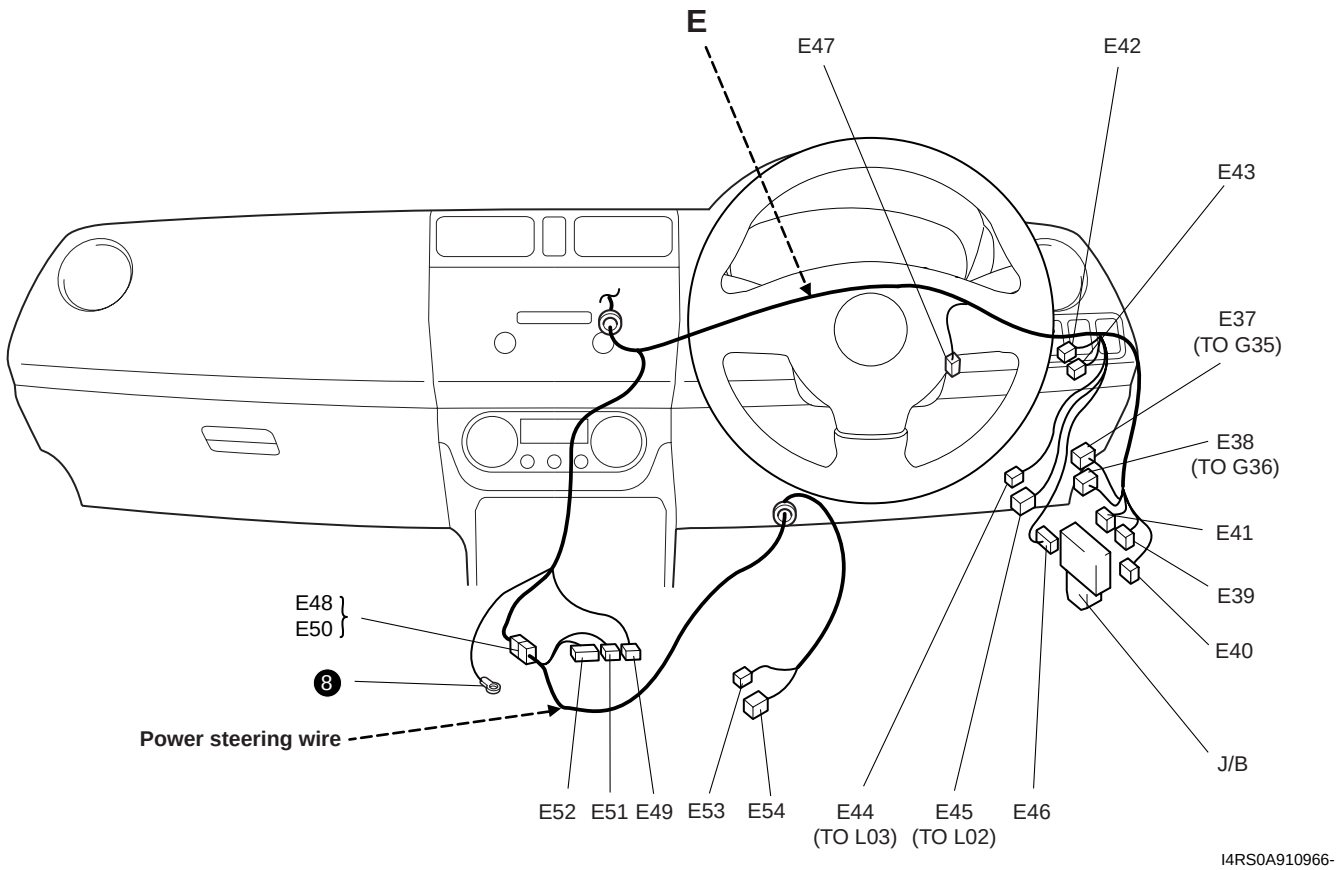
No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E20/GRY	Front turn signal light (L)
E02/GRY	Brake fluid level switch	E21/BLK	Headlight (R)
E03/BLK	ABS control module	E22/N	Front position light (L)
E04/BLK	A/C pressure sensor	E23/GRY	ECM
E05/BLK	Wheel speed sensor (FR)	E24/N	Engine Harness (To C36)
E06/N	Side turn signal light (R)	E25/BLK	Wheel speed sensor (FL)
E07/N	Front position light (R)	E26/N	Main fuse box

No./Color	Connective position	No./Color	Connective position
E08/BLK	Head light (R)	E27/BLK	Main fuse box
E09/GRY	Front turn signal light (R)	E28/N	Radiator fan relay #1
E10/GRN	Rear washer motor	E29/N	Radiator fan relay #2
E11/BLU	Windshield washer motor	E30/N	Radiator fan relay #3
E12/BLK (IF EQPD)	Front fog light (R)	E31/N	Starting motor relay
E13/YEL	Forward sensor	E32/N	Main relay
E14/BLK	Ambient temperature sensor	E33/N	A/T relay
E15/BLK	Horn	E34/N	Front fog light relay
E17/BLK	Radiator fan motor	E35/N	Fuel pump relay
E18/BLK (IF EQPD)	Front fog light (L)	E36/N	A/C compressor relay
E19/N	Side turn signal light (L)	E55/-	Weld splice

Instrument Panel

S4RS0A910A003

E: Main harness and power steering wire



I4RS0A910966-

E: Main harness

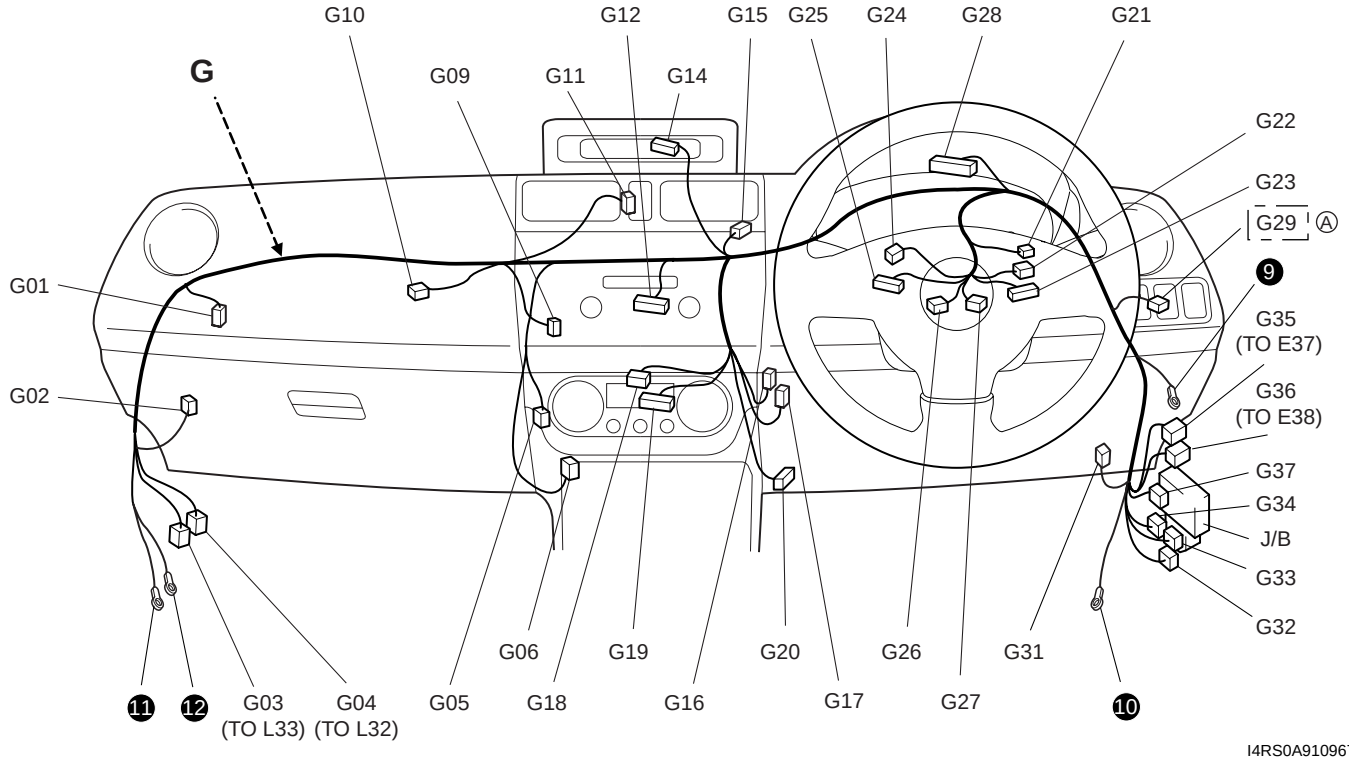
No./Color	Connective position	No./Color	Connective position
E37/GRY	Instrument panel harness (To G35)	E44/YEL	Floor harness (To L03)
E38/N	Instrument panel harness (To G36)	E45/N	Floor harness (To L02)
E39/BRN	J/B	E46/BLU	BCM
E40/N	J/B	E47/N	Brake lamp switch
E41/N	J/B	E48/BLU	Power steering wire (To E50)
E42/N	J/C	E49/BLK	P/S control module
E43/N	J/C		

E: Power steering wire

No./Color	Connective position	No./Color	Connective position
E50/BLU	Main harness (To E48)	E53/BLK	P/S torque sensor
E51/BLU	P/S control module	E54/GRY	P/S motor
E52/BLK	P/S control module		

G: Instrument panel harness

Ⓐ IF EQPD



I4RS0A910967-

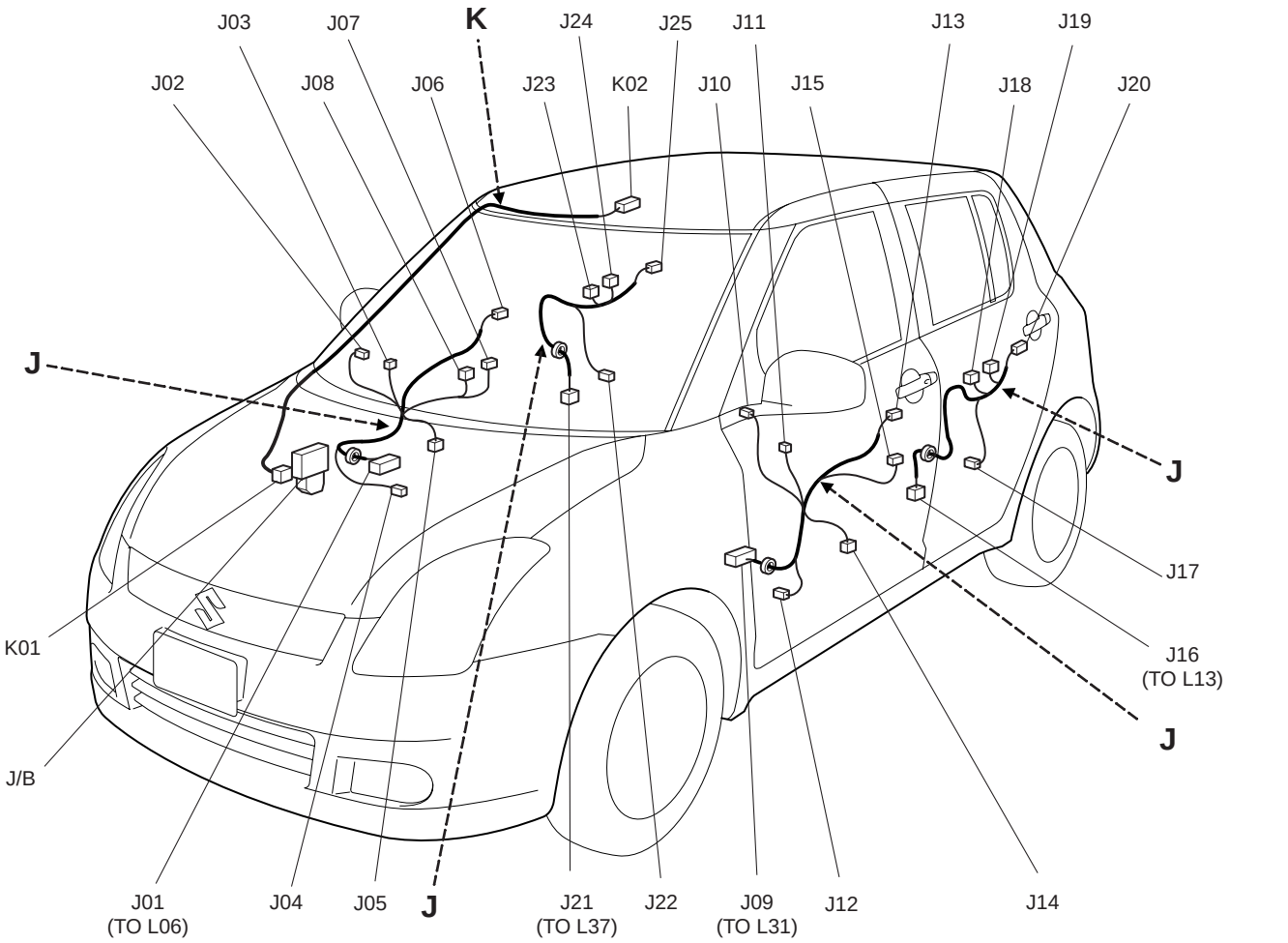
G: Instrument panel harness

No./Color	Connective position	No./Color	Connective position
G01/YEL	Fresh / Recircle actuator	G20/BLK	Data link connector
G02/N	Keyless receiver	G21/N	IG switch
G03/N	Floor harness (To L33)	G22/N	Main switch (Key switch)
G04/YEL	Floor harness (To L34)	G23/BLK	COMB switch
G05/N	Blower fan motor	G24/BLK	ICM
G06/N	Heater resister	G25/N	COMB switch
G09/N	EVAP thermistor	G26/YEL	Driver inflator
G10/BLK	Passenger inflator	G27/N	COMB switch
G11/N	Hazard switch	G28/GRY	COMB meter
G12/BLU	Audio	G29/GRN	Front fog light switch
G13/N	Navigation	G31/N	J/C
G14/GRN	Multi information display	G32/N	J/B
G15/GRY	J/C	G33/N	J/B
G16/BLU	J/C	G34/N	J/B
G17/N	J/C	G35/GRY	Main harness (To E37)
G18/GRN	Mode control switch	G36/N	Main harness (To E38)
G19/BRN	Heater fan switch	G37/BLU	BCM

Door, Roof

S4RS0A910A004

J: Front and rear door wire and rear door joint wire / K: Roof wire



I4RS0A910968-

J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/N	Floor harness (To L06)	J05/GRY	Front power window motor (Driver side)
J02/BLK	Tweeter (Driver side)	J06/N	Front door lock switch (Driver side)
J03/N	Power mirror motor (Driver side)	J07/N	Power mirror switch (Driver side)
J04/N	Front speaker (Driver side)	J08/BLK	Power window main switch

J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J09/N	Floor harness (To L03)	J13/N	Front door lock motor (Passenger side)
J10/BLK	Tweeter (Passenger side)	J14/GRY	Front power window motor (Passenger side)
J11/N	Power mirror motor (Passenger side)	J15/N	Power window sub switch
J12/N	Front speaker (Passenger side)		

J: Rear door wire

No./Color	Connective position	No./Color	Connective position
J16/N	Floor harness (To L13)	J21/N	Floor harness (To L37)
J17/N	Rear speaker (R)	J22/N	Rear speaker (L)
J18/BLK	Rear power window motor (R)	J23/BLK	Rear power window motor (L)
J19/N	Rear power window sub switch (R)	J24/N	Rear power window sub switch (L)
J20/N	Rear door lock motor (R)	J25/N	Rear door lock motor (L)

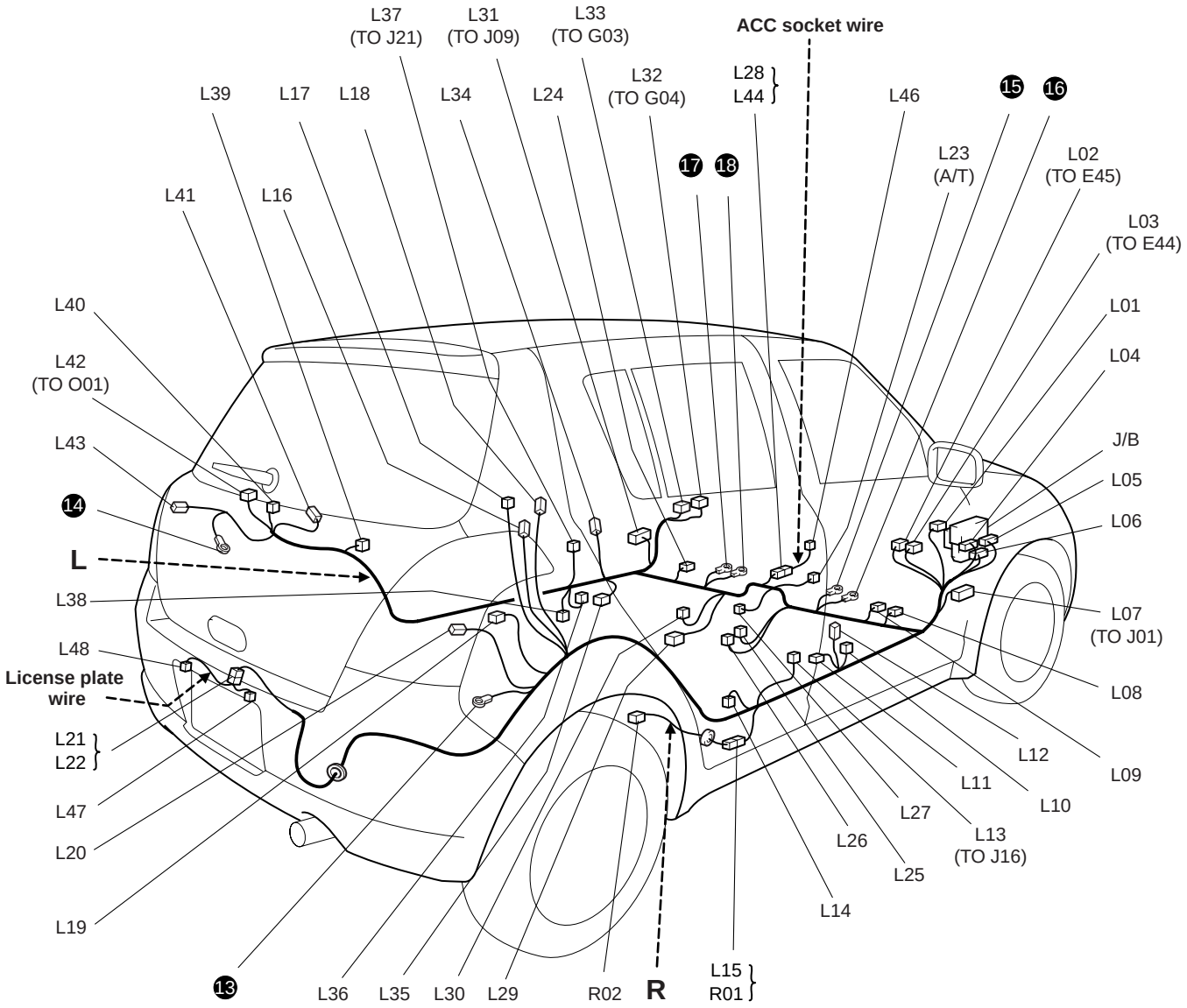
K: Roof wire

No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/GRY	Interior light

Floor

S4RS0A910A005

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire



I4RS0A910969-

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L24/GRY	J/C
L02/N	Main harness (To E44)	L25/YEL	Side air-bag inflator (Driver side)
L03/YEL	Main harness (To E45)	L26/N	Seat belt switch
L04/YEL	J/B	L27/BLK	Parking brake switch
L05/N	J/B	L28/BLU	ACC socket wire (To L44)
L06/N	J/B	L29/PNK	A/B SDM
L07/N	Front door wire (Driver side) (To J01)	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L08/N	J/C	L30/YEL	Side air-bag inflator (Passenger side)
L09/N	J/C	L31/N	Front door wire (Passenger side) (To J09)
L10/BLK	Pretentioner (Driver side)	L32/YEL	Instrument panel harness (To G04)
L11/N	Side air-bag sensor (Driver side)	L33/N	Instrument panel harness (To G03)
L12/N	Front door switch (Driver side)	L34/N	Front door switch (Passenger side)
L13/N	Rear door wire (R) (To J16)	L35/N	Side air- bag sensor (Passenger side)
L14/N	Wheel speed sensor (RR)	L36/BLK	Pretentioner (Passenger side)
L15/GRY	Fuel pump wire (To R01)	L37/N	Rear door wire (L) (To J21)
L16/N	Rear door switch (R)	L38/N	Wheel speed sensor (RL)
L17/N	High mounted stop lamp	L39/N	Antenna amplifier
L18/BLK	Side curtain air-bag (R)	L40/N	Rear door switch (L)
L19/GRY	Luggage compartment light	L41/BLK	Side curtain air-bag (L)
L20/N	Rear combination lamp (R)	L42/N	Rear end door wire (To O01)
L21/N	License plate wire (To L22)	L43/BLK	Rear combination lamp (L)
L23/N (A/T)	A/T shift lever		

L: ACC socket wire

No./Color	Connective position	No./Color	Connective position
L44/BLU	Floor harness (To L28)	L46/N	ACC socket

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

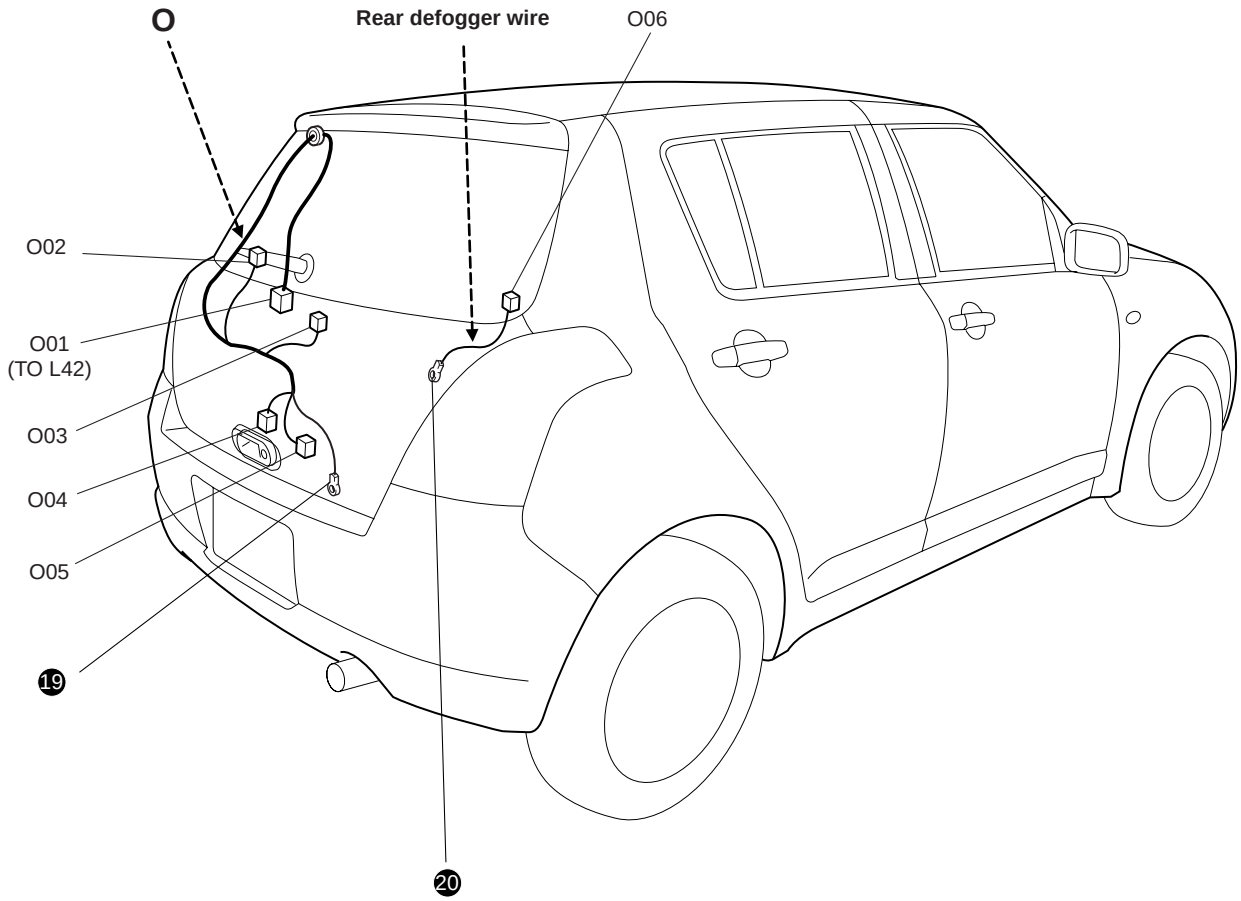
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/BLK	Fuel pump and gauge

Rear

S4RS0A910A006

O: Rear end door harness, Rear defogger wire



I4RS0A910970-

O: Rear end door harness

No./Color	Connective position	No./Color	Connective position
O01/N	Floor harness (To L42)	O04/N	Rear end door lock solenoid
O02/BLK	Rear defogger (+)	O05/GRN	Rear end door lock switch
O03/N	Rear wiper motor		

O: Rear defogger wire

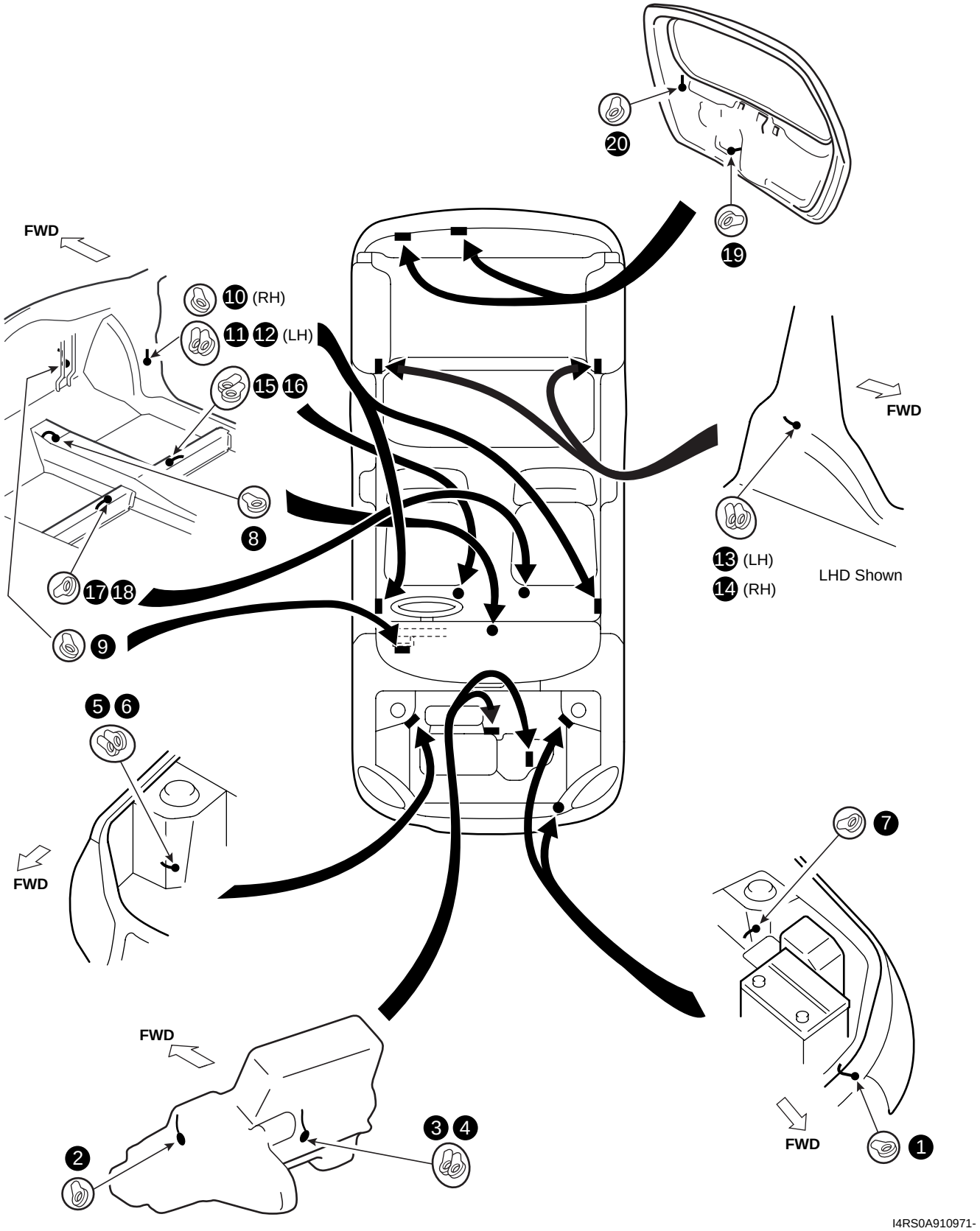
No./Color	Connective position	No./Color	Connective position
O06/BLK	Rear defogger (–)		

Ground Point

Ground (earth) Point

S4RS0A910C001

Refer to “Connector Layout Diagram: ”.



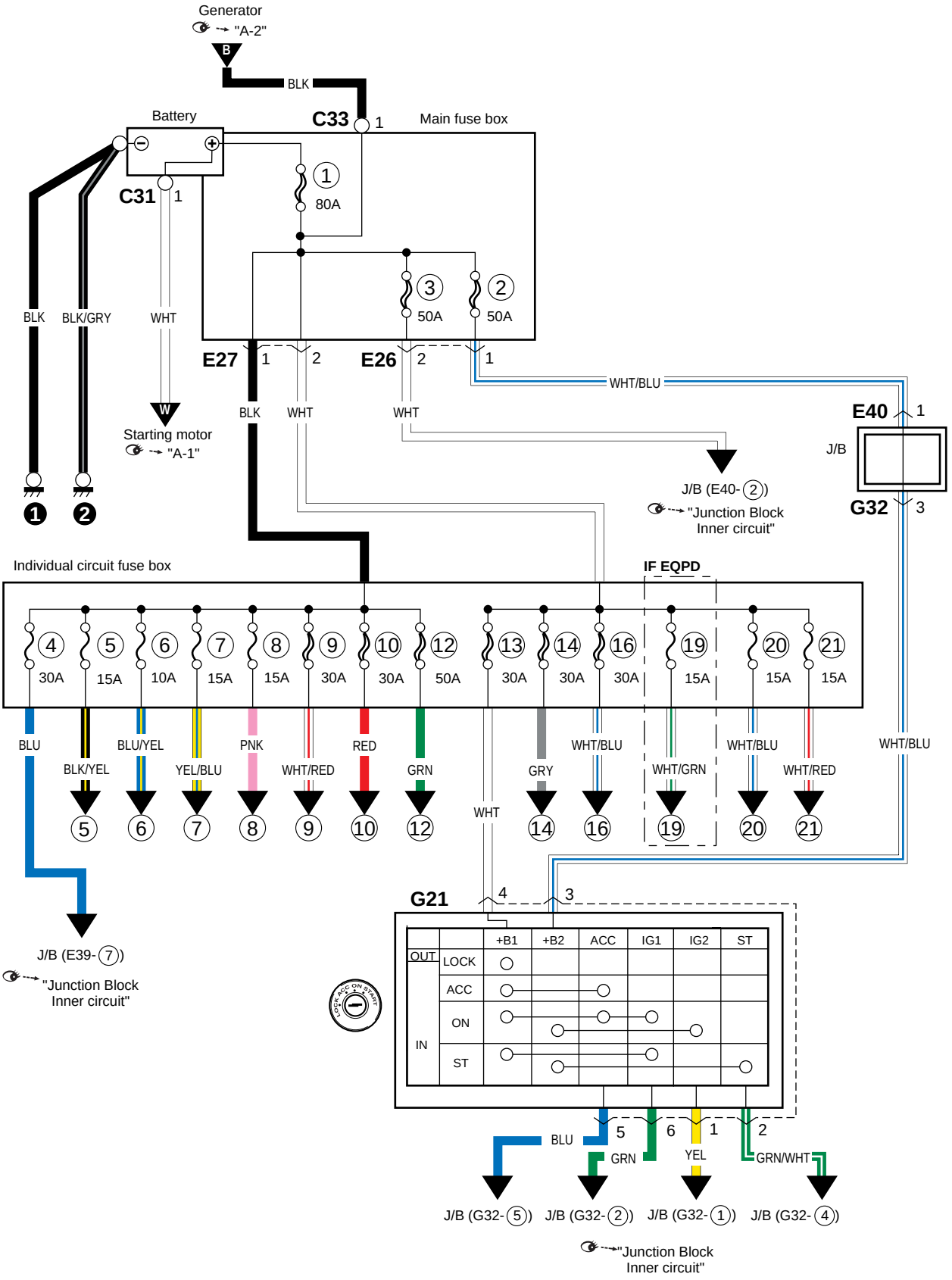
I4RS0A910971-

Power Supply Diagram

Power Supply Diagram

S4RS0A910D001

Refer to “Fuses and the Protected Parts: ”.
Refer to “Fuses in Main Fuse Box: ”.
Refer to “Individual Circuit Fuse Box No. 1: ”.
Refer to “Individual Circuit Fuse Box No. 2 (In J/B): ”.
Refer to “Junction Block (J/B) Connector / Fuse Layout: ”.
Refer to “Junction Block Inner Circuit (Overview): ”.
Refer to “Junction Block Inner Circuit (Detail): ”.



I4RS0A910904-

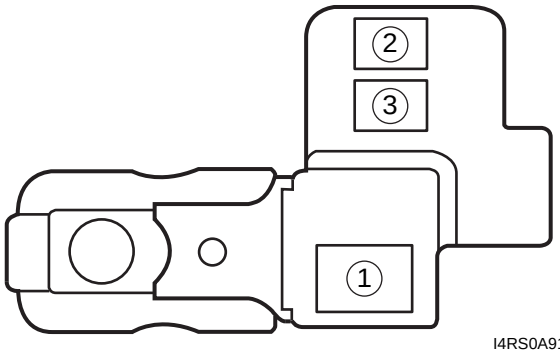
Fuses and the Protected Parts

S4RS0A910D002

The chart below describes what parts each fuse protects.

Fuses in Main Fuse Box

S4RS0A910D003

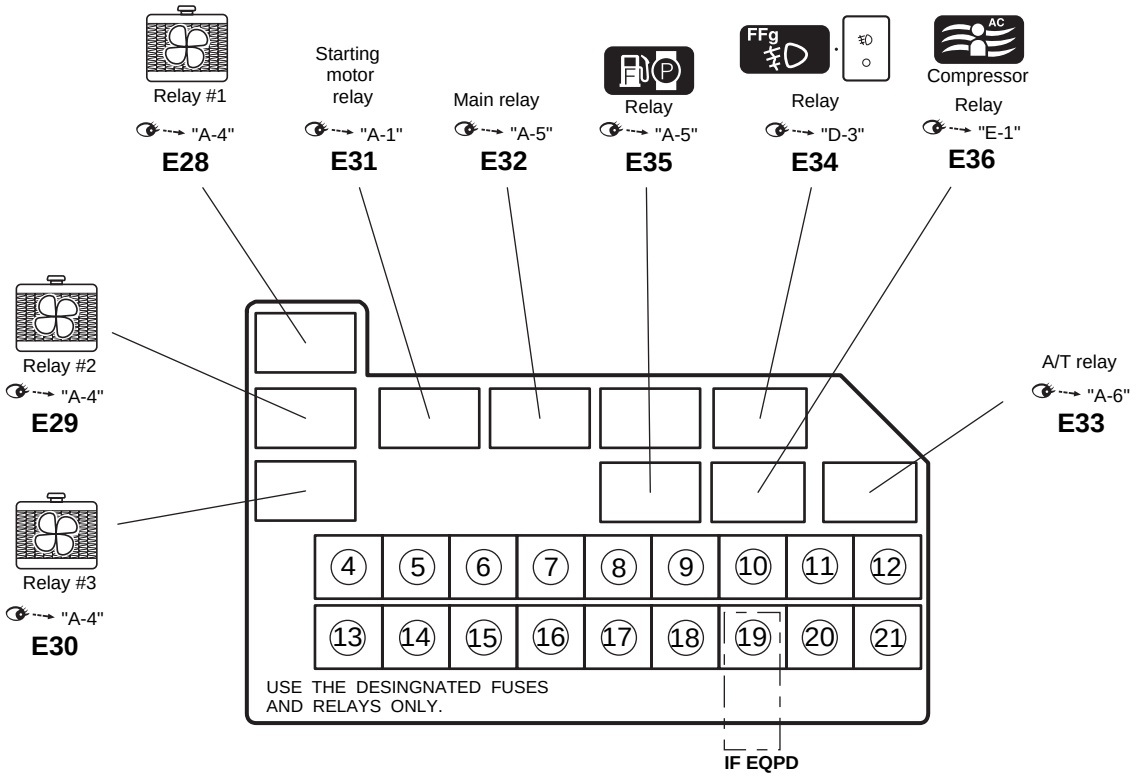


I4RS0A910905-

No.	Fuse	Protected circuit
①	80 A	All electric circuit
		Battery
		Generator
②	50 A	LAMP
③	50 A	IG switch
		Supplementary fuse box No.2 (In J/B)

Individual Circuit Fuse Box No. 1

S4RS0A910D004



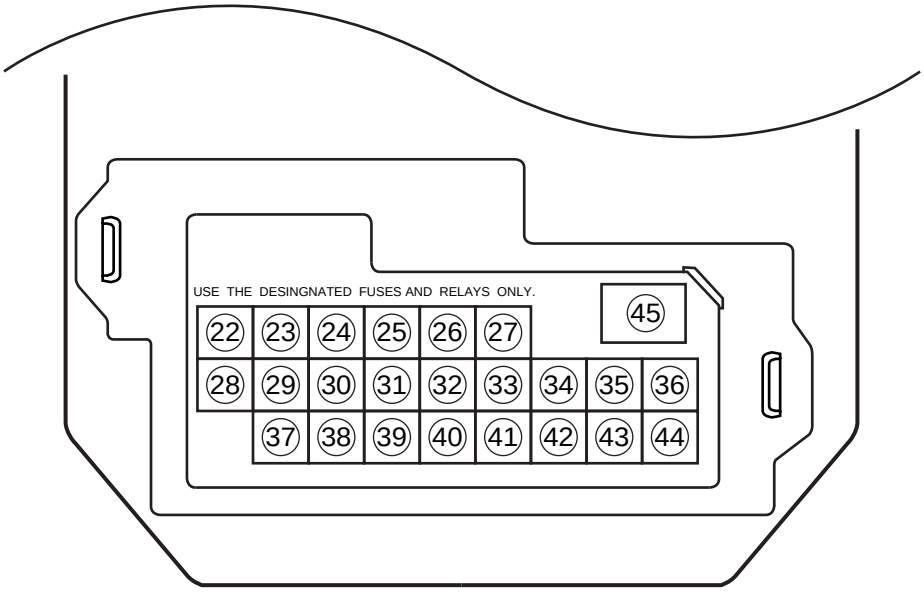
I4RS0A910906-

No.	Fuse	Description on the cover	Protected circuit
④	30 A	HTR FAN	Heater relay
⑤	15 A	FI	Main relay
⑥	10 A	A/C CPRSR	A/C compressor relay
⑦	15 A	AT ETM	A/T relay
⑧	15 A	STOP LAMP	Brake light switch
⑨	30 A	ABS MOT	ABS control module
⑩	30 A	ST MOT	Starting motor relay
⑪	50 A	MTA	BLANK
⑫	50 A	EPS	Power steering control module

No.	Fuse	Description on the cover	Protected circuit
⑬	30 A	IG ACC	IG switch
⑭	30 A	RDTR FAN	Radiator fan relay #1
			Radiator fan relay #2
⑮	BLANK	BLANK	BLANK
⑯	30 A	ABS SOL	ABS control module
⑰	BLANK	BLANK	BLANK
⑱	15 A	THR MOT	BLANK
⑲	15 A	FR FOG	Front fog light relay
⑳	15 A	H/L L	Headlight (L)
㉑	15 A	H/L R	Headlight (R)

Individual Circuit Fuse Box No. 2 (In J/B)

S4RS0A910D005



I4RS0A910907-

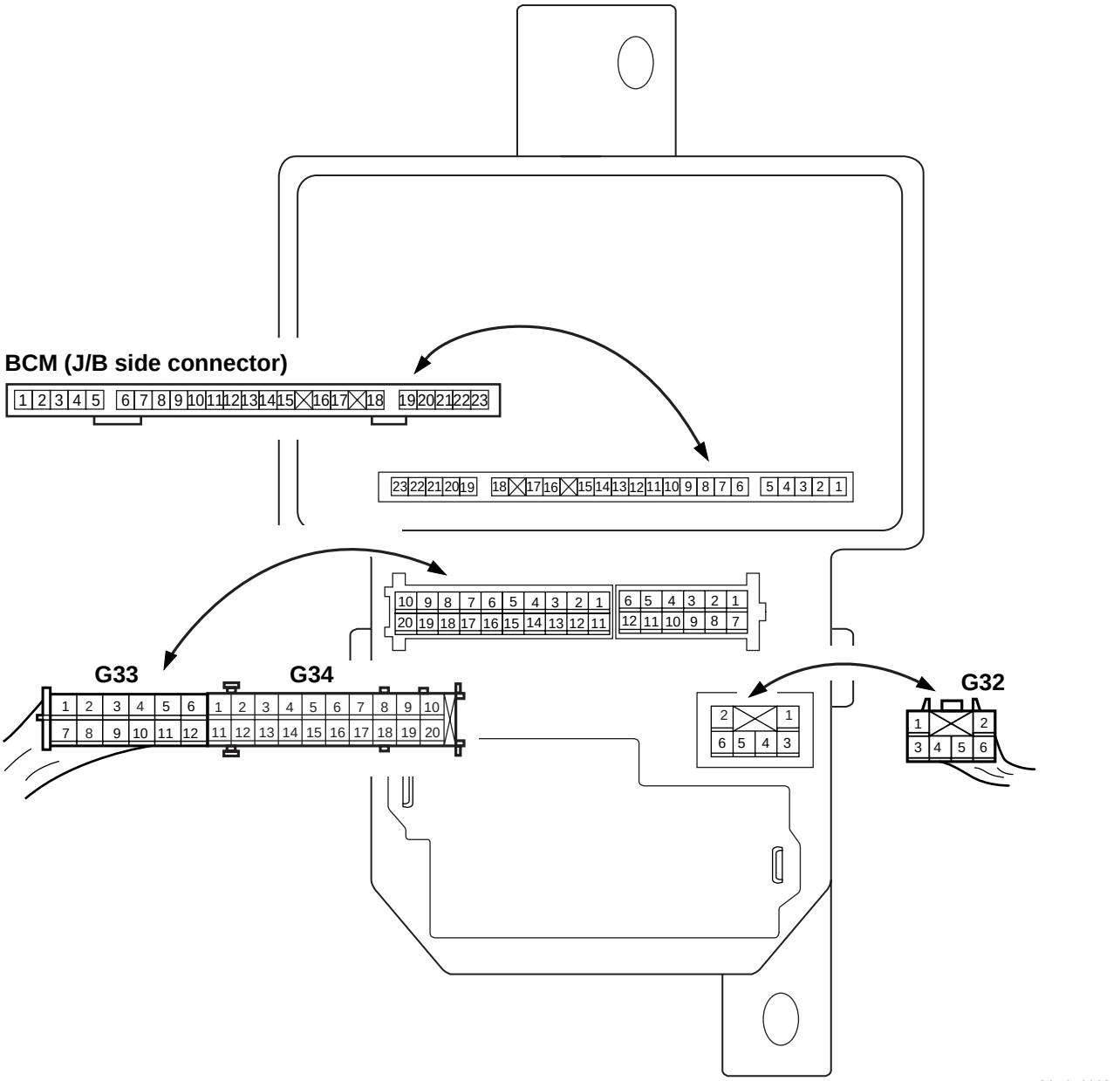
No.	Fuse	Description on the cover	Protected circuit
㉒	BLANK	BLANK	BLANK
㉓	15 A	IG COIL	ECM
			Fuel pump relay
			Generator
			Heated oxygen relay #1
			Heated oxygen relay #2
			ICM
			IG coil #1
			IG coil #2
㉔	10 A	BACK	Back-up light switch (M/T)
			Fresh / Recircle actuator
			Mode control switch
			A/C Panel (Auto / Manual)
			Transaxle range sensor (A/T)
㉕	10 A	METER	BCM
			COMB meter
			Flasher relay
㉖	15 A	ACC 1	BCM
			Power mirror
㉗	15 A	ACC 2	ACC socket or Cigar lighter
			Audio
			Multi information display

No.	Fuse	Description on the cover	Protected circuit
㉘	15 A	WIPER	COMB switch
			Rear washer motor
			Rear wiper motor
			Rear wiper relay
			Windshield washer motor
			Windshield wiper motor
㉙	10 A	IG1 SIG	A/T relay (A/T)
			Power steering control module
㉚	15 A	A/BAG	A/B SDM
㉛	10 A	ABS	ABS control module
㉜	10 A	TAIL	COMB switch
㉝	BLANK	BLANK	BLANK
㉞	20 A	D/L	BCM
㉟	10 A	IMMOBI	BLANK
㊱	10 A	ST SIG	Starting motor relay
㊲	15 A	SEAT HTR	BLANK
㊳	10 A	IG2 SIG	Heater relay
㊴	15 A	RR FOG	BLANK
㊵	15 A	RADIO	Audio
			BCM
			COMB meter
			DLC
			ECM
			Interior light
			Luggage compartment light
			Main switch (Key switch)
			Multi information display
			TCM
㊶	25 A	RR DEF	Rear defogger relay
㊷	15 A	HAZ-HORN	Horn relay
			Flasher relay
㊸	10 A	MTA	BLANK
㊹	20 A	P/WT	BLANK
㊺	30 A	P/W	Front power window main switch
			Front power window sub switch
			Rear power window sub switch (R)
			Rear power window sub switch (L)

Junction Block (J/B) Connector / Fuse Layout

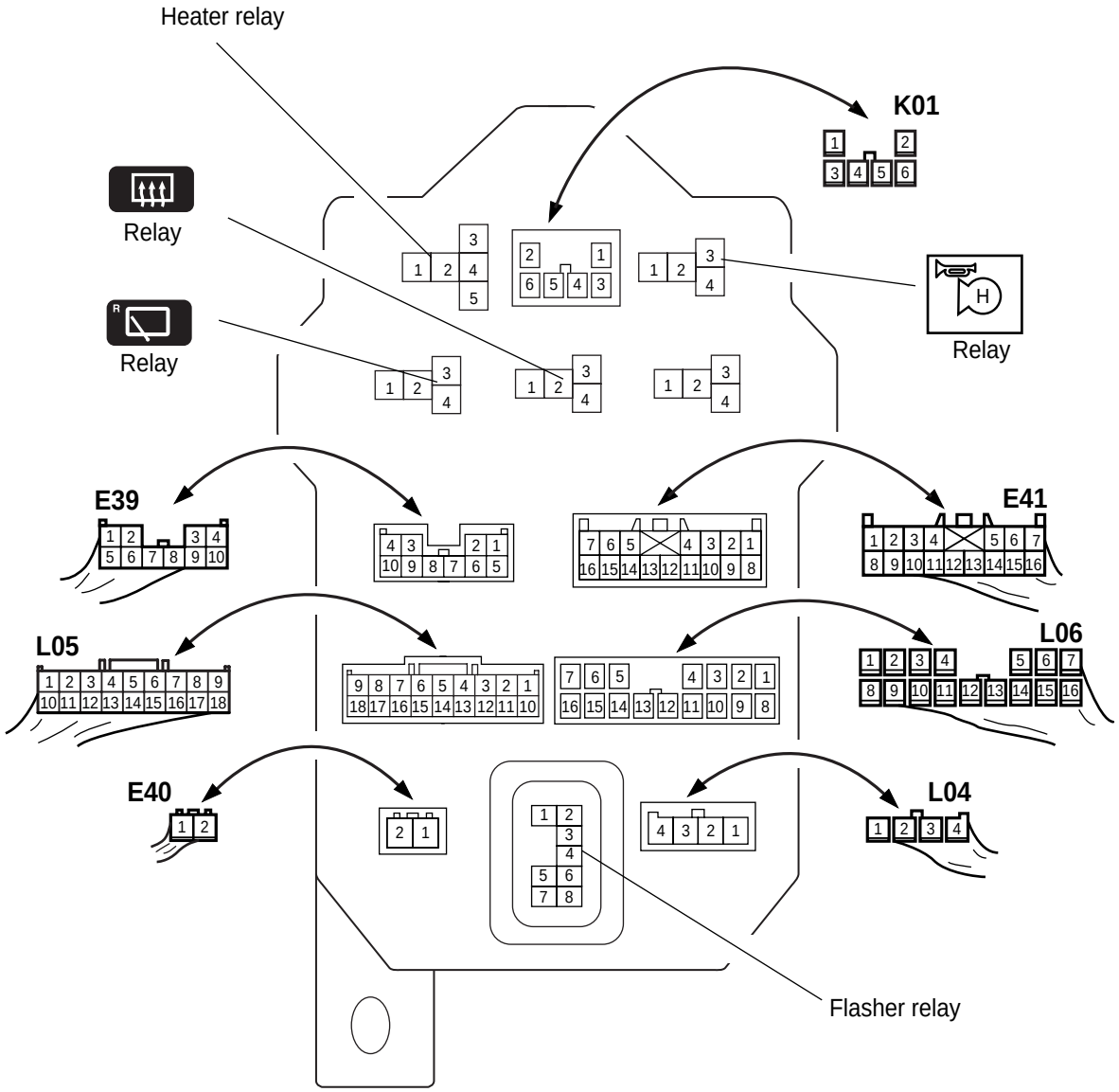
S4RS0A910D006

BCM side



I4RS0A910908-

Fuse side

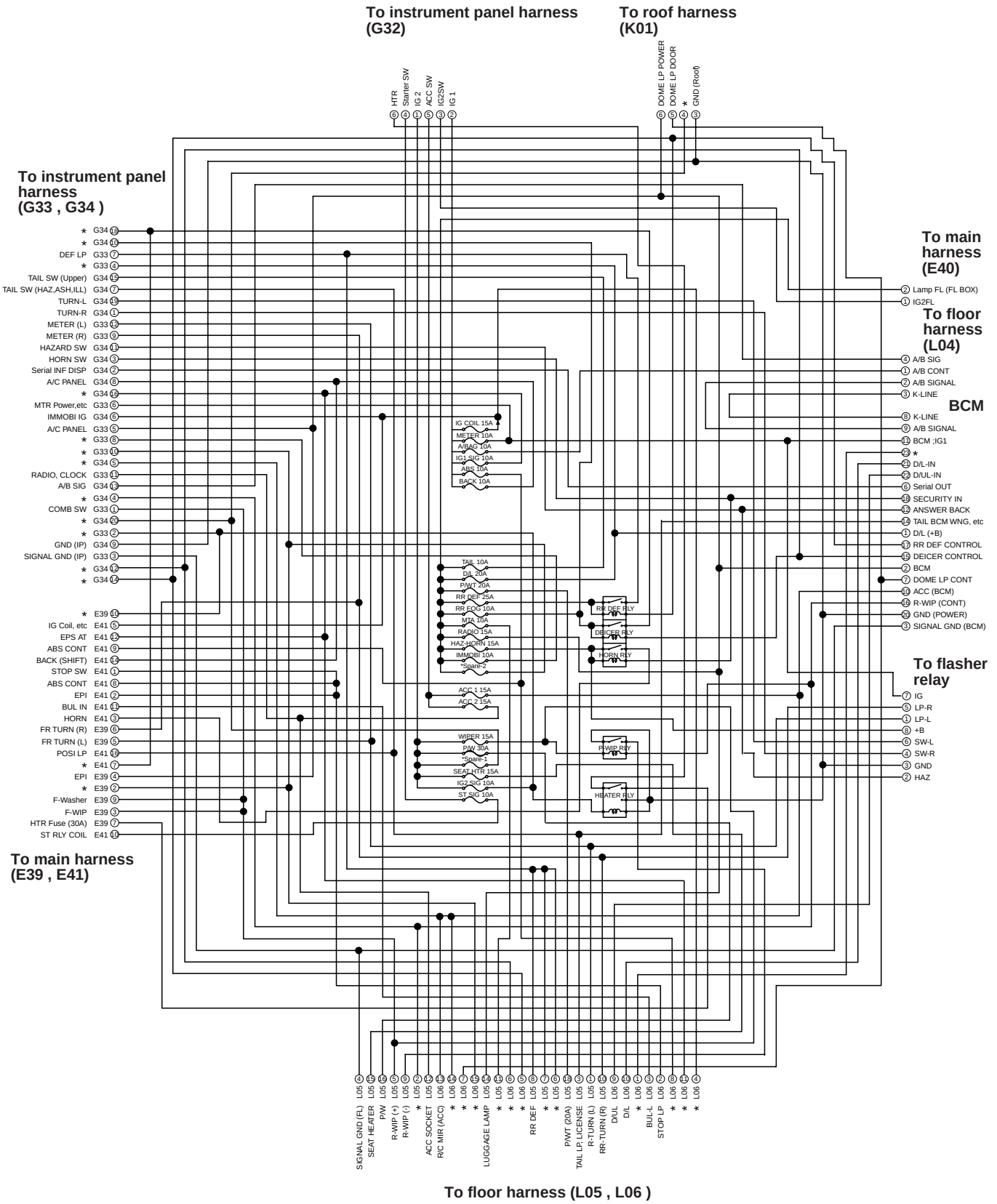


I4RS0A910909-

Junction Block Inner Circuit (Overview)

S4RS0A910D007

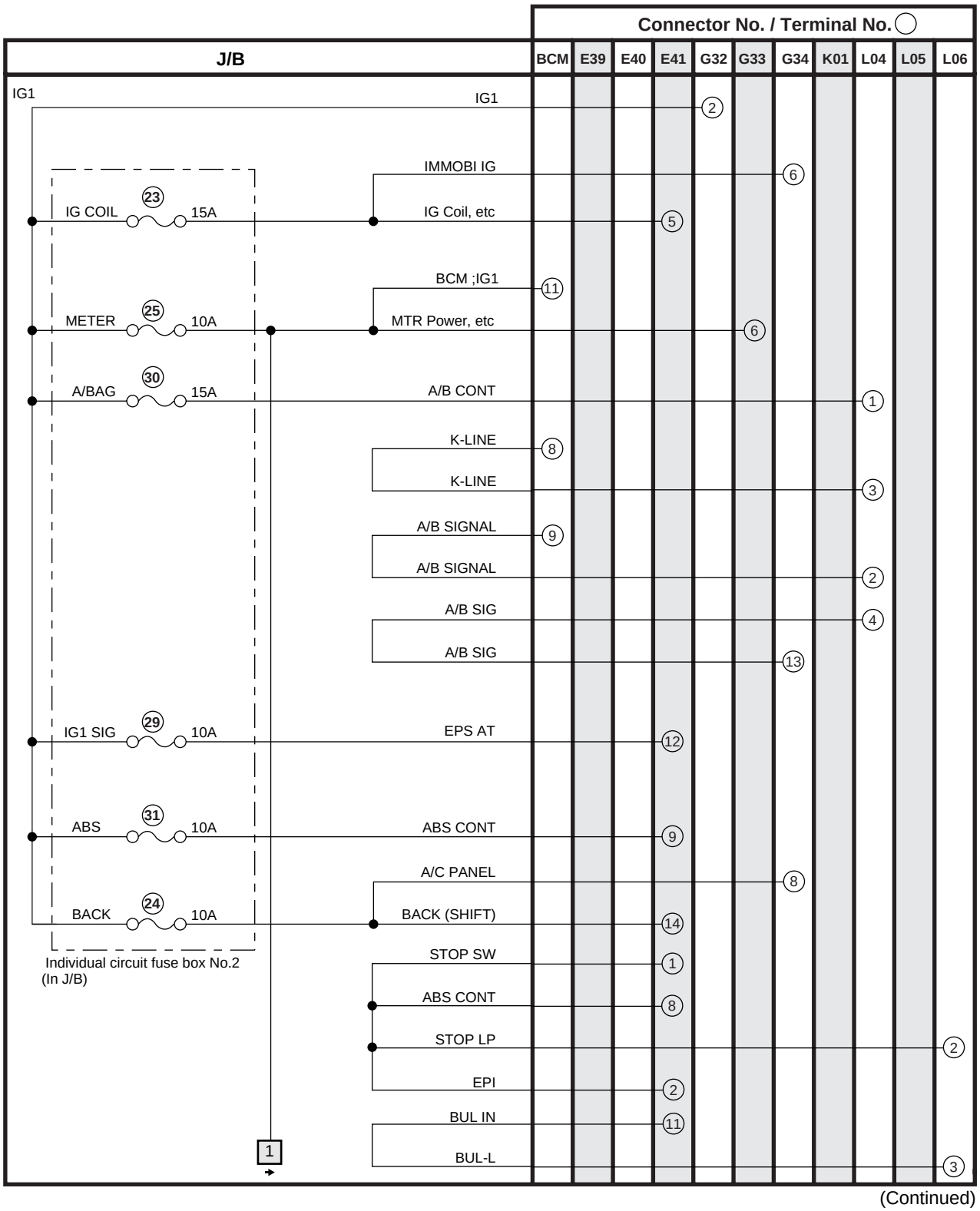
* : Not used



I4RS0A910972-

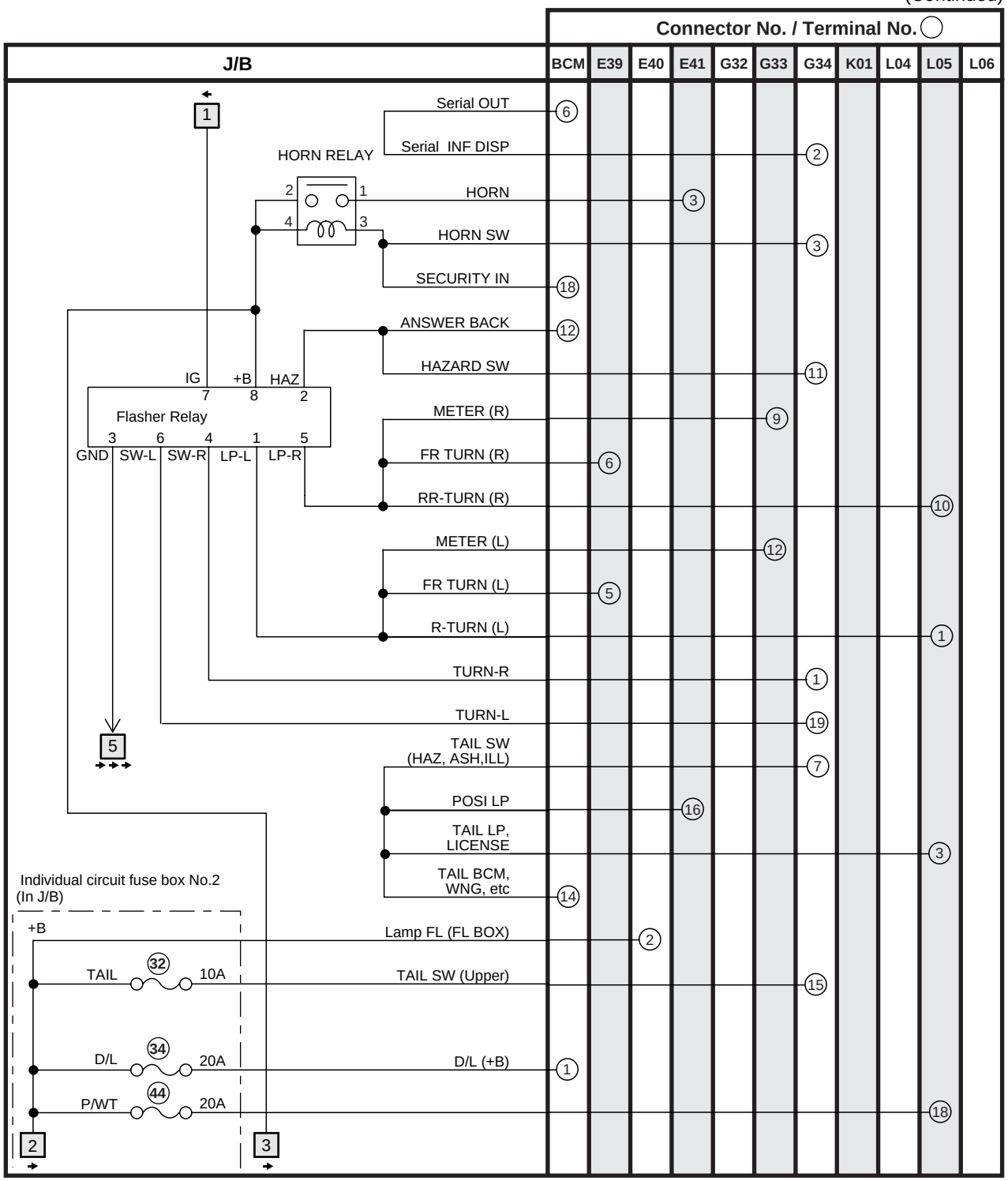
Junction Block Inner Circuit (Detail)

S4RS0A910D008

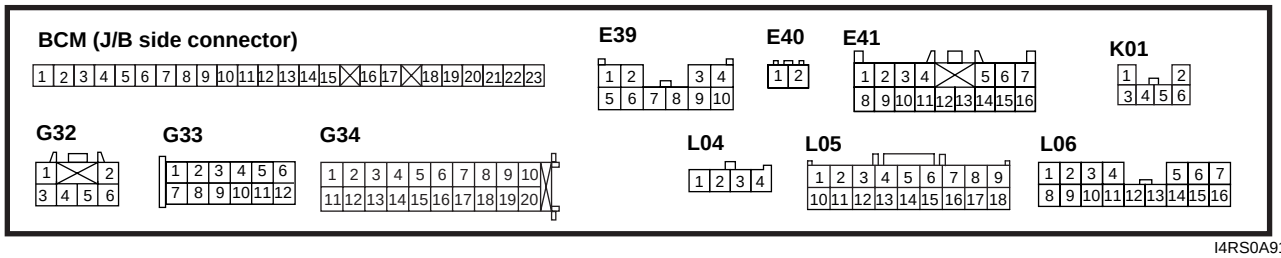


I4RS0A910910-

(Continued)

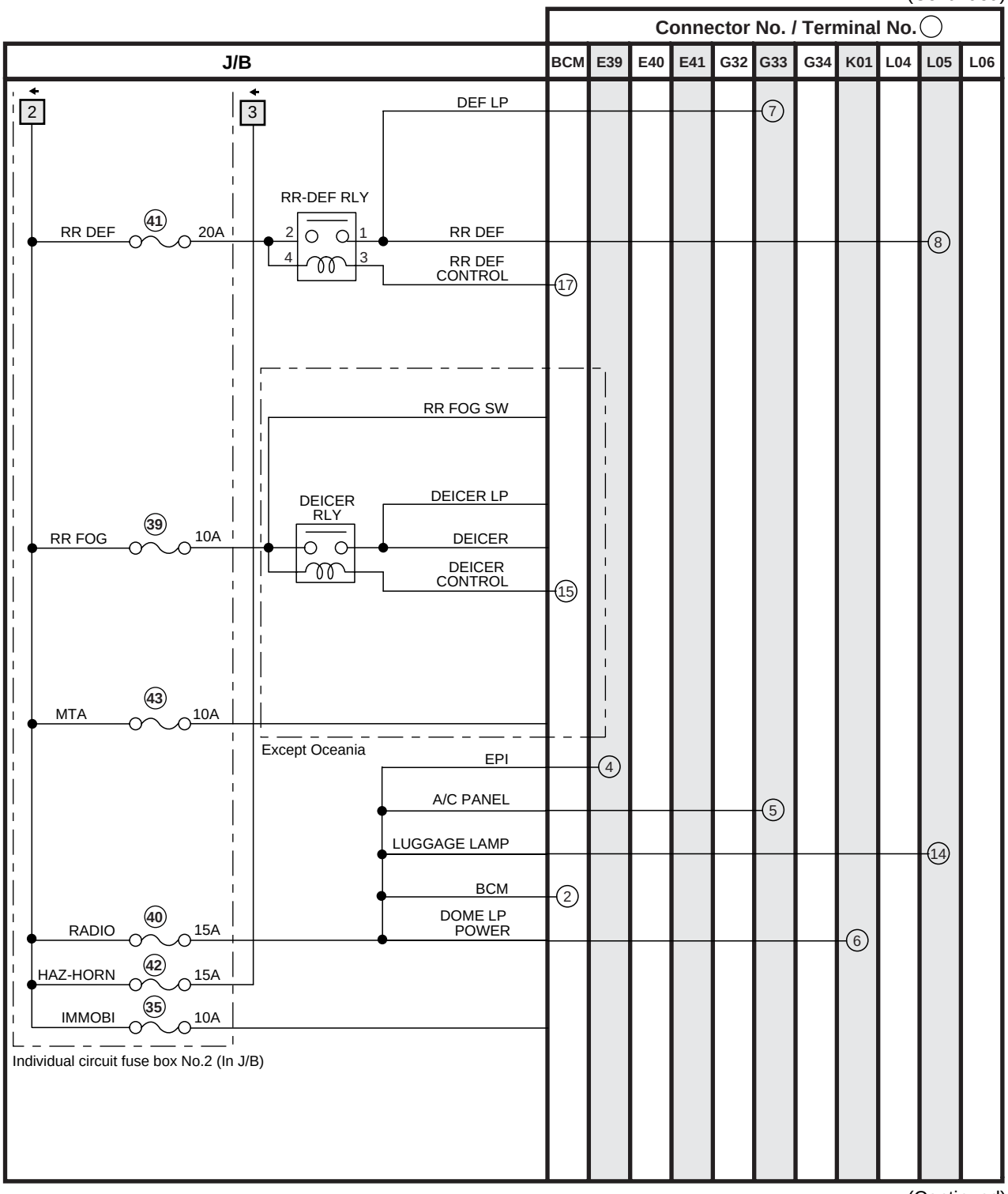


(Continued)

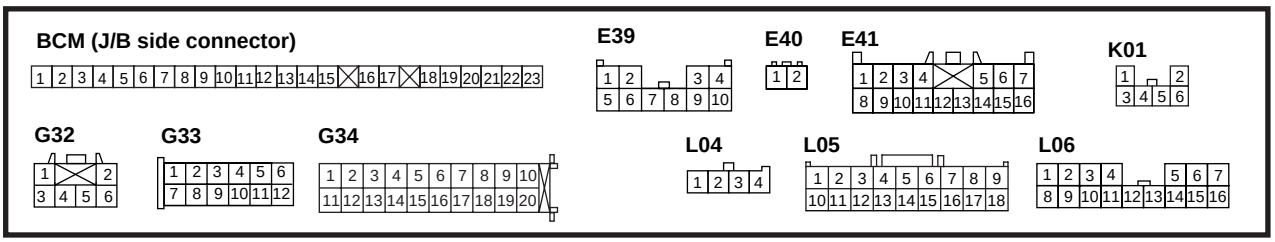


I4RS0A910911-

(Continued)

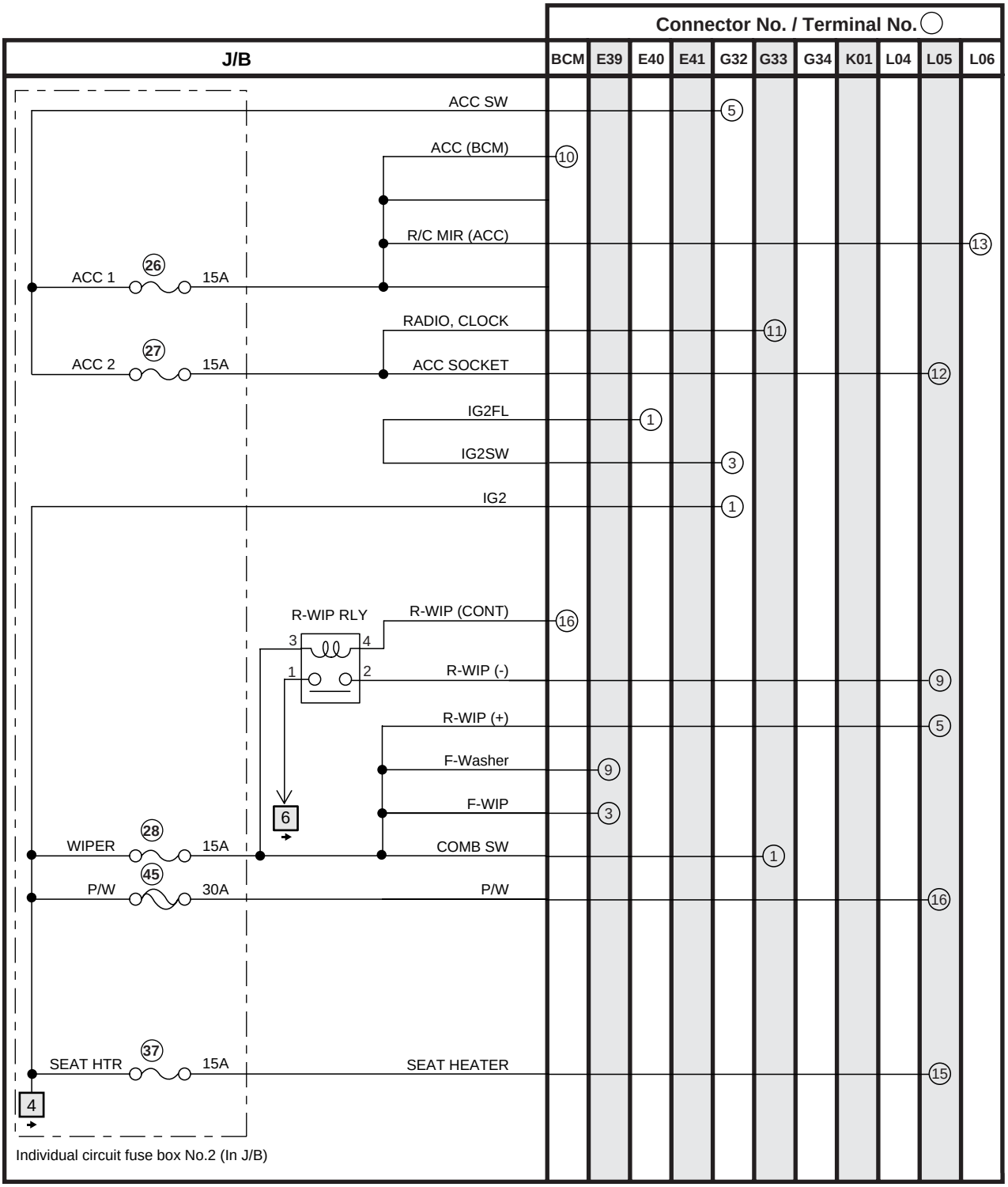


(Continued)

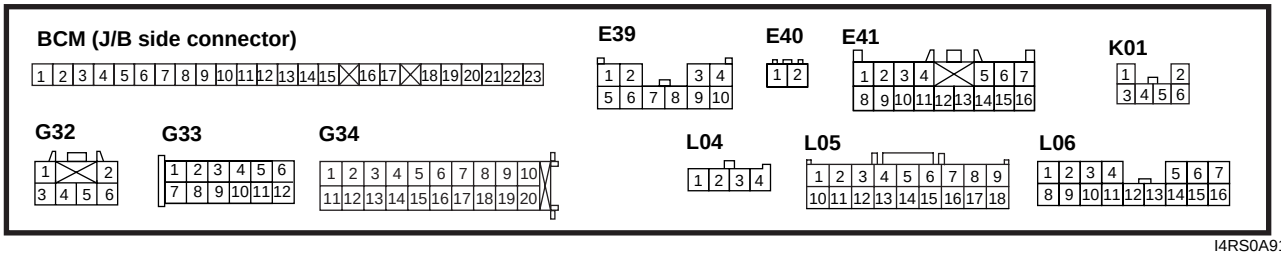


I4RS0A910912-

(Continued)

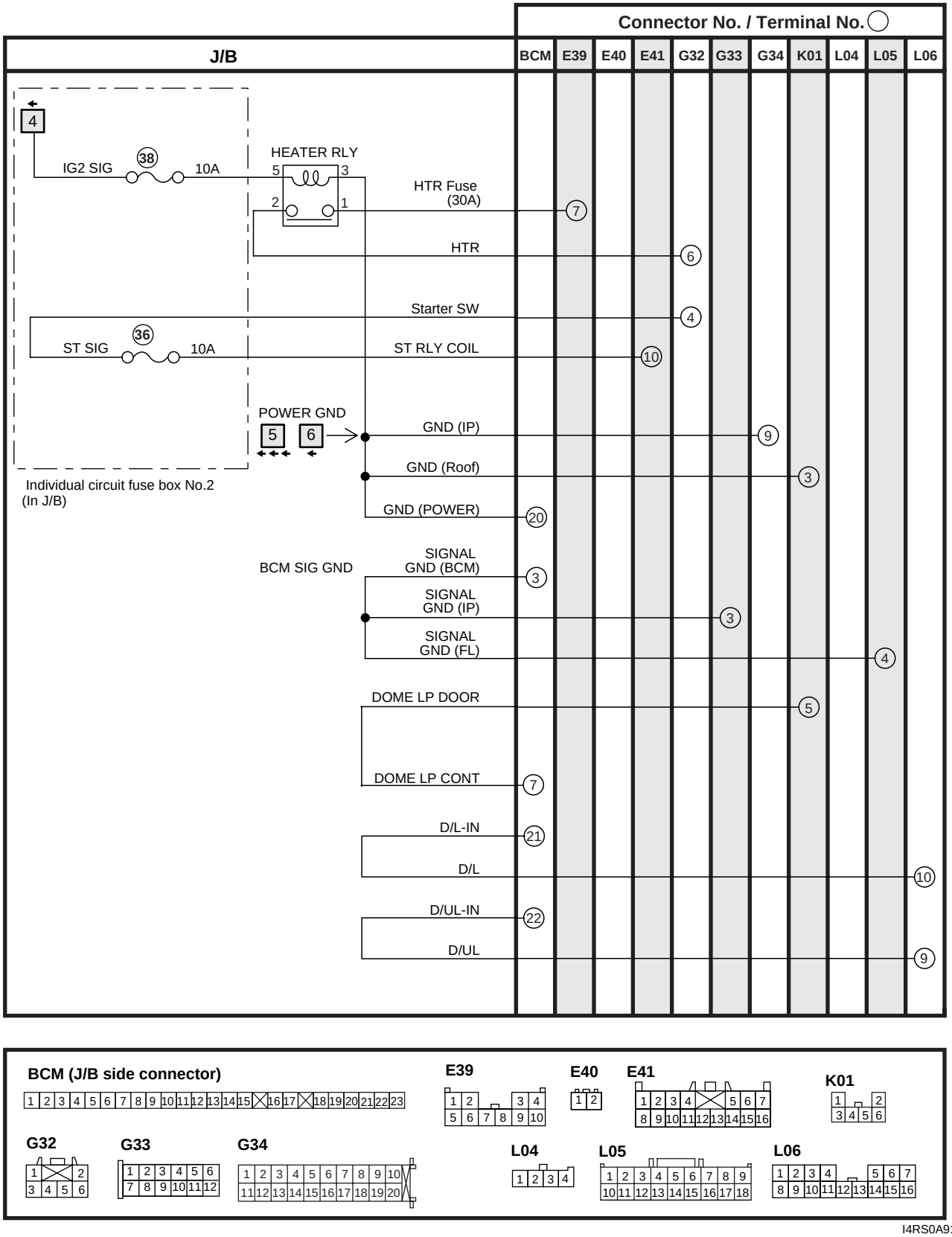


(Continued)



I4RS0A910913-

(Continued)



I4RS0A910914-

System Circuit Diagram

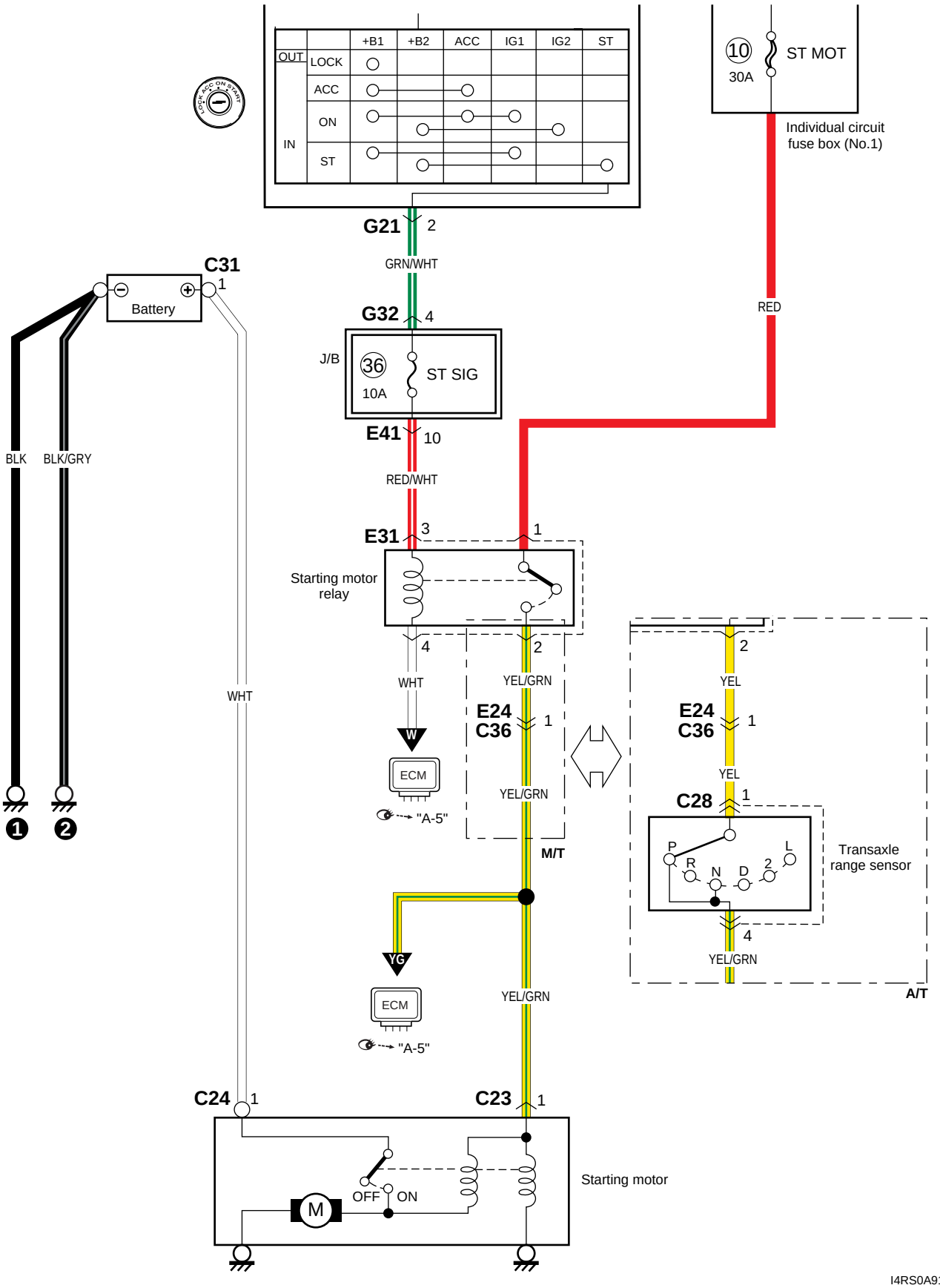
System Circuit Diagram

S4RS0A910E001

Refer to “A-1 Cranking System Circuit Diagram: ”.
Refer to “A-2 Charging System Circuit Diagram: ”.
Refer to “A-3 Ignition System Circuit Diagram: ”.
Refer to “A-4 Cooling System Circuit Diagram: ”.
Refer to “A-5 Engine and A/C Control System Circuit Diagram: ”.
Refer to “A-6 A/T Control System Circuit Diagram: ”.
Refer to “A-7 Immobilizer System Circuit Diagram: ”.
Refer to “A-8 Body Control System Circuit Diagram: ”.
Refer to “B-1 Windshield Wiper and Washer Circuit Diagram: ”.
Refer to “B-2 Rear Wiper and Washer Circuit Diagram: ”.
Refer to “B-3 Rear Defogger Circuit Diagram: ”.
Refer to “B-4 Power Window Circuit Diagram: ”.
Refer to “B-5 Power Door Lock Circuit Diagram: ”.
Refer to “B-6 Power Mirror Circuit Diagram: ”.
Refer to “B-7 Horn Circuit Diagram: ”.
Refer to “C-1 Combination Meter Circuit Diagram (Meter): ”.
Refer to “C-2 Combination Meter Circuit Diagram (Indicator): ”.
Refer to “C-3 Combination Meter Circuit Diagram (Warning Light): ”.
Refer to “D-1 Headlight System Circuit Diagram: ”.
Refer to “D-2 Position, Tail and Licence Plate Light System Circuit Diagram: ”.
Refer to “D-3 Front Fog Light System Circuit Diagram: ”.
Refer to “D-4 Illumination Light System Circuit Diagram: ”.
Refer to “D-5 Interior Light System Circuit Diagram: ”.
Refer to “D-6 Turn Signal and Hazard Warning Light System Circuit Diagram: ”.
Refer to “D-7 Brake Light System Circuit Diagram: ”.
Refer to “D-8 Back-Up Light System Circuit Diagram: ”.
Refer to “E-1 Heater System Circuit Diagram: ”.
Refer to “F-1 Air-Bag System Circuit Diagram: ”.
Refer to “F-2 Anti-Lock Brake System Circuit Diagram: ”.
Refer to “F-3 Power Steering System Circuit Diagram: ”.
Refer to “G-1 Audio System Circuit Diagram: ”.
Refer to “G-2 Multi Information Display / Accessory Socket System Circuit Diagram: ”.

A-1 Cranking System Circuit Diagram

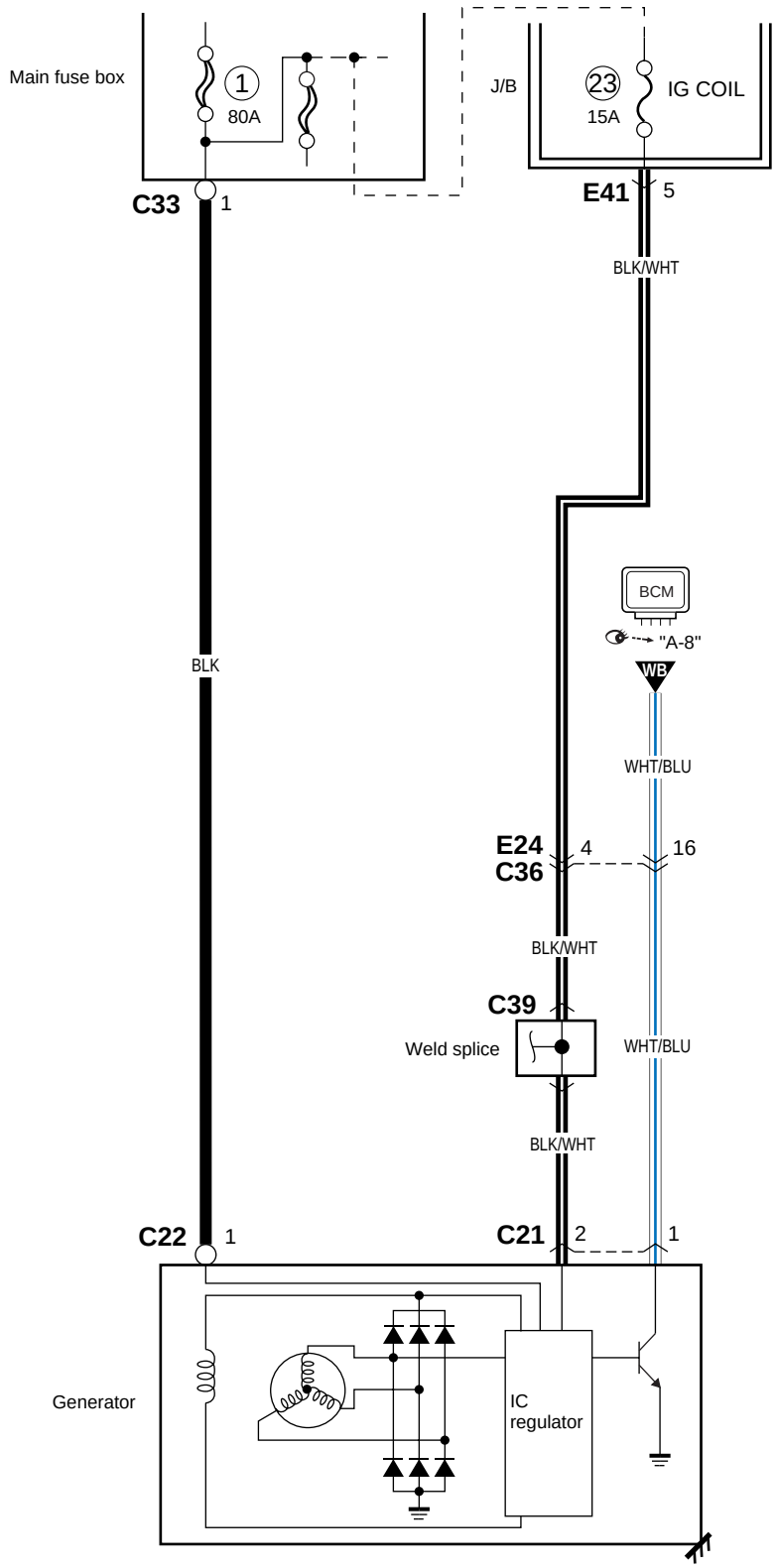
S4RS0A910E002



I4RS0A910915-

A-2 Charging System Circuit Diagram

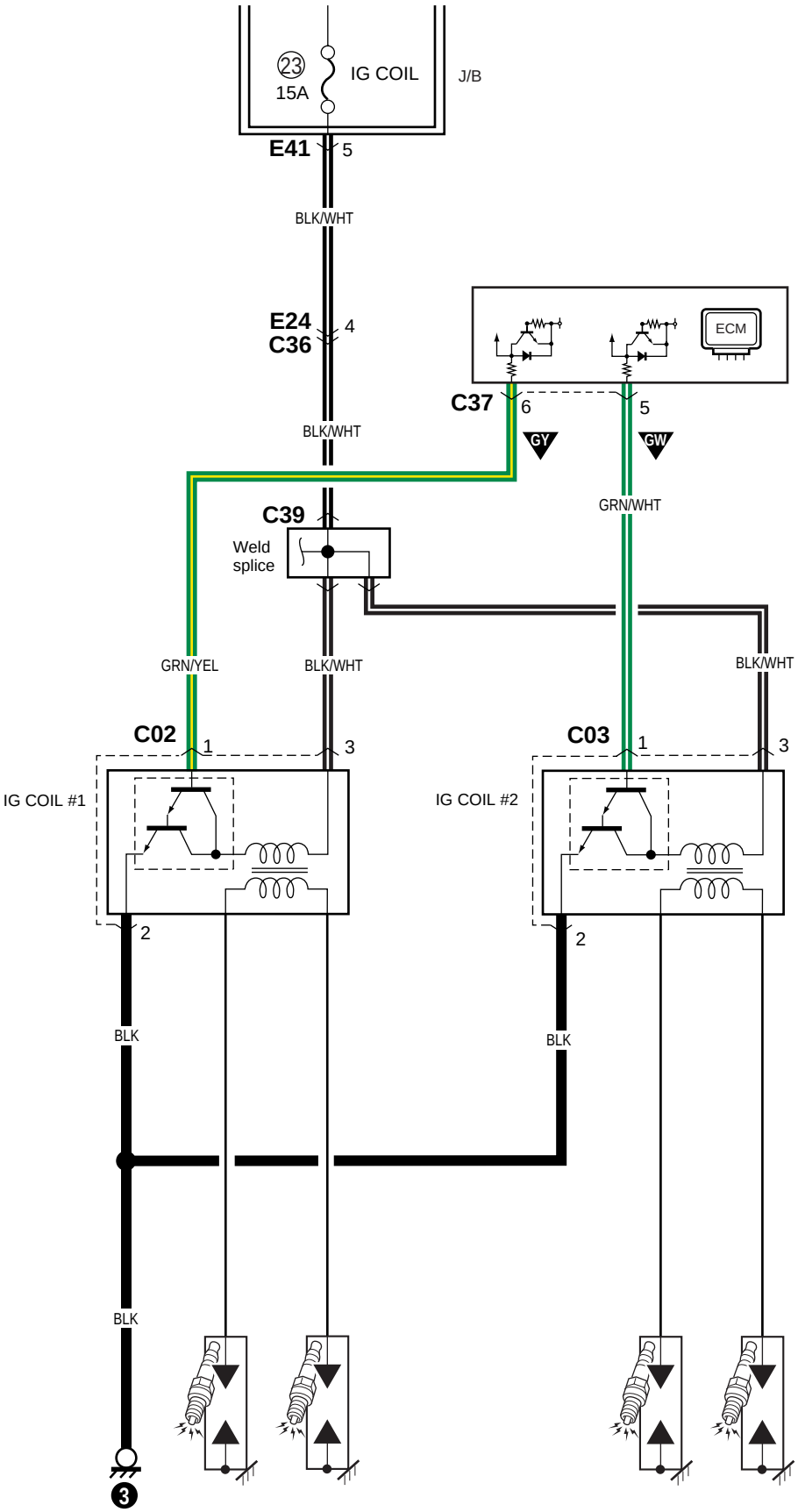
S4RS0A910E003



I4RS0A910916-

A-3 Ignition System Circuit Diagram

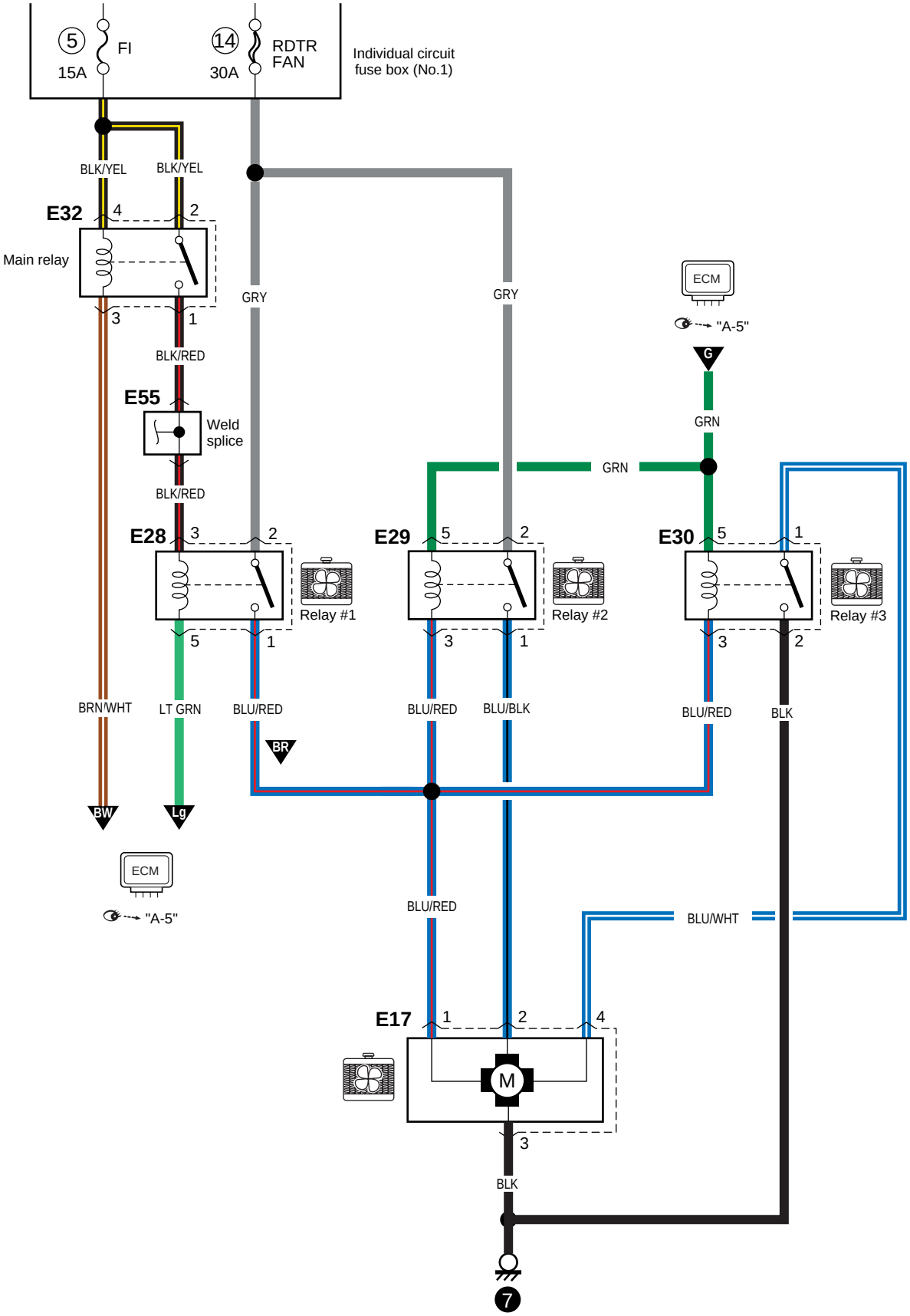
S4RS0A910E004



I4RS0A910917-

A-4 Cooling System Circuit Diagram

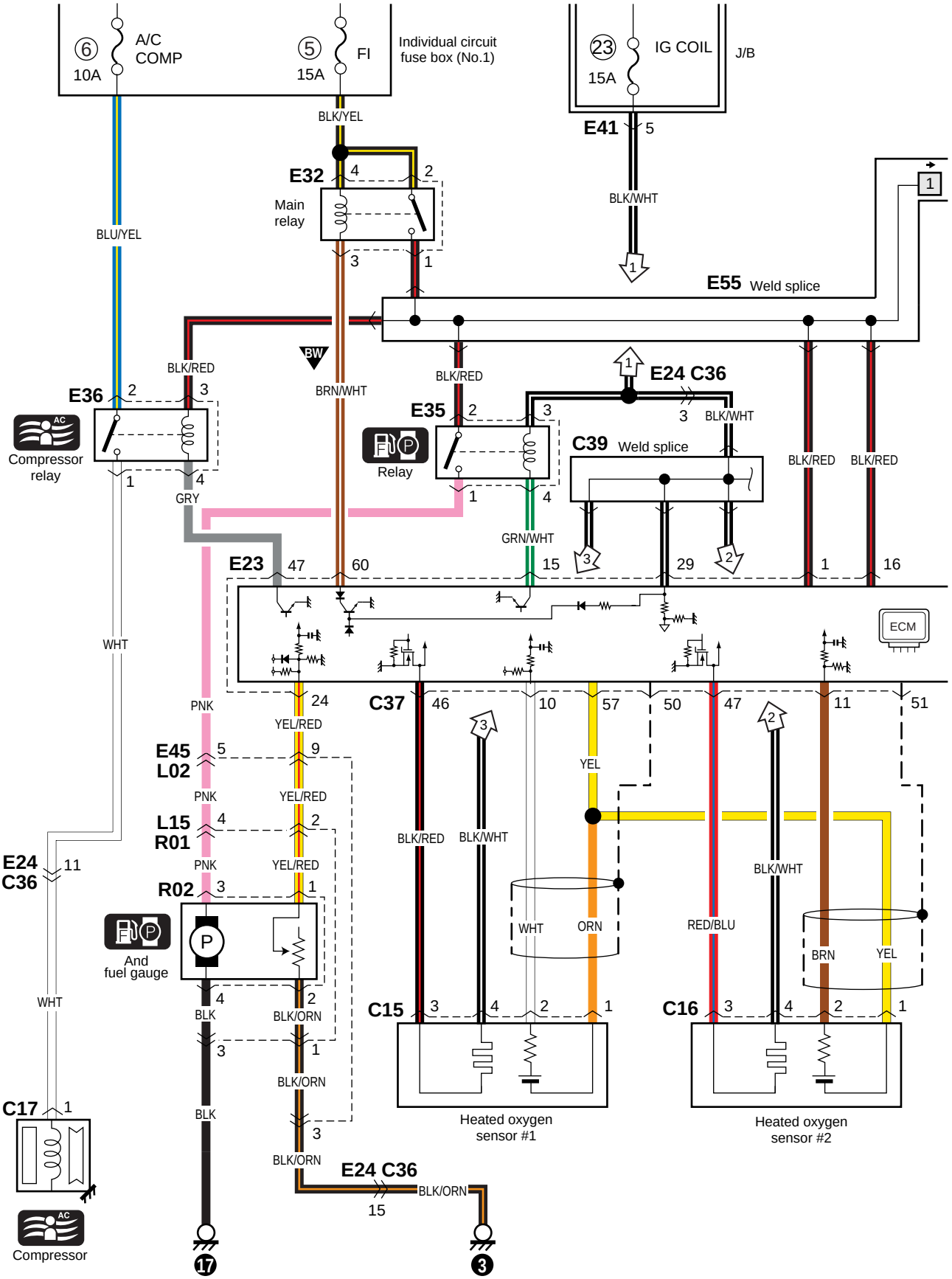
S4RS0A910E005



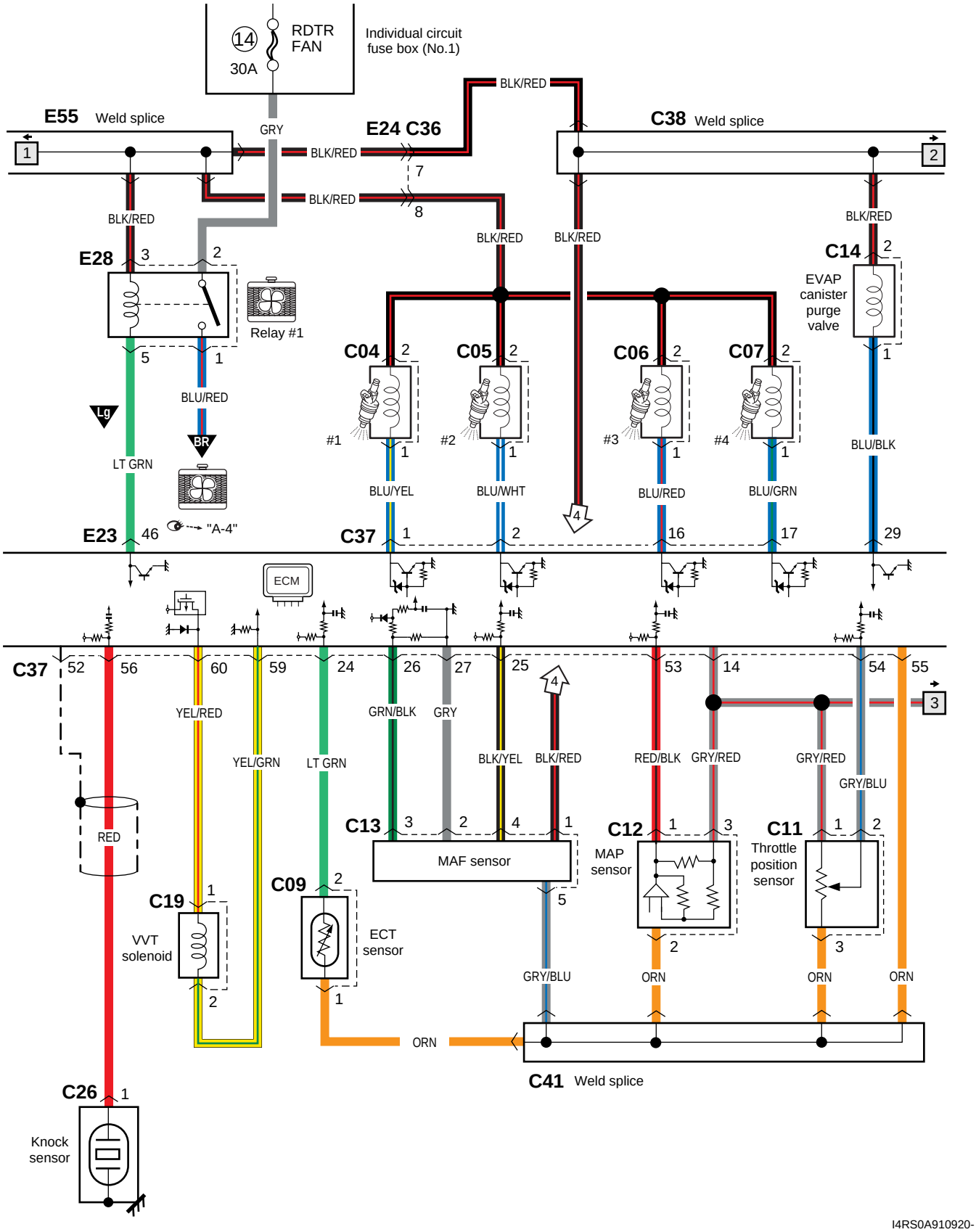
I4RS0A910918-

A-5 Engine and A/C Control System Circuit Diagram

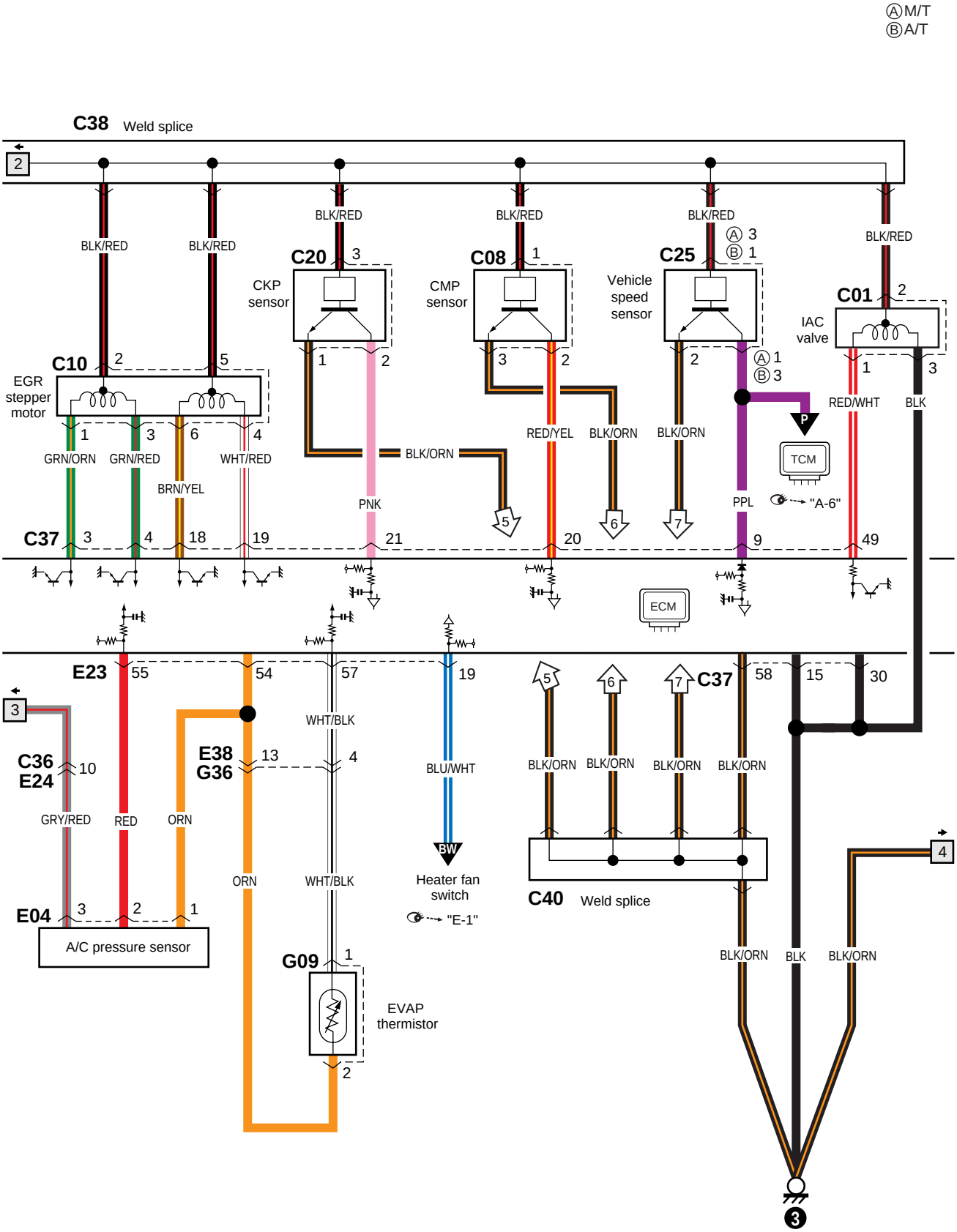
S4RS0A910E006

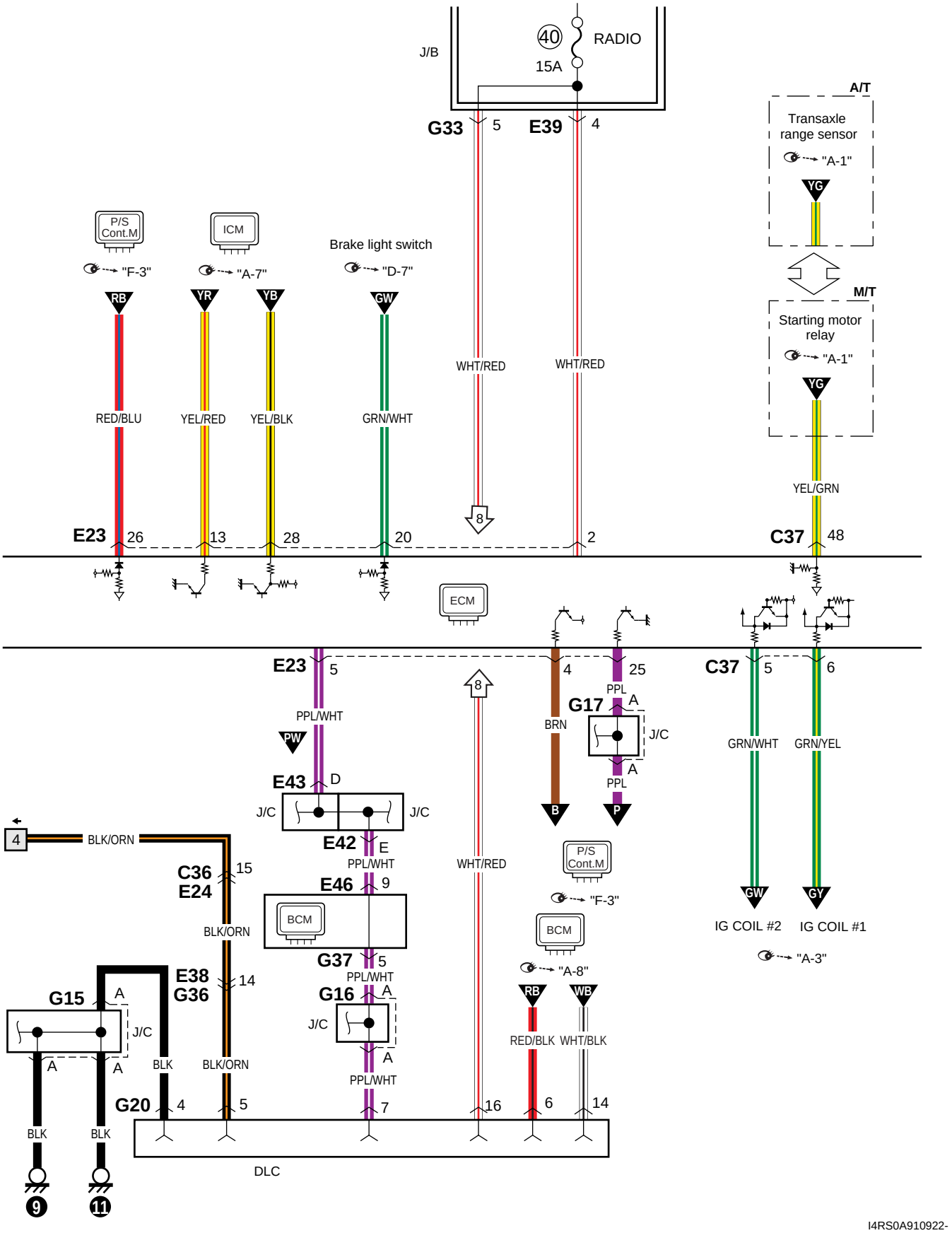


I4RS0A910919-

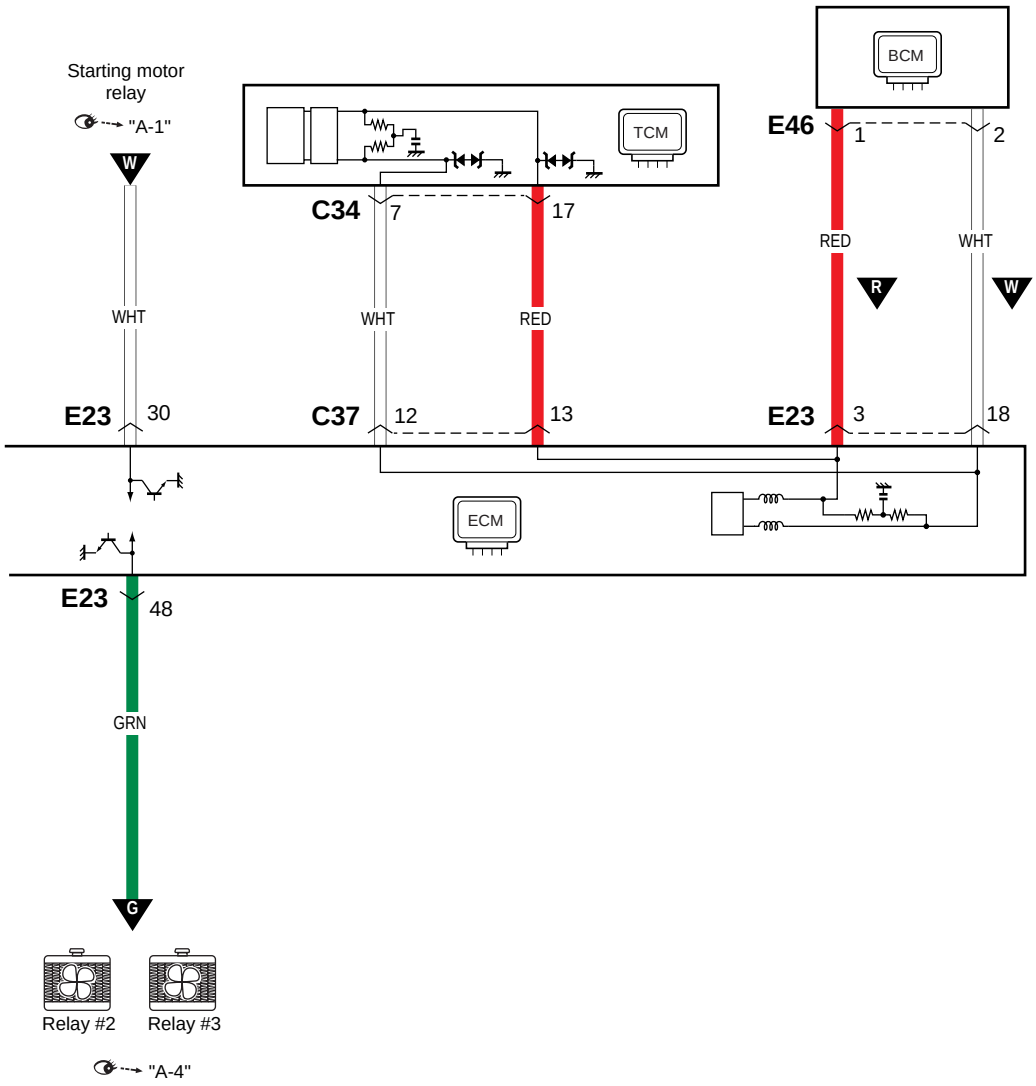


I4RS0A910920-


Ⓐ M/T
Ⓑ A/T
C38 Weld splice
2
BLK/RED
BLK/RED
BLK/RED
BLK/RED
BLK/RED
C20
3
CKP sensor
1
2
C08
1
CMP sensor
3
2
C25
Ⓐ 3
Ⓑ 1
Vehicle speed sensor
2
Ⓐ 1
Ⓑ 3
C01
2
IAC valve
1
3
C10
2
5
EGR stepper motor
1
3
6
4
GRN/ORN
GRN/RED
BRN/YEL
WHT/RED
BLK/ORN
PNK
RED/YEL
BLK/ORN
BLK/ORN
P
PPL
TCM
"A-6"
RED/WHT
BLK
C37
3
4
18
19
21
5
20
6
7
9
49
ECM
E23
55
54
57
19
WHT/BLK
BLU/WHT
BW
Heater fan switch
"E-1"
3
C36
E24
10
GRY/RED
RED
ORN
E38
G36
13
4
ORN
WHT/BLK
E04
3
2
1
A/C pressure sensor
G09
1
2
EVAP thermistor
5
6
7
C37
58
15
30
BLK/ORN
BLK/ORN
BLK/ORN
BLK/ORN
C40 Weld splice
4
BLK/ORN
BLK
BLK/ORN
3
I4RS0A910921-



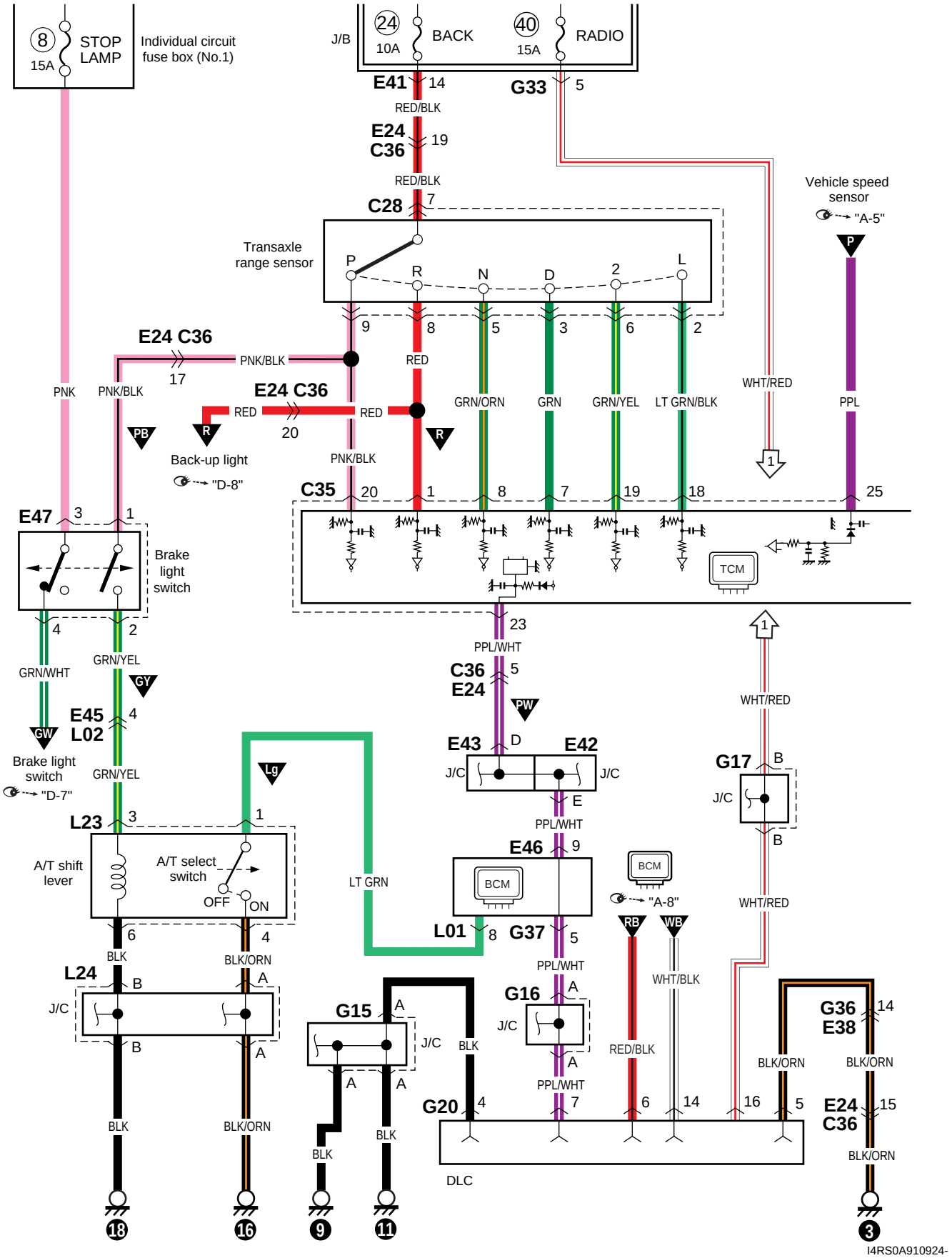
I4RS0A910922-

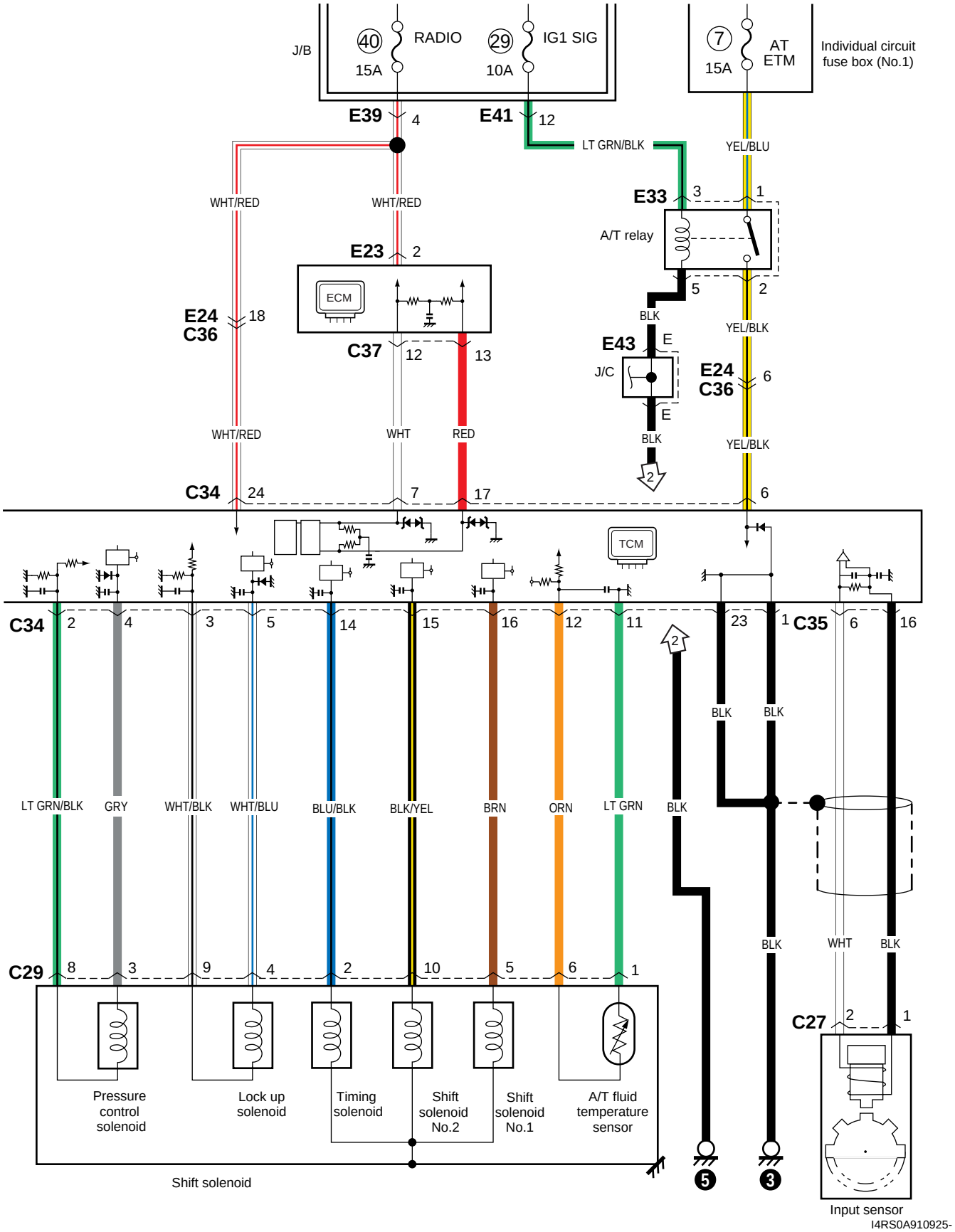


I4RS0A910923-

A-6 A/T Control System Circuit Diagram

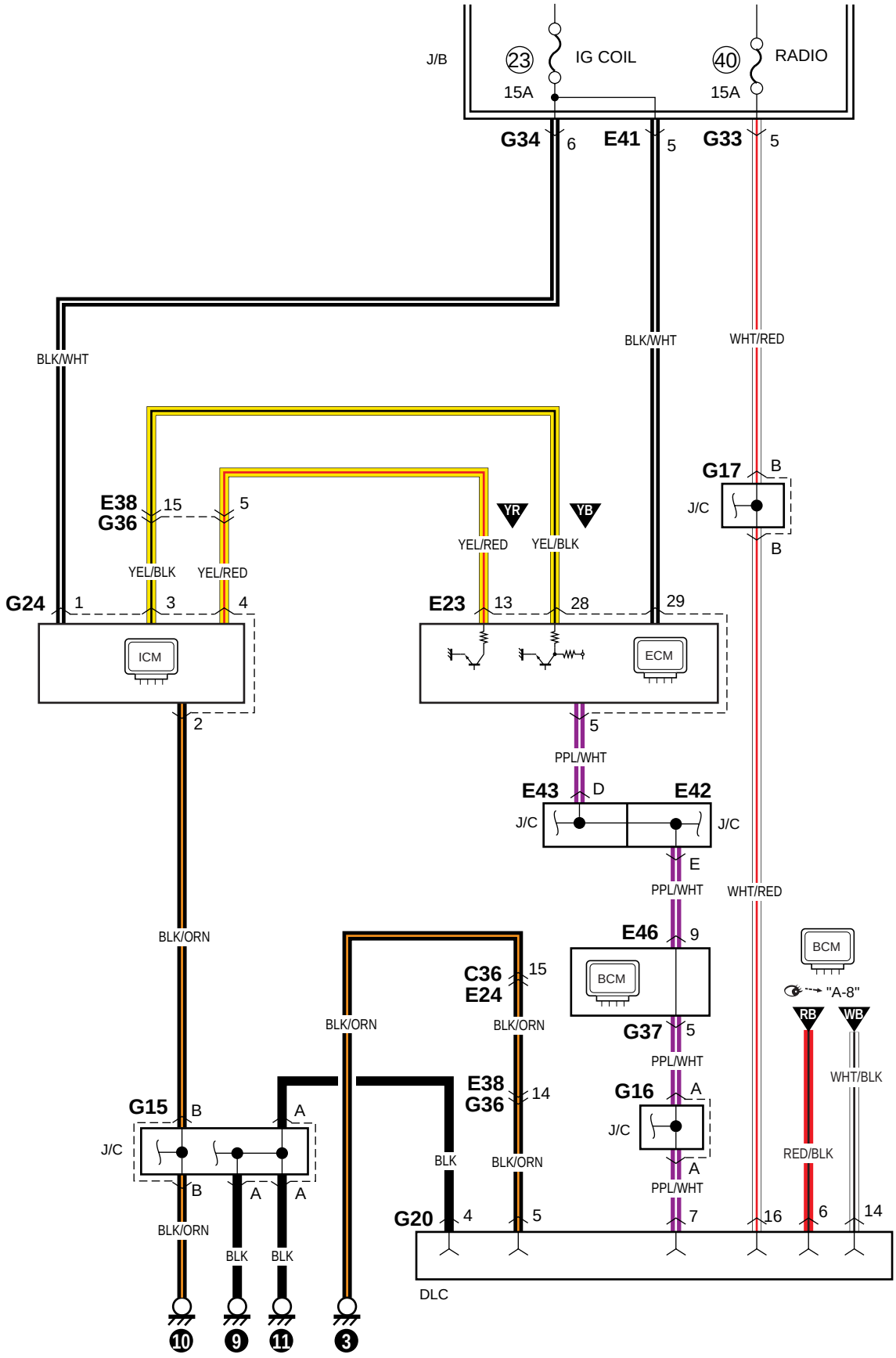
S4RS0A910E007




J/B
40
RADIO
15A
29
IG1 SIG
10A
7
AT
ETM
15A
Individual circuit
fuse box (No.1)
E39
4
E41
12
LT GRN/BLK
YEL/BLU
WHT/RED
WHT/RED
E33
3
1
A/T relay
E23
2
ECM
E24
C36
18
C37
12
13
5
2
BLK
YEL/BLK
E43
E
J/C
E24
C36
6
E
BLK
YEL/BLK
WHT/RED
WHT
RED
2
C34
24
7
17
6
TCM
C34
2
4
3
5
14
15
16
12
11
2
23
1
C35
6
16
LT GRN/BLK
GRY
WHT/BLK
WHT/BLU
BLU/BLK
BLK/YEL
BRN
ORN
LT GRN
BLK
BLK
BLK
BLK
WHT
BLK
C29
8
3
9
4
2
10
5
6
1
C27
2
1
Pressure
control
solenoid
Lock up
solenoid
Timing
solenoid
Shift
solenoid
No.2
Shift
solenoid
No.1
A/T fluid
temperature
sensor
Shift solenoid
5
3
Input sensor
I4RS0A910925-

A-7 Immobilizer System Circuit Diagram

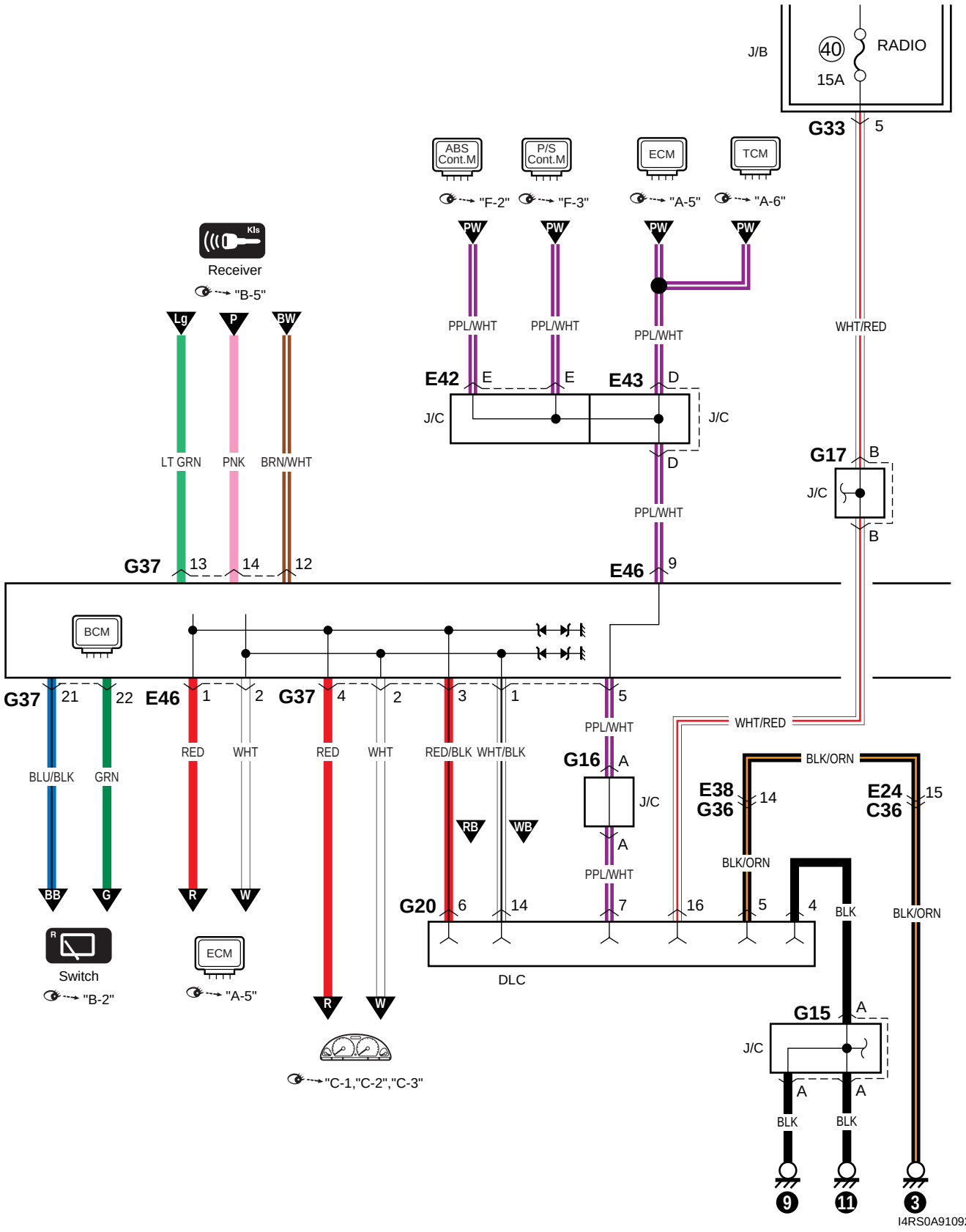
S4RS0A910E008

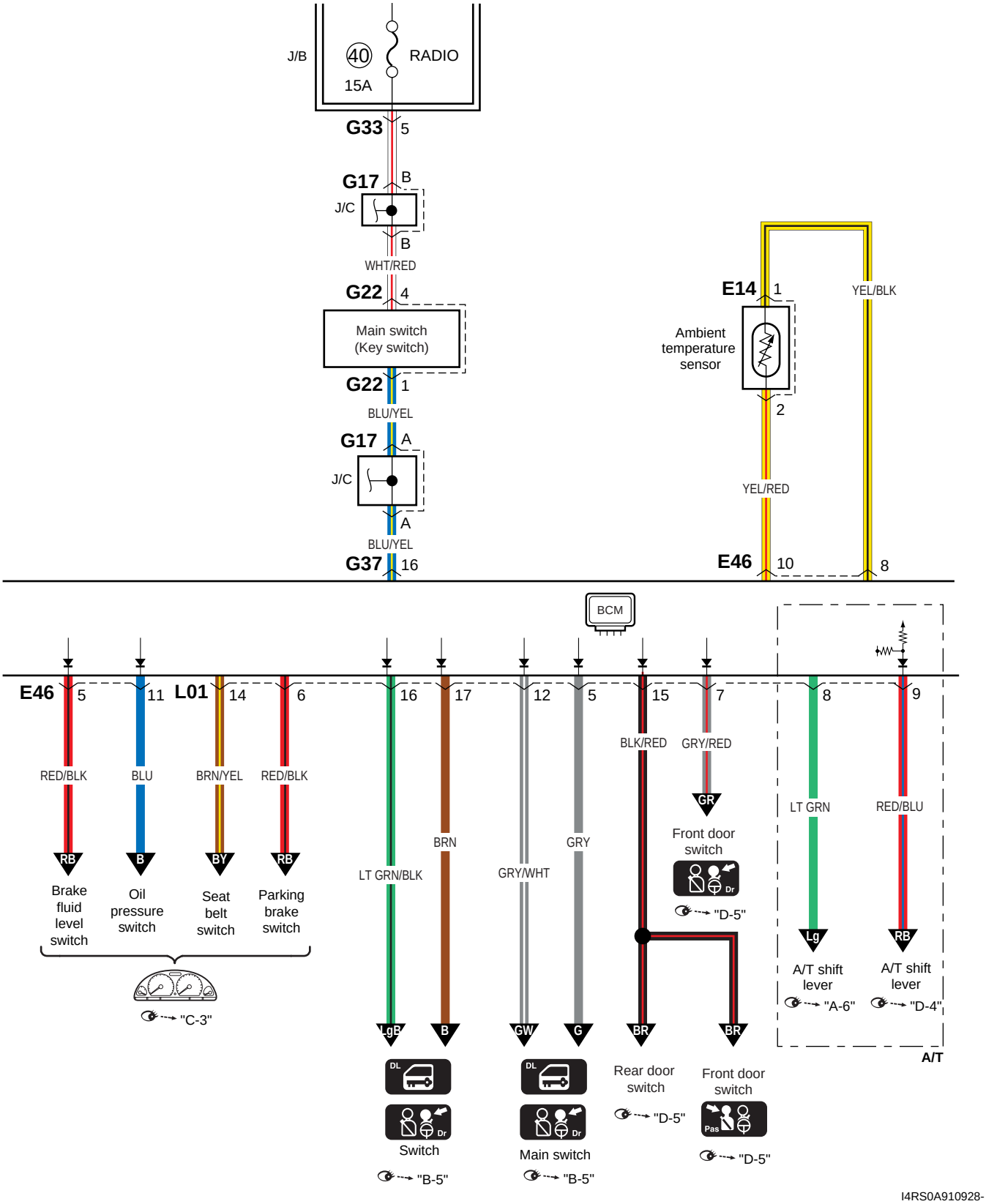


I4RS0A910926-

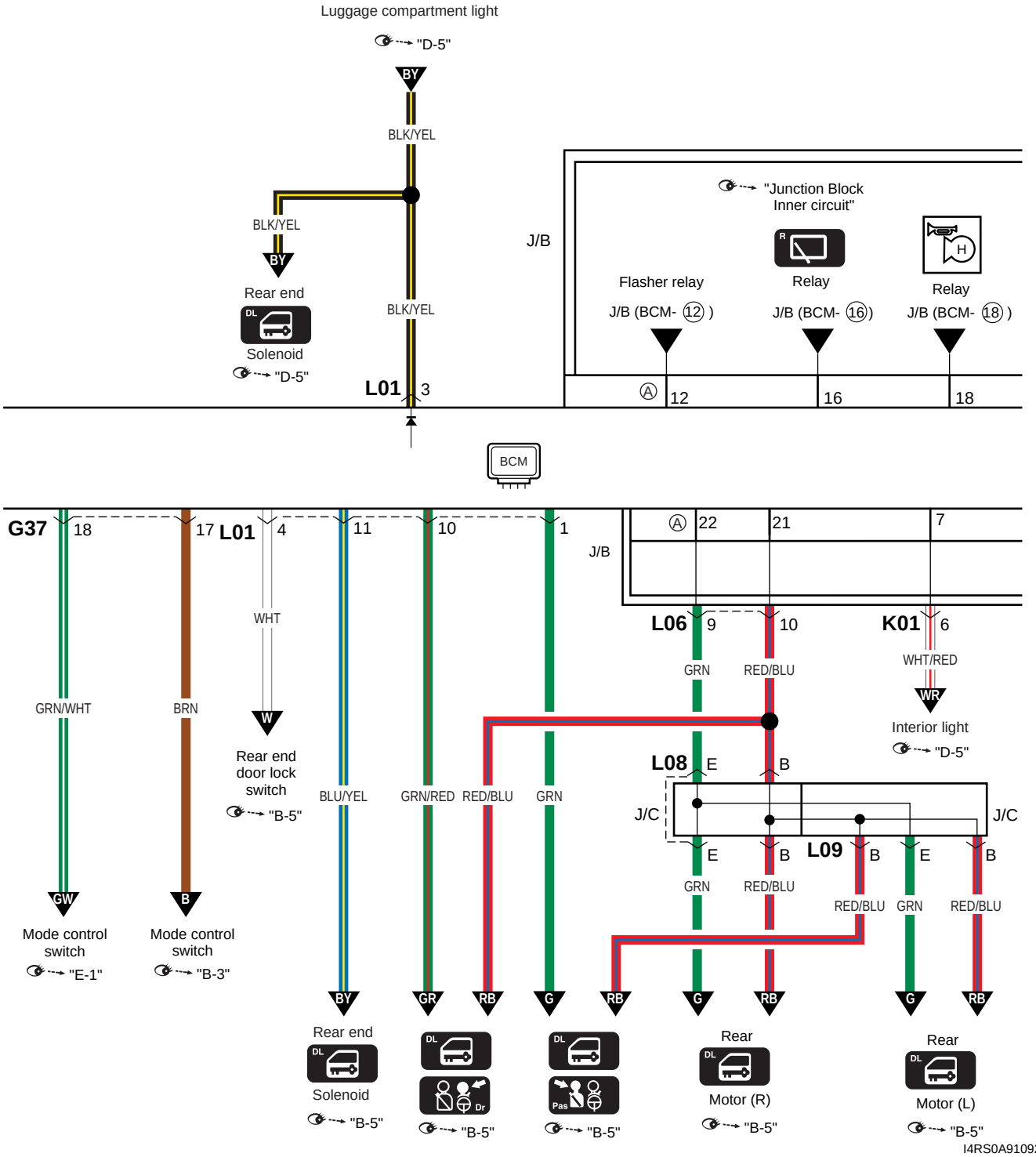
A-8 Body Control System Circuit Diagram

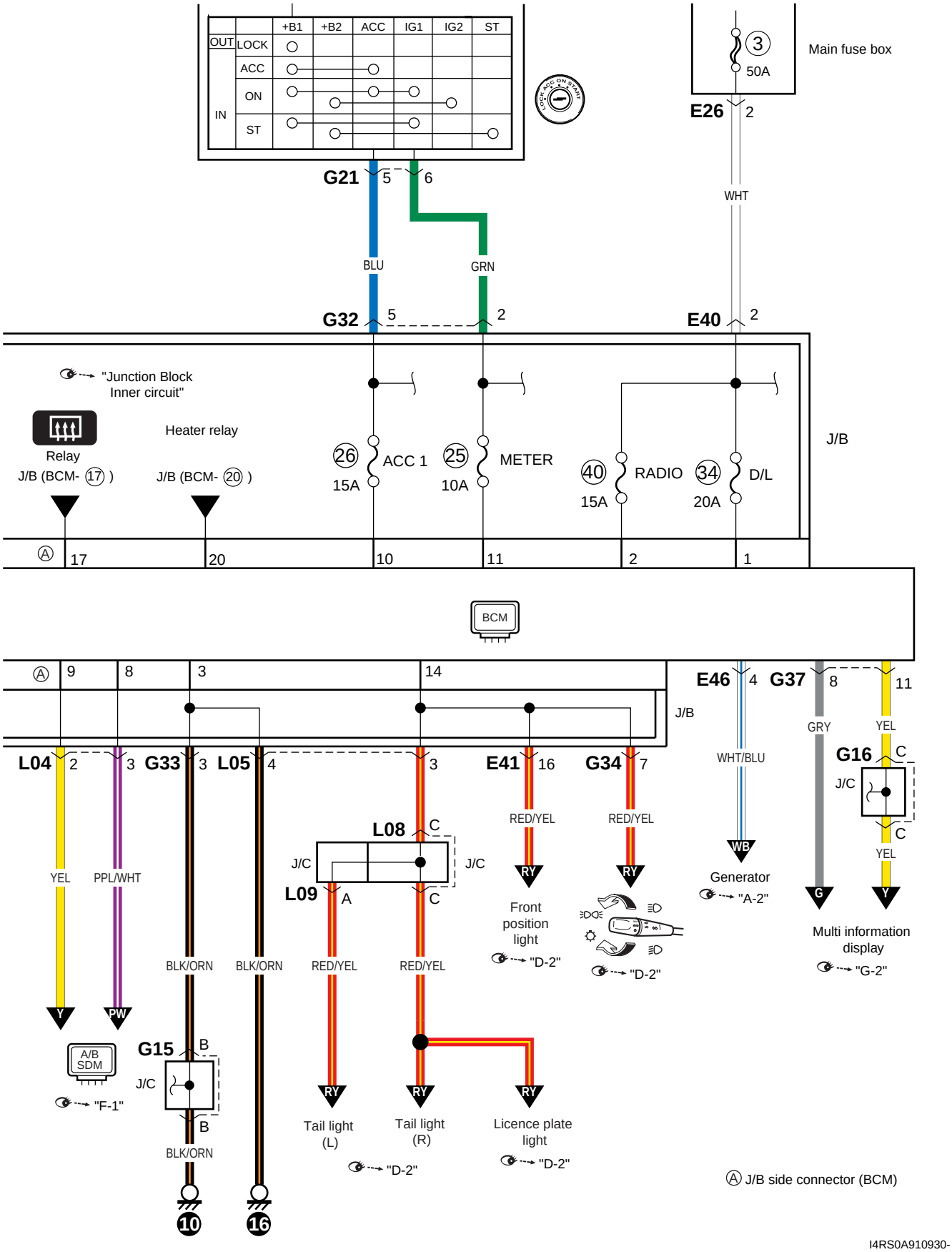
S4RS0A910E009




J/B
40
15A
RADIO
G33
5
G17
B
J/C
B
WHT/RED
G22
4
Main switch
(Key switch)
G22
1
BLU/YEL
G17
A
J/C
A
BLU/YEL
G37
16
E14
1
YEL/BLK
Ambient
temperature
sensor
2
YEL/RED
E46
10
8
BCM
E46
5
11
L01
14
6
16
17
12
5
15
7
8
9
RED/BLK
BLU
BRN/YEL
RED/BLK
LT GRN/BLK
BRN
GRY/WHT
GRY
BLK/RED
GRY/RED
LT GRN
RED/BLU
RB
B
BY
RB
LgB
B
GW
G
BR
GR
Lg
RB
Brake
fluid
level
switch
Oil
pressure
switch
Seat
belt
switch
Parking
brake
switch
"C-3"
Front door
switch
Dr
"D-5"
A/T shift
lever
"A-6"
A/T shift
lever
"D-4"
A/T
DL
Dr
Switch
"B-5"
DL
Dr
Main switch
"B-5"
Rear door
switch
"D-5"
Front door
switch
Pas
"D-5"
I4RS0A910928-

Ⓐ J/B side connector (BCM)

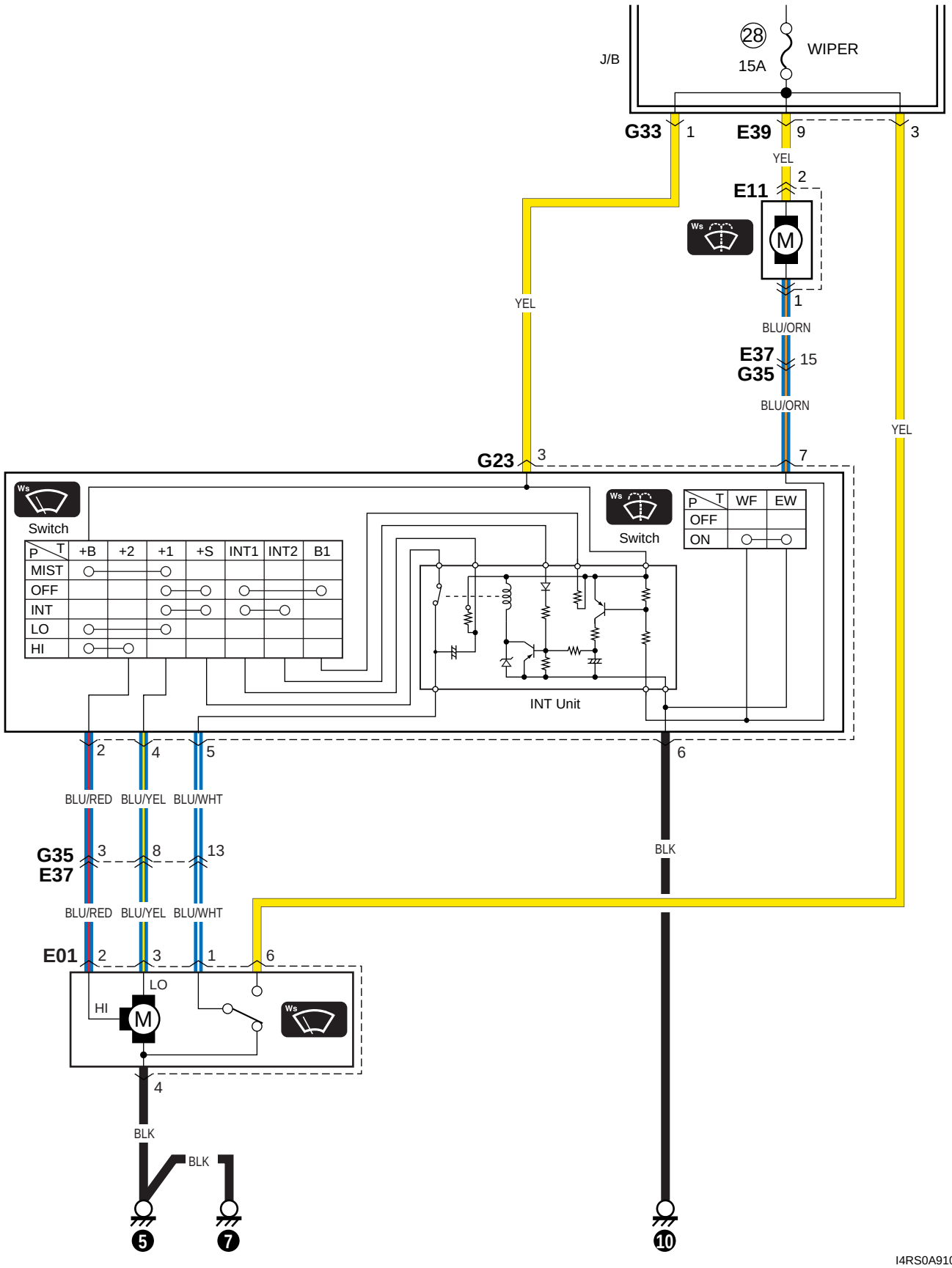




I4RS0A910930-

B-1 Windshield Wiper and Washer Circuit Diagram

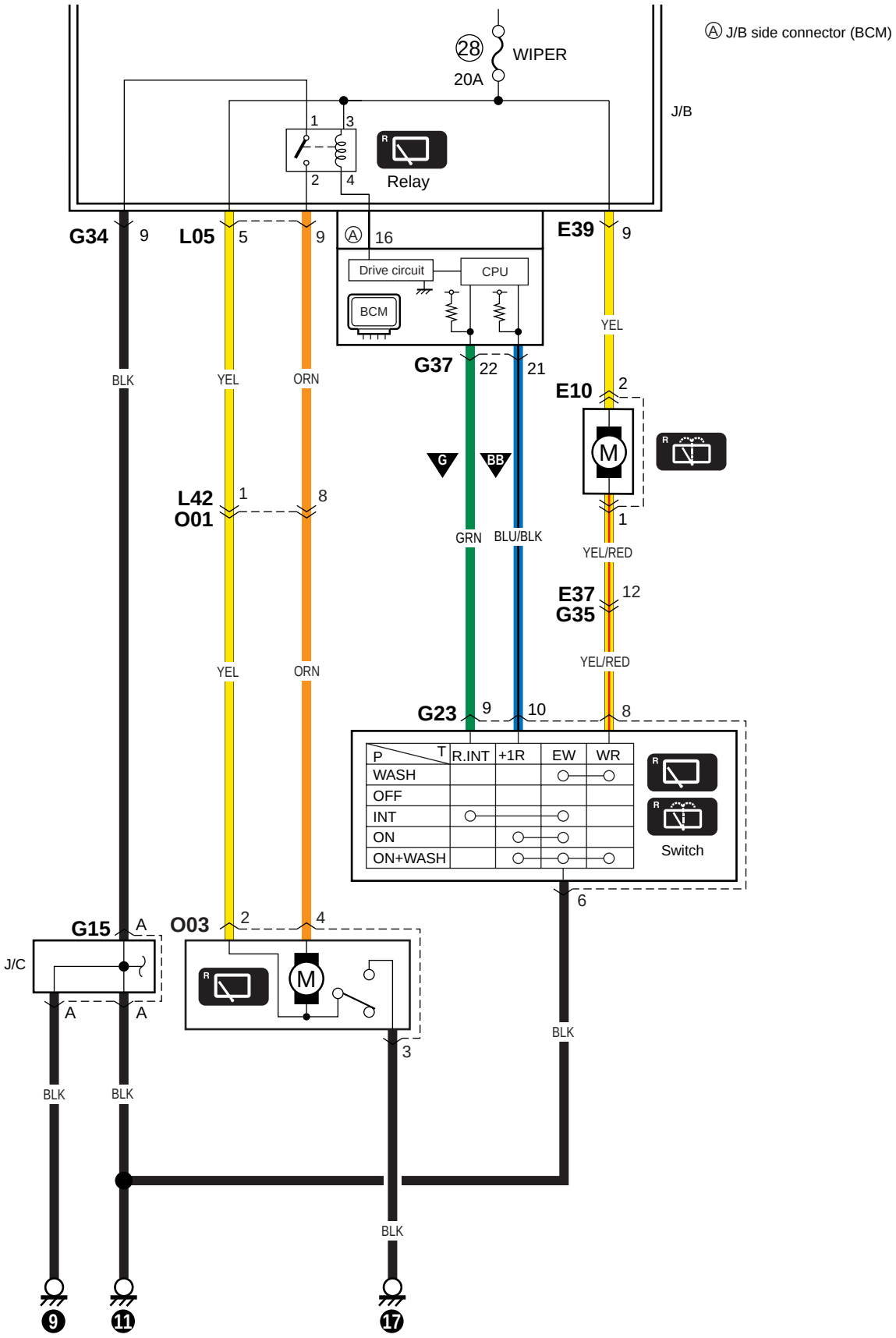
S4RS0A910E010



I4RS0A910931-

B-2 Rear Wiper and Washer Circuit Diagram

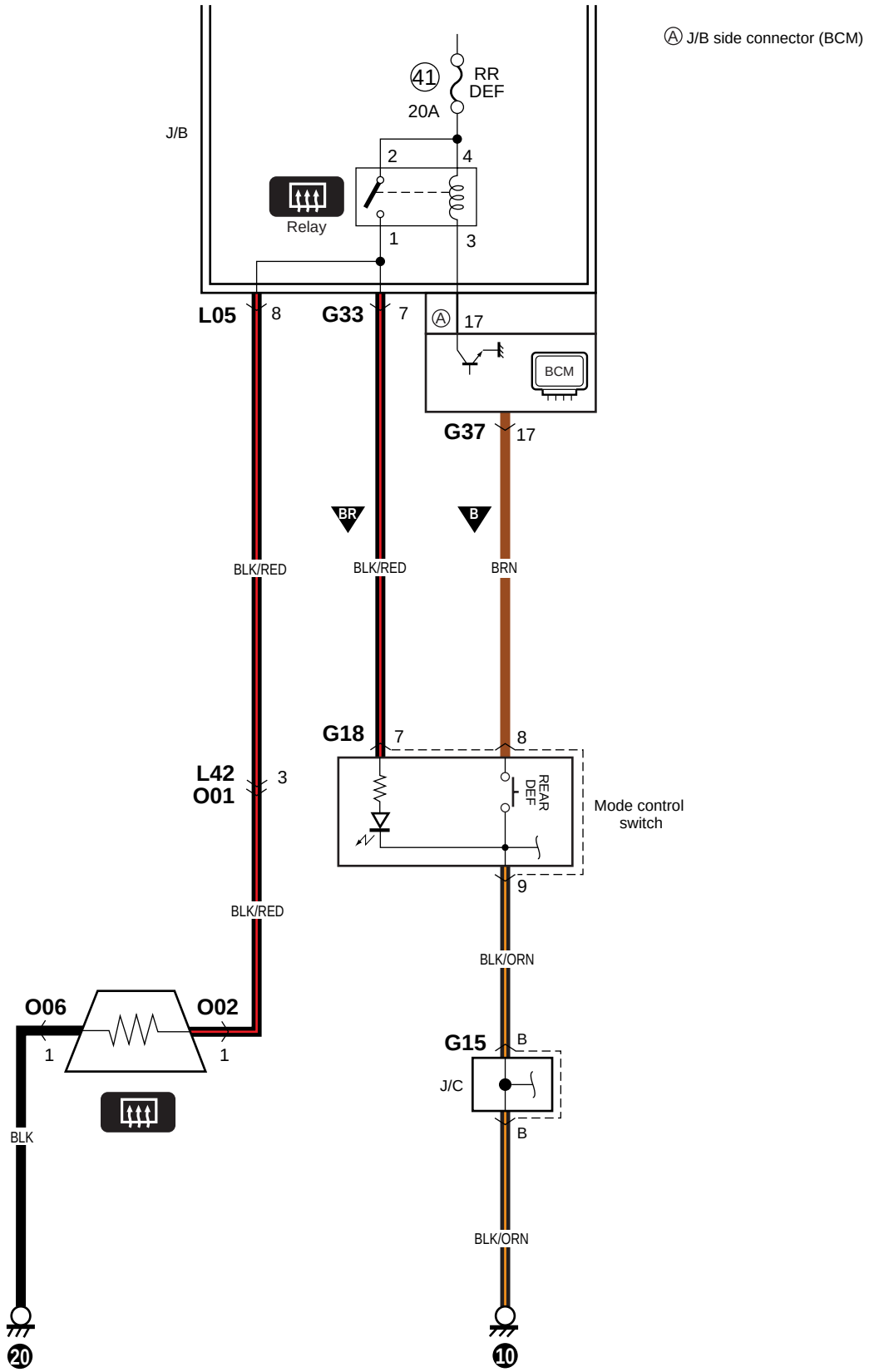
S4RS0A910E011



I4RS0A910932-

B-3 Rear Defogger Circuit Diagram

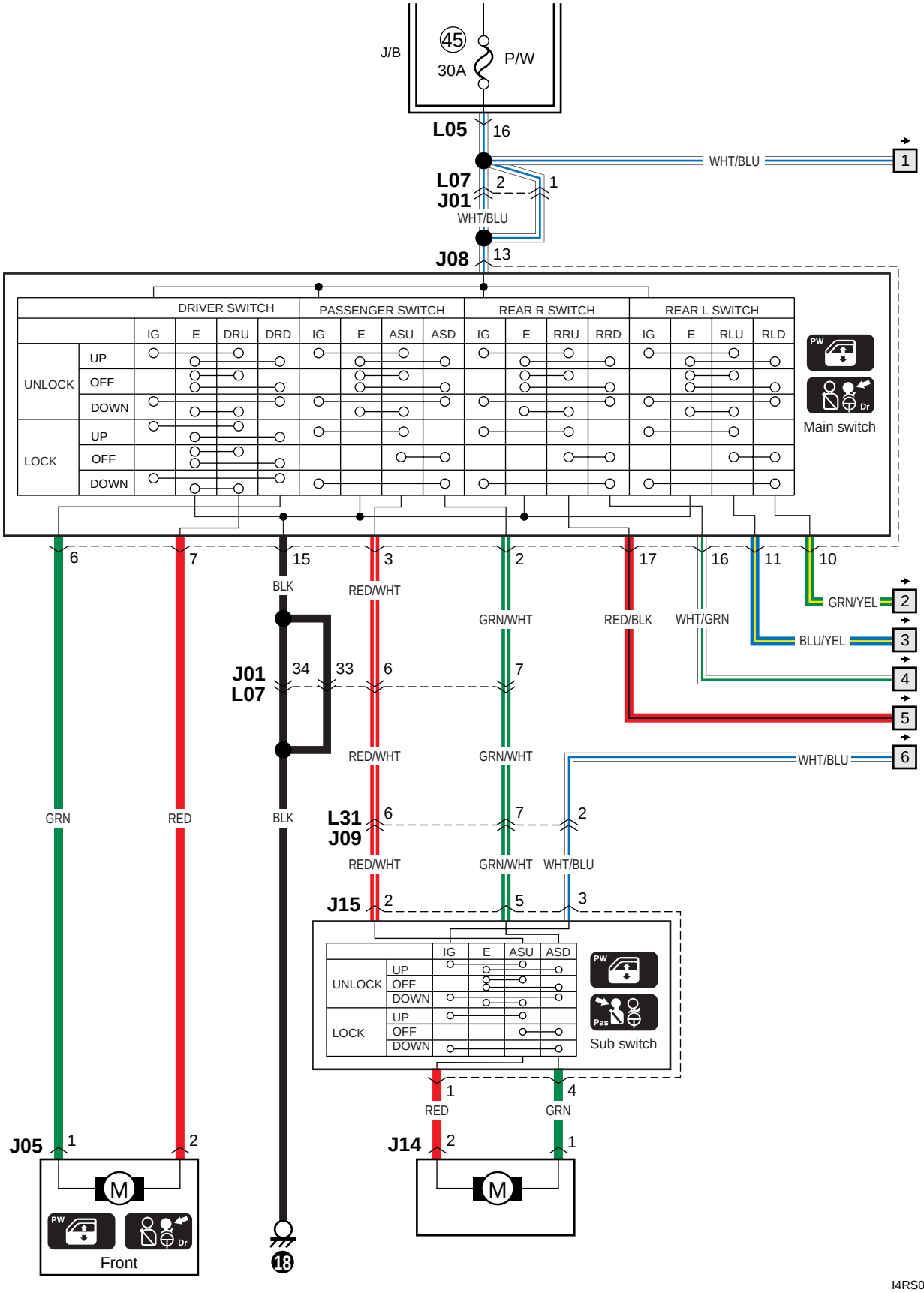
S4RS0A910E012



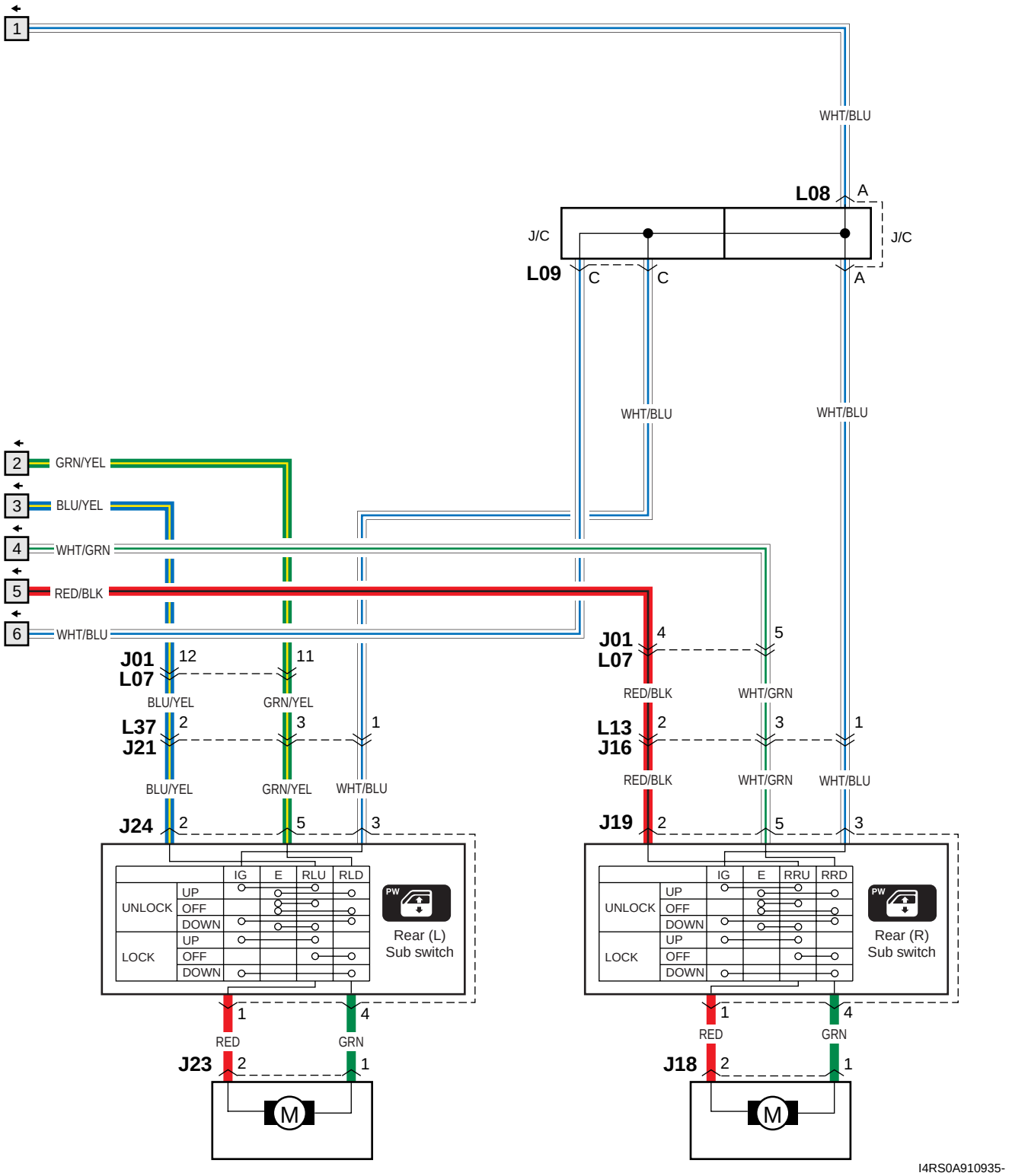
I4RS0A910933-

B-4 Power Window Circuit Diagram

S4RS0A910E013

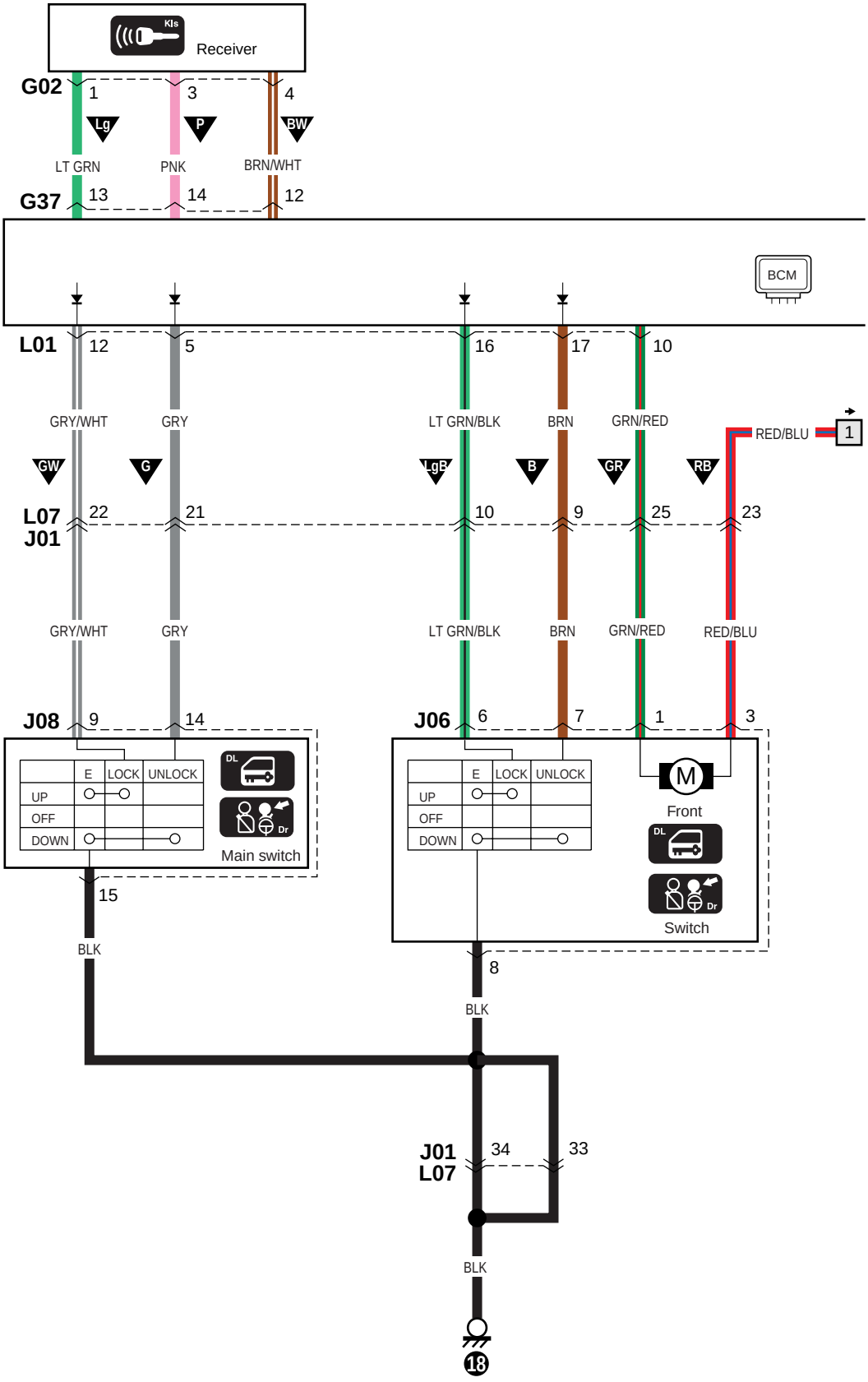


I4RS0A910934-

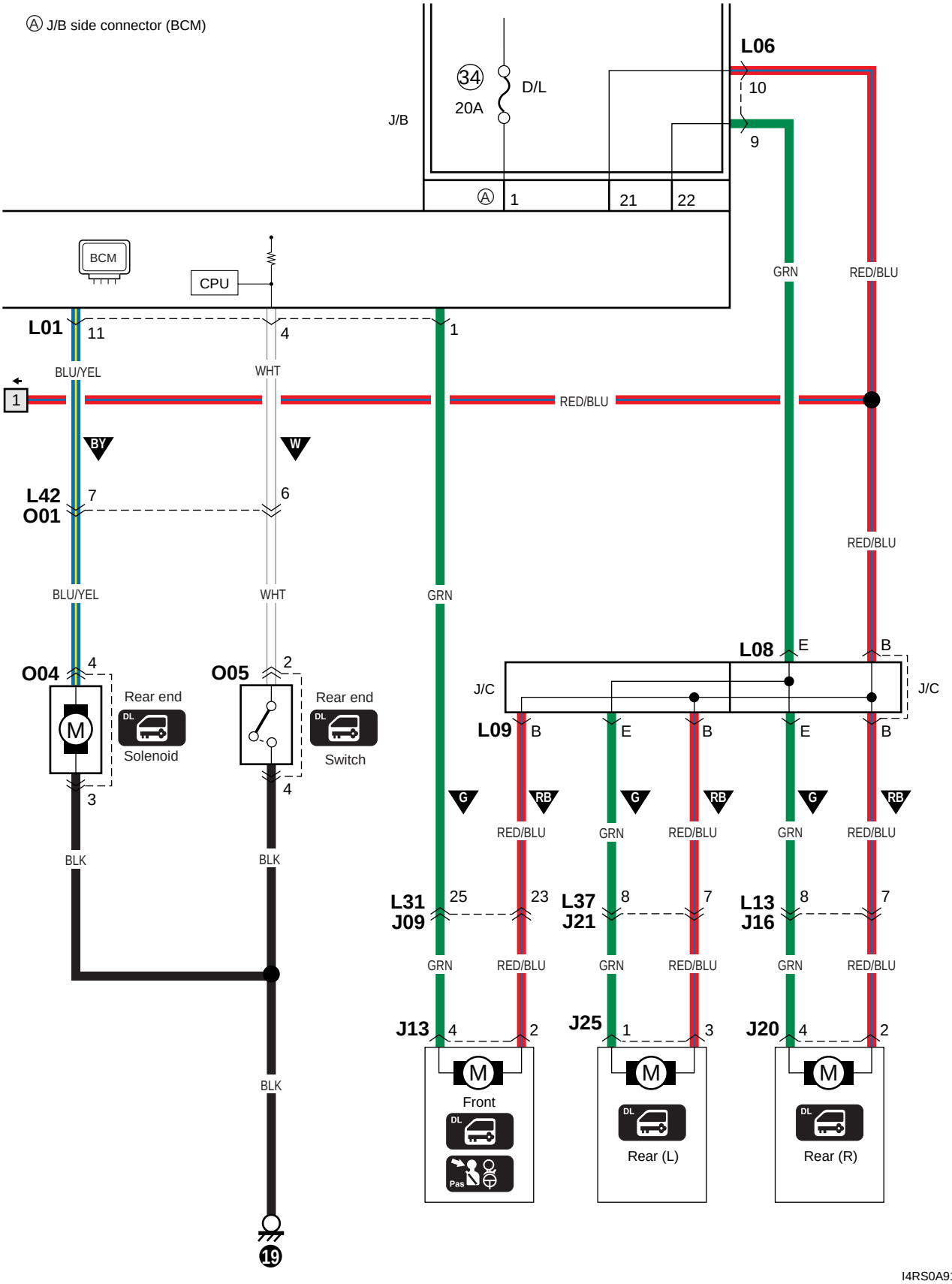

1
2 GRN/YEL
3 BLU/YEL
4 WHT/GRN
5 RED/BLK
6 WHT/BLU
WHT/BLU
L08 A
J/C
J/C
L09 C C A
WHT/BLU
WHT/BLU
J01 L07 12 11
BLU/YEL GRN/YEL
L37 J21 2 3 1
BLU/YEL GRN/YEL WHT/BLU
J24 2 5 3
J01 L07 4 5
RED/BLK WHT/GRN
L13 J16 2 3 1
RED/BLK WHT/GRN WHT/BLU
J19 2 5 3
IG E RLU RLD
UNLOCK UP OFF DOWN
LOCK UP OFF DOWN
PW
Rear (L) Sub switch
IG E RRU RRD
UNLOCK UP OFF DOWN
LOCK UP OFF DOWN
PW
Rear (R) Sub switch
1 4
RED GRN
J23 2 1
1 4
RED GRN
J18 2 1
M
M
I4RS0A910935-

B-5 Power Door Lock Circuit Diagram

S4RS0A910E014



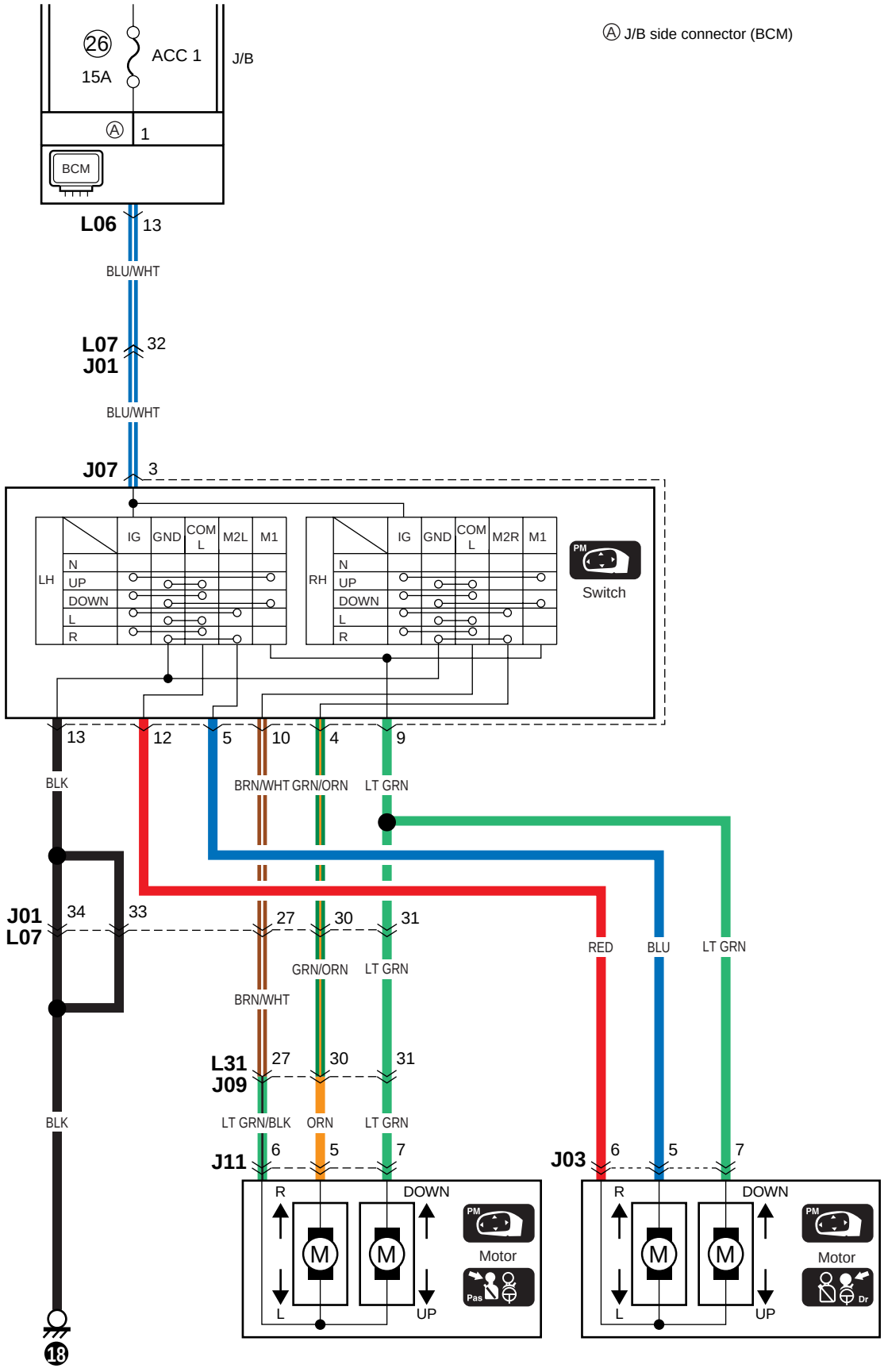
I4RS0A910936-



I4RS0A910937-

B-6 Power Mirror Circuit Diagram

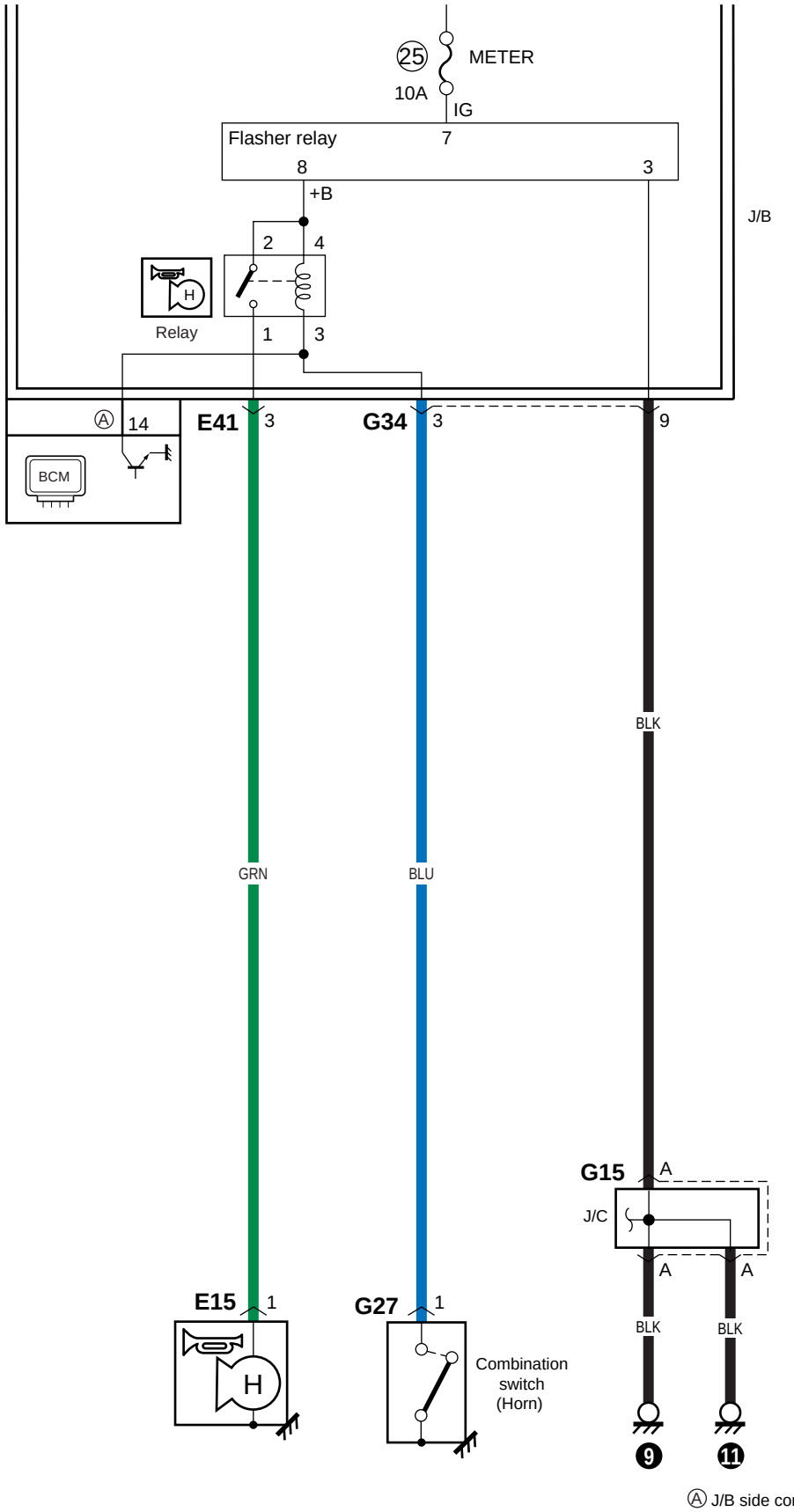
S4RS0A910E015



I4RS0A910938-

B-7 Horn Circuit Diagram

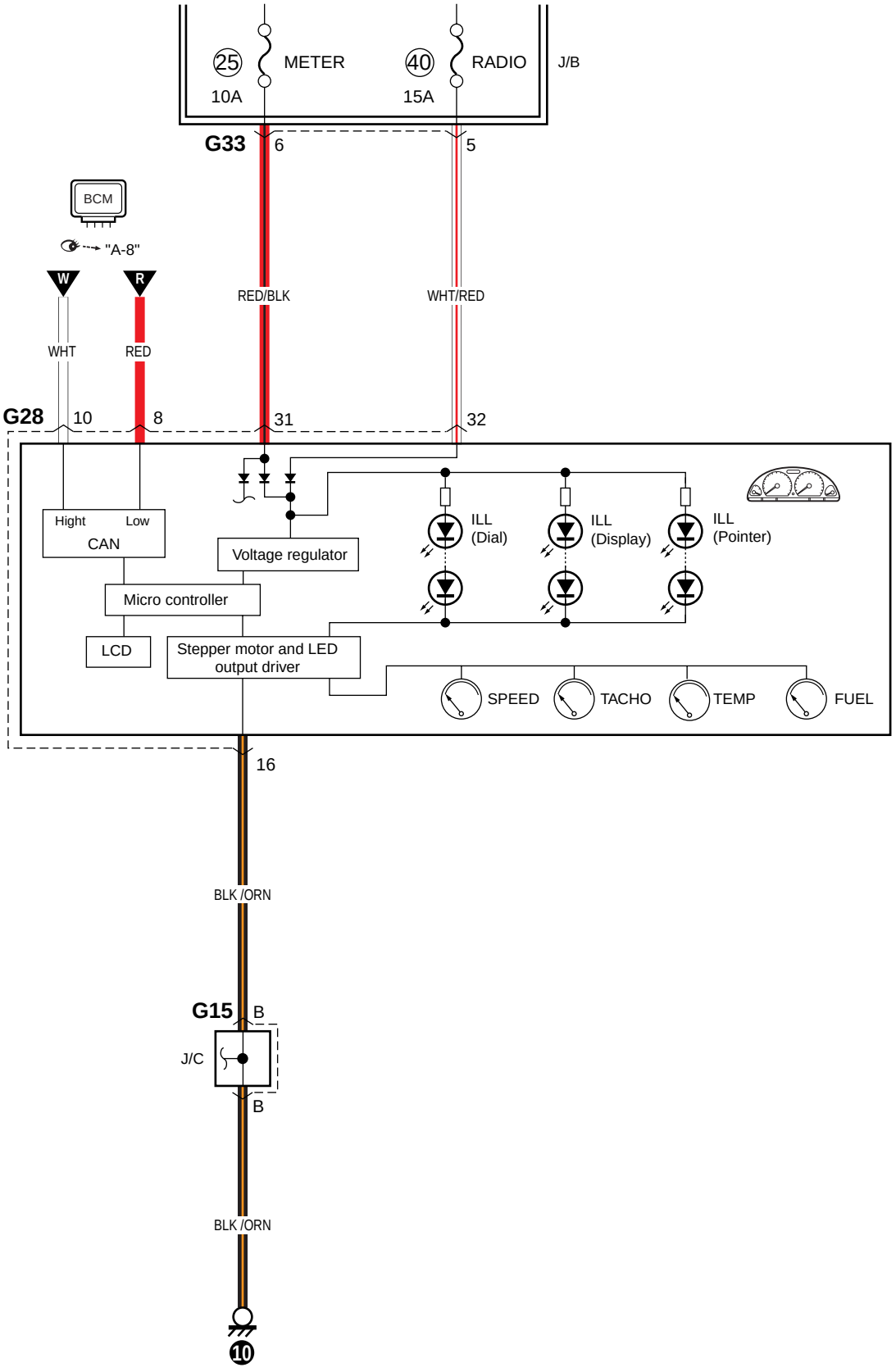
S4RS0A910E016



I4RS0A910939-

C-1 Combination Meter Circuit Diagram (Meter)

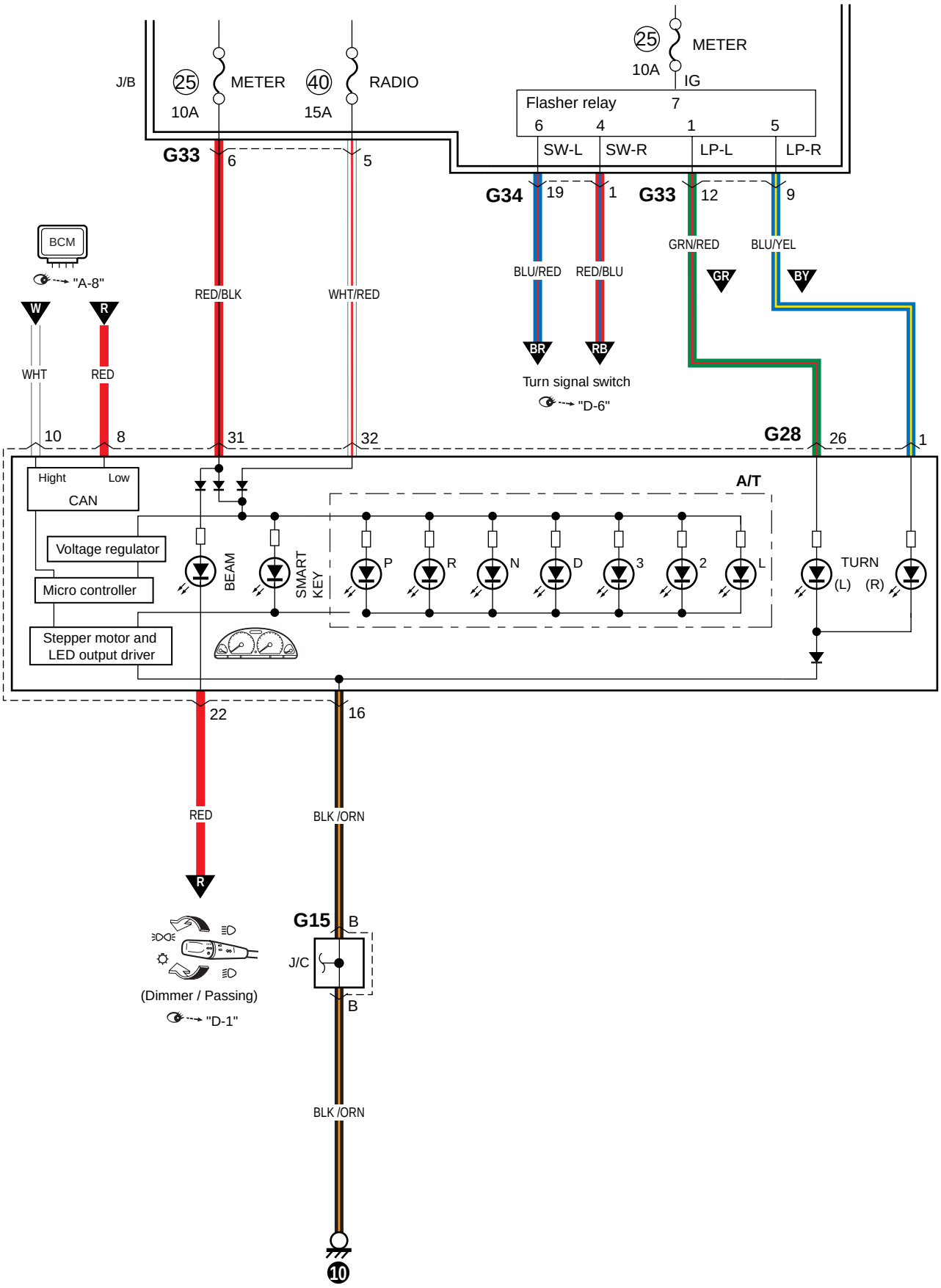
S4RS0A910E017



I4RS0A910940-

C-2 Combination Meter Circuit Diagram (Indicator)

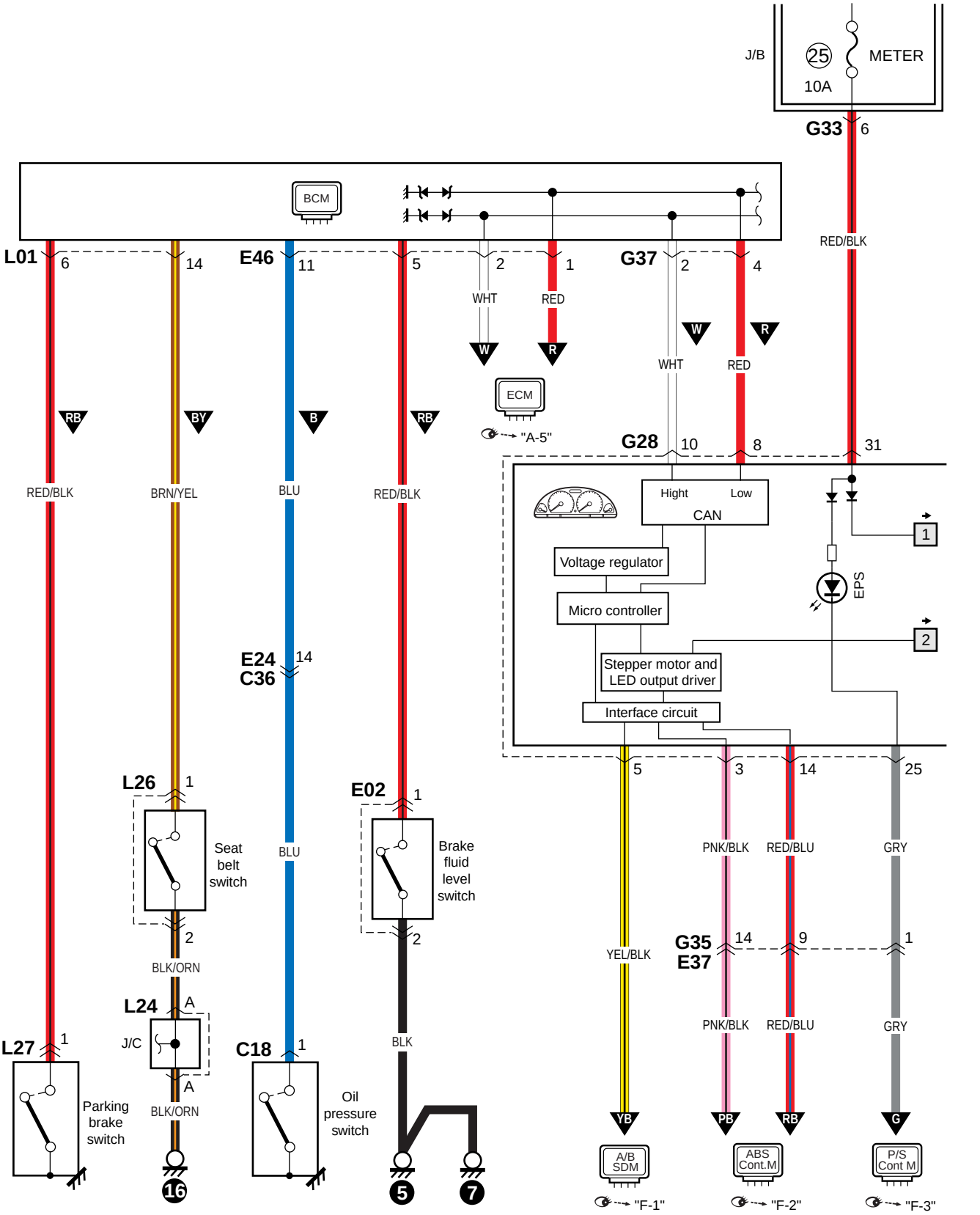
S4RS0A910E018



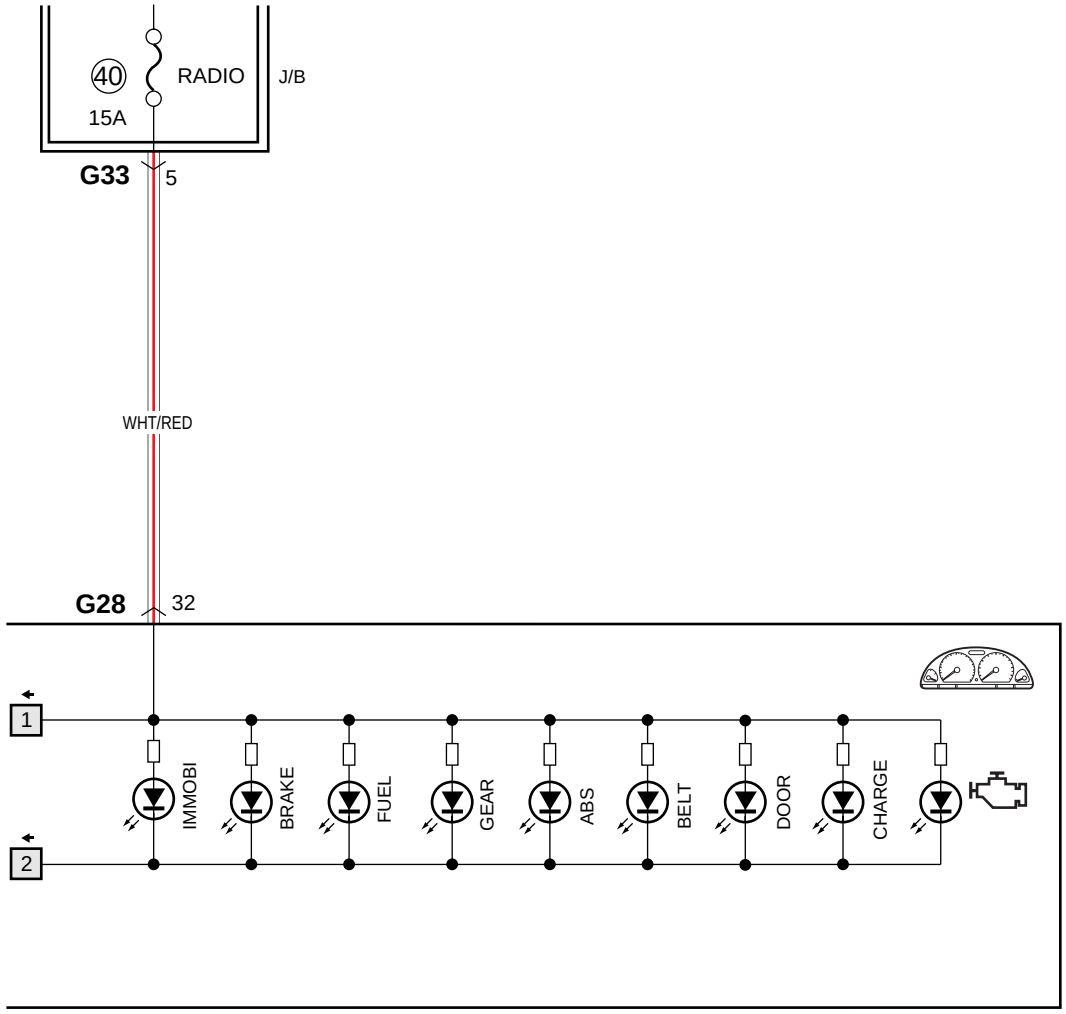
I4RS0A910941-

C-3 Combination Meter Circuit Diagram (Warning Light)

S4RS0A910E019



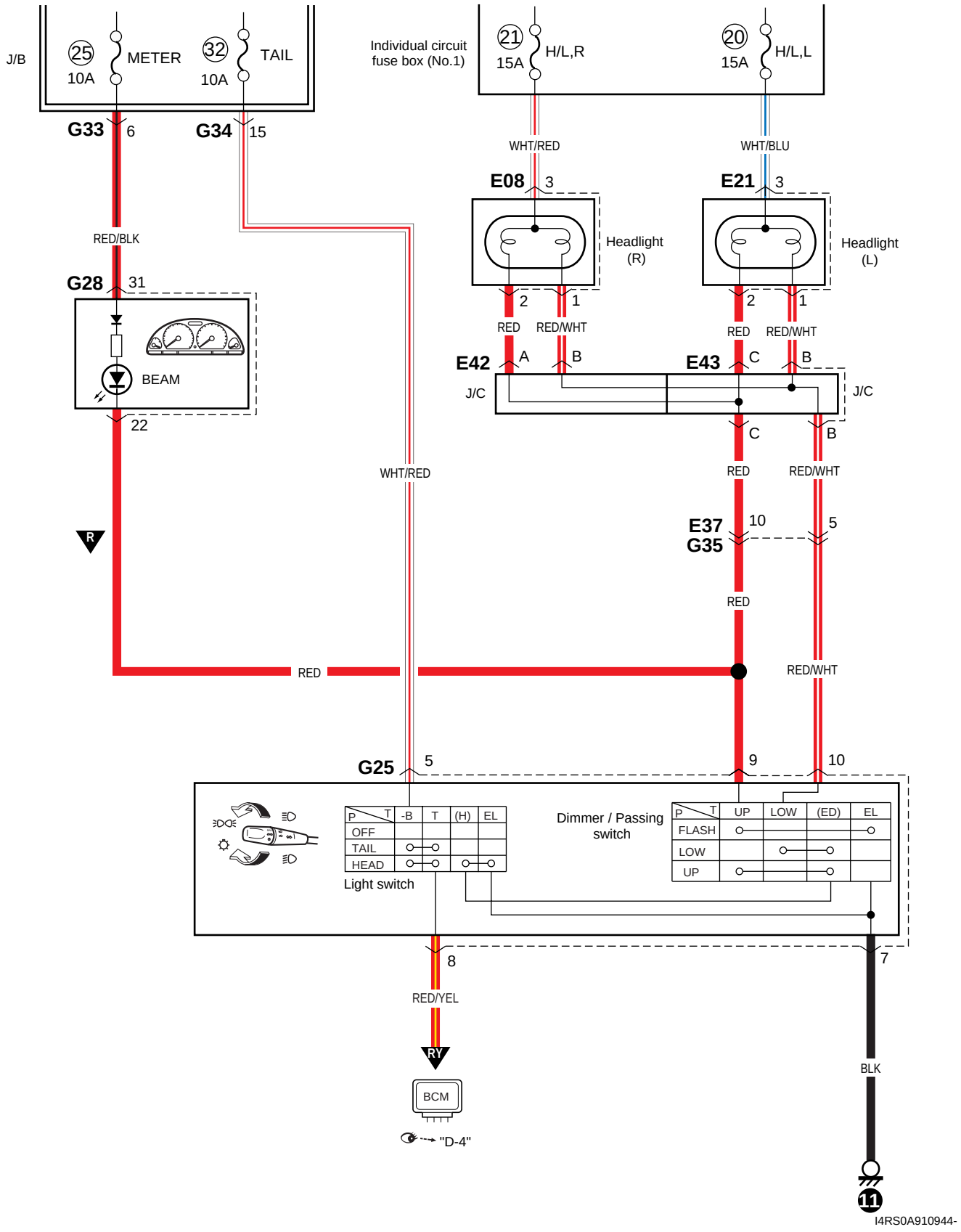
I4RS0A910942-



I4RS0A910943-

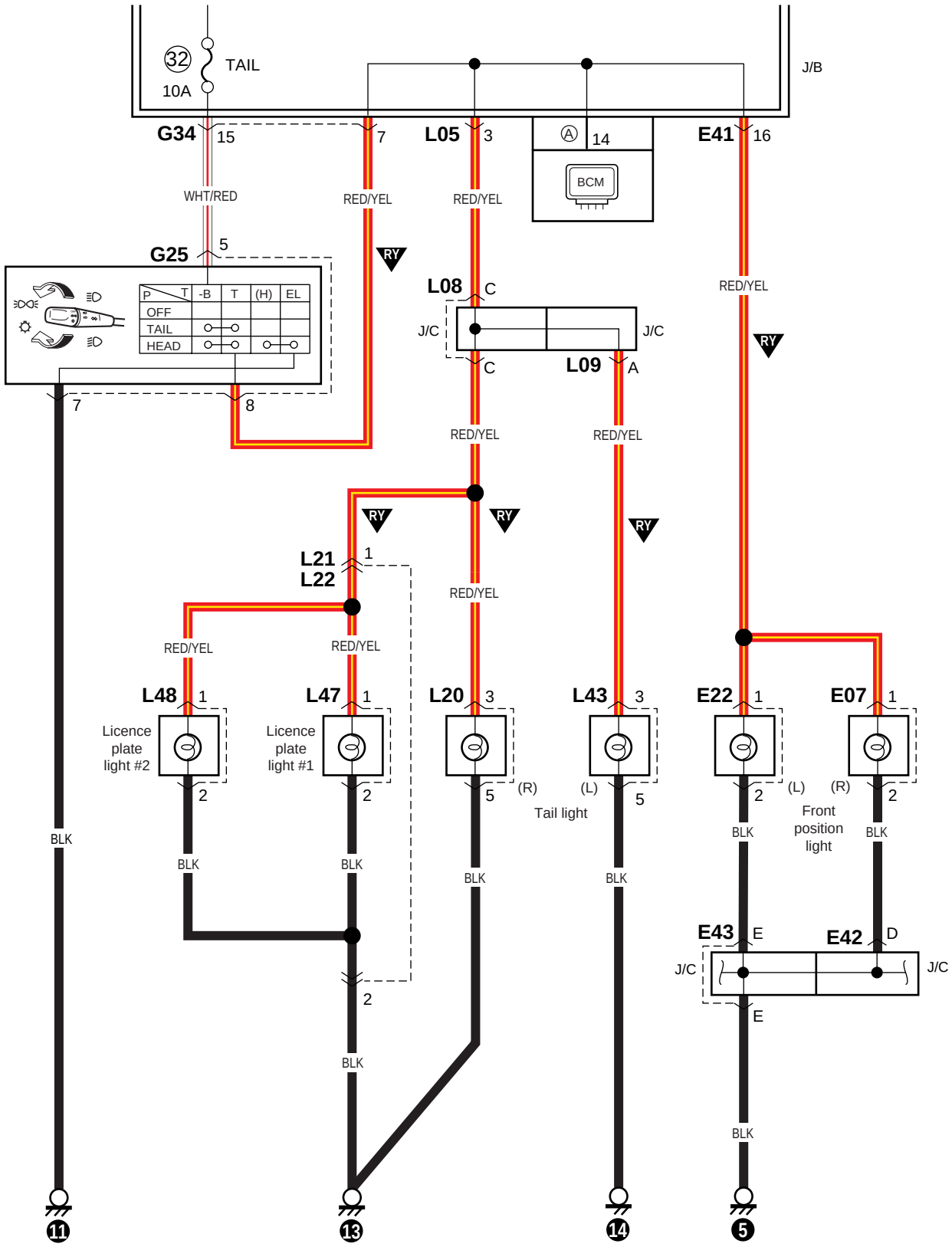
D-1 Headlight System Circuit Diagram

S4RS0A910E020



D-2 Position, Tail and Licence Plate Light System Circuit Diagram

S4RS0A910E021

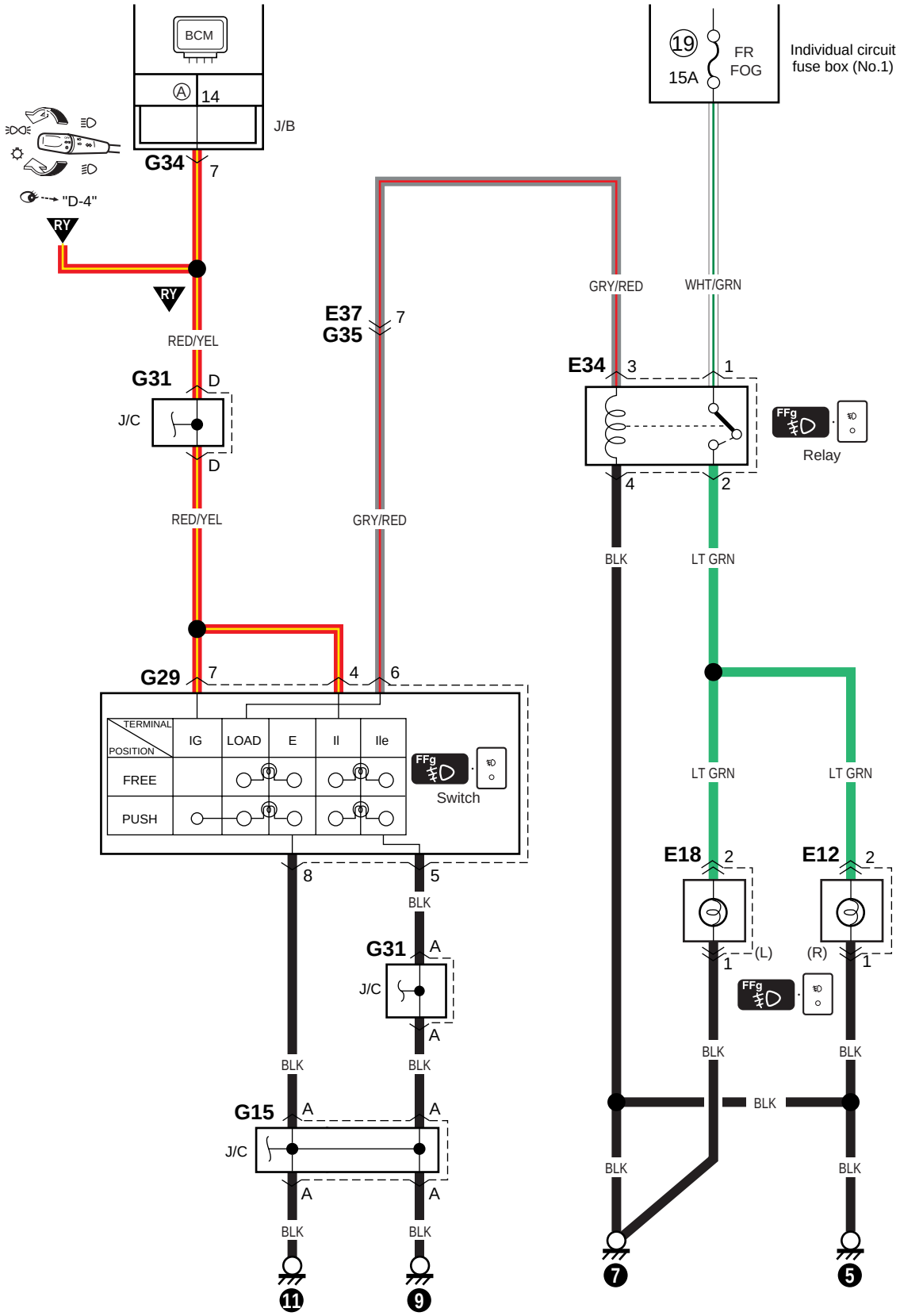


Ⓐ J/B side connector (BCM)

I4RS0A910945-

D-3 Front Fog Light System Circuit Diagram

S4RS0A910E022

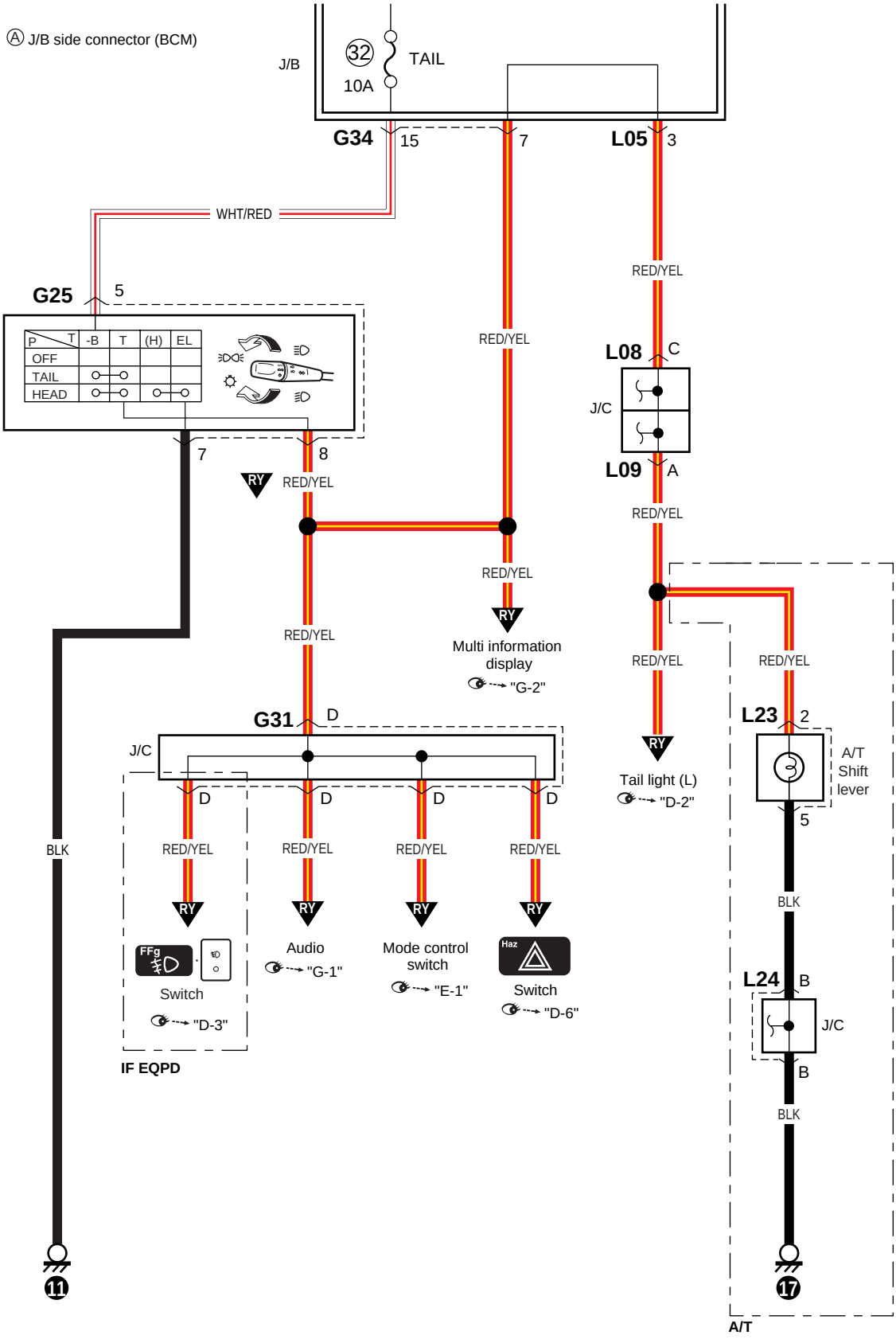


Ⓐ J/B side connector (BCM)

I4RS0A910946-

D-4 Illumination Light System Circuit Diagram

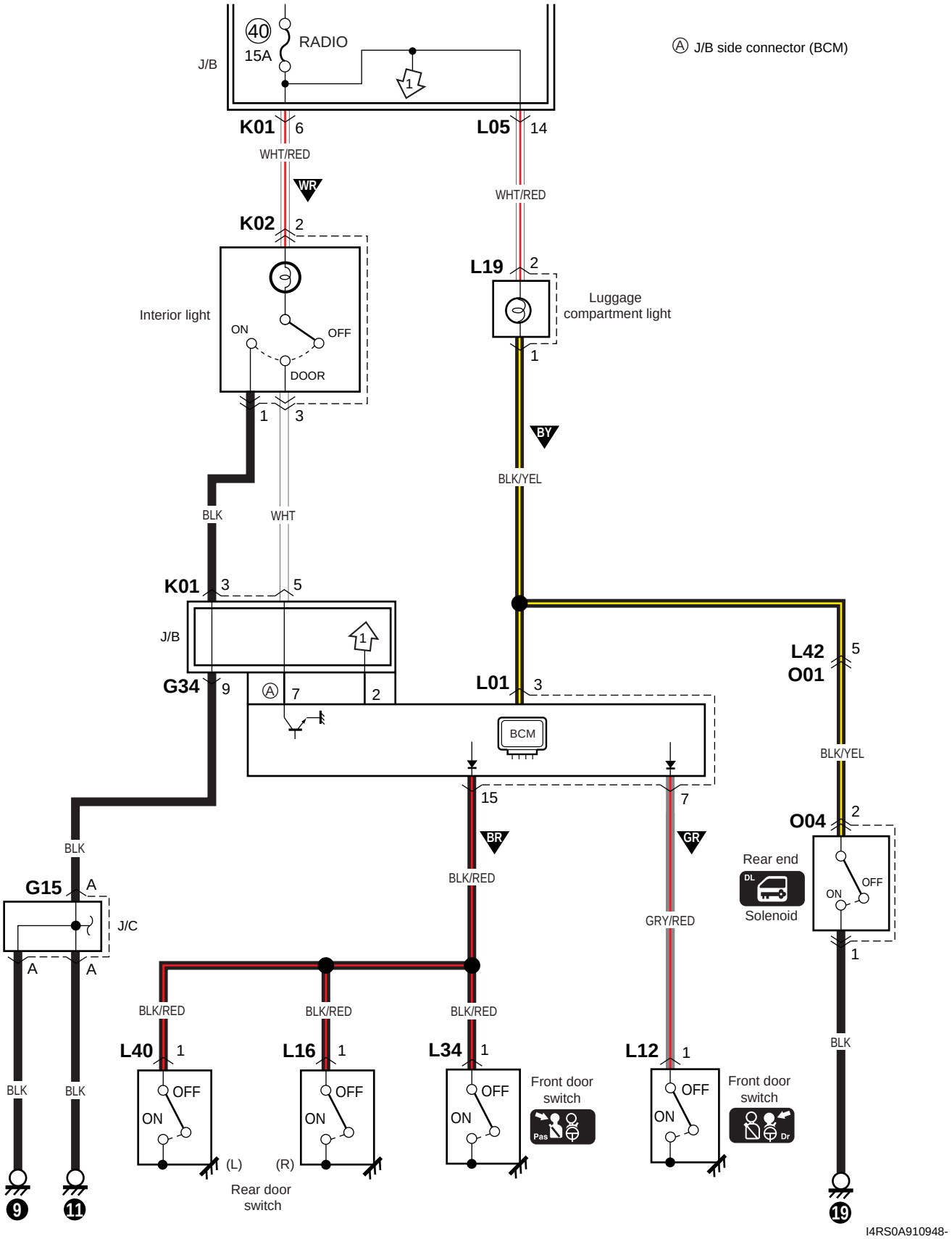
S4RS0A910E023



I4RS0A910947-

D-5 Interior Light System Circuit Diagram

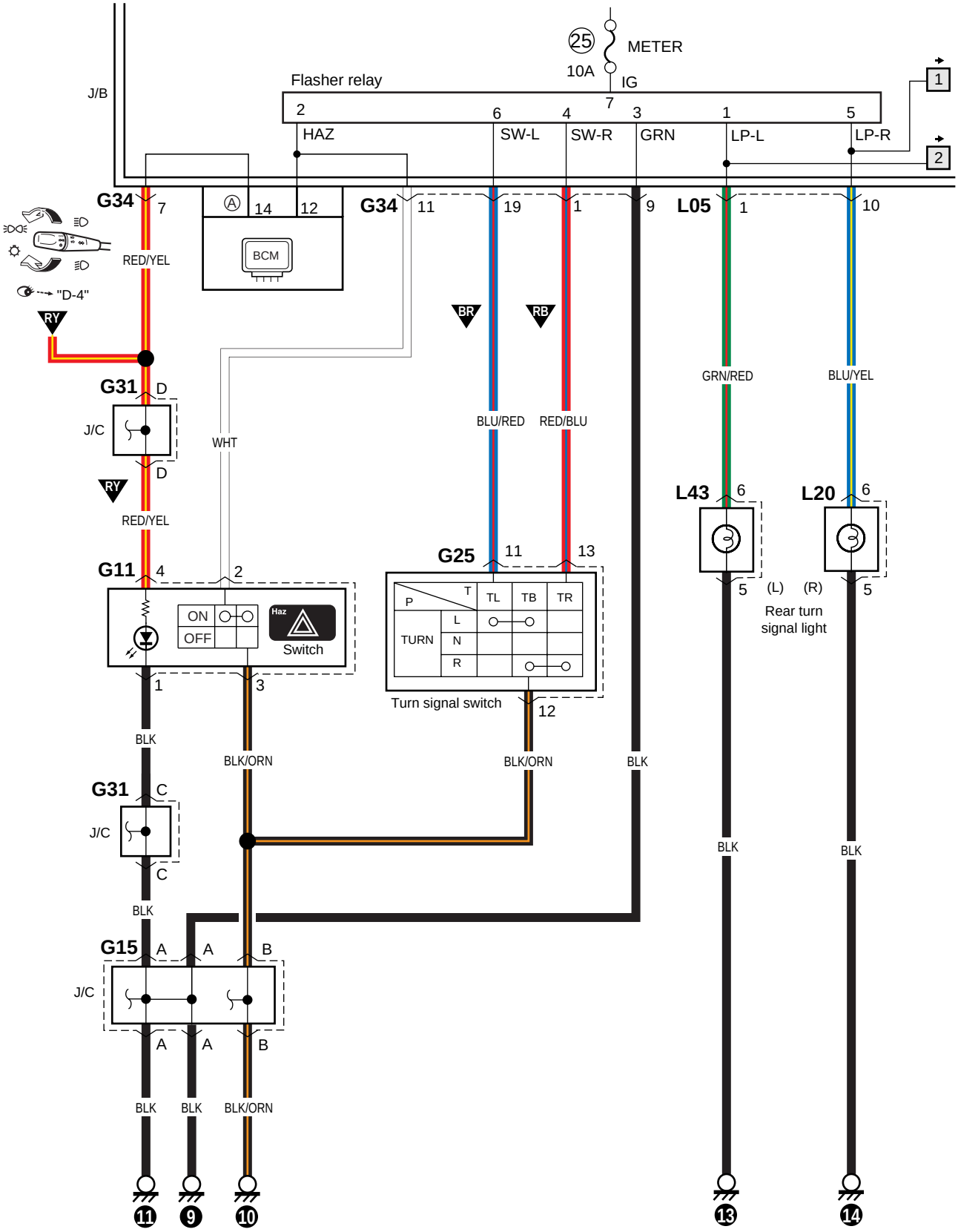
S4RS0A910E024



I4RS0A910948-

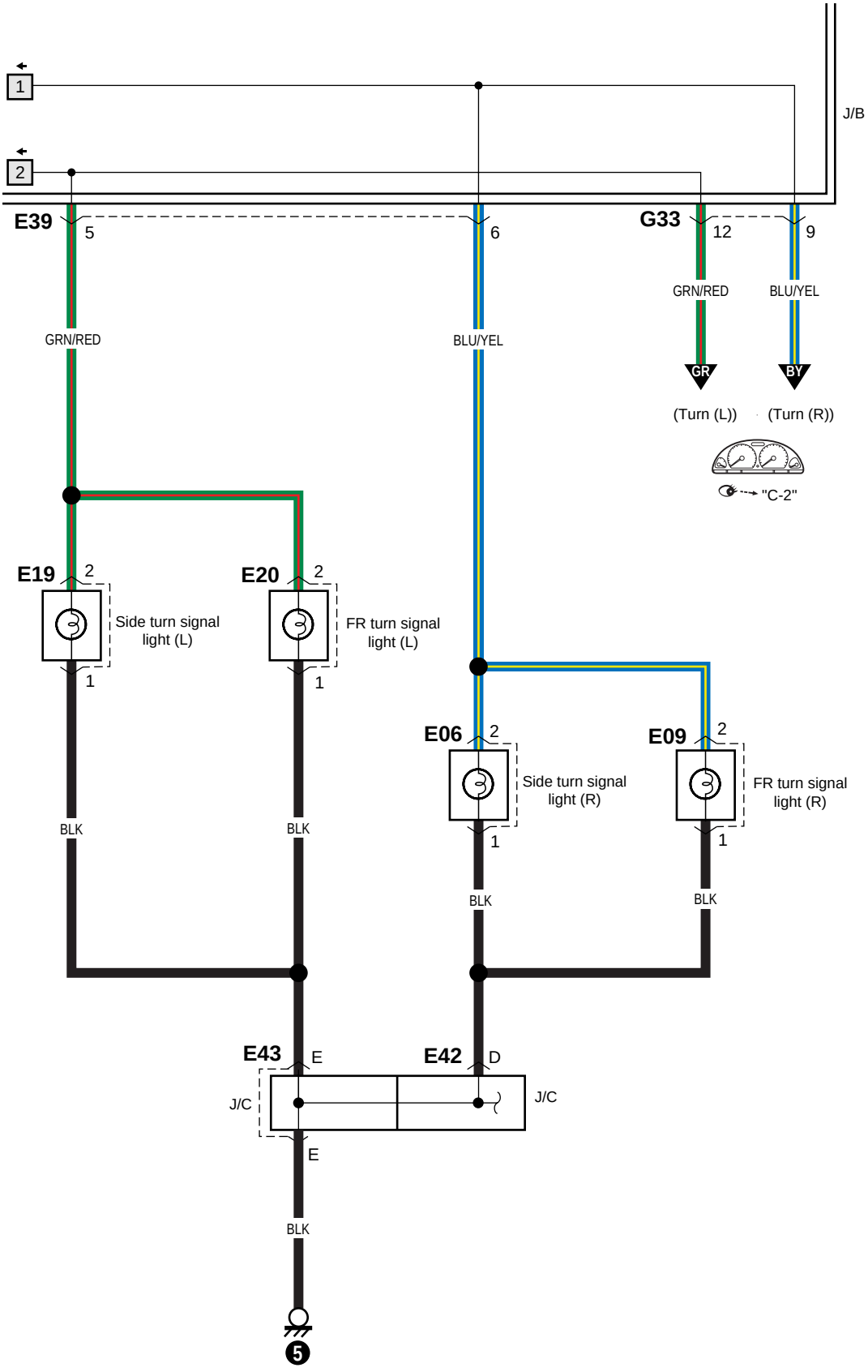
D-6 Turn Signal and Hazard Warning Light System Circuit Diagram

S4RS0A910E025



Ⓐ J/B side connector (BCM)

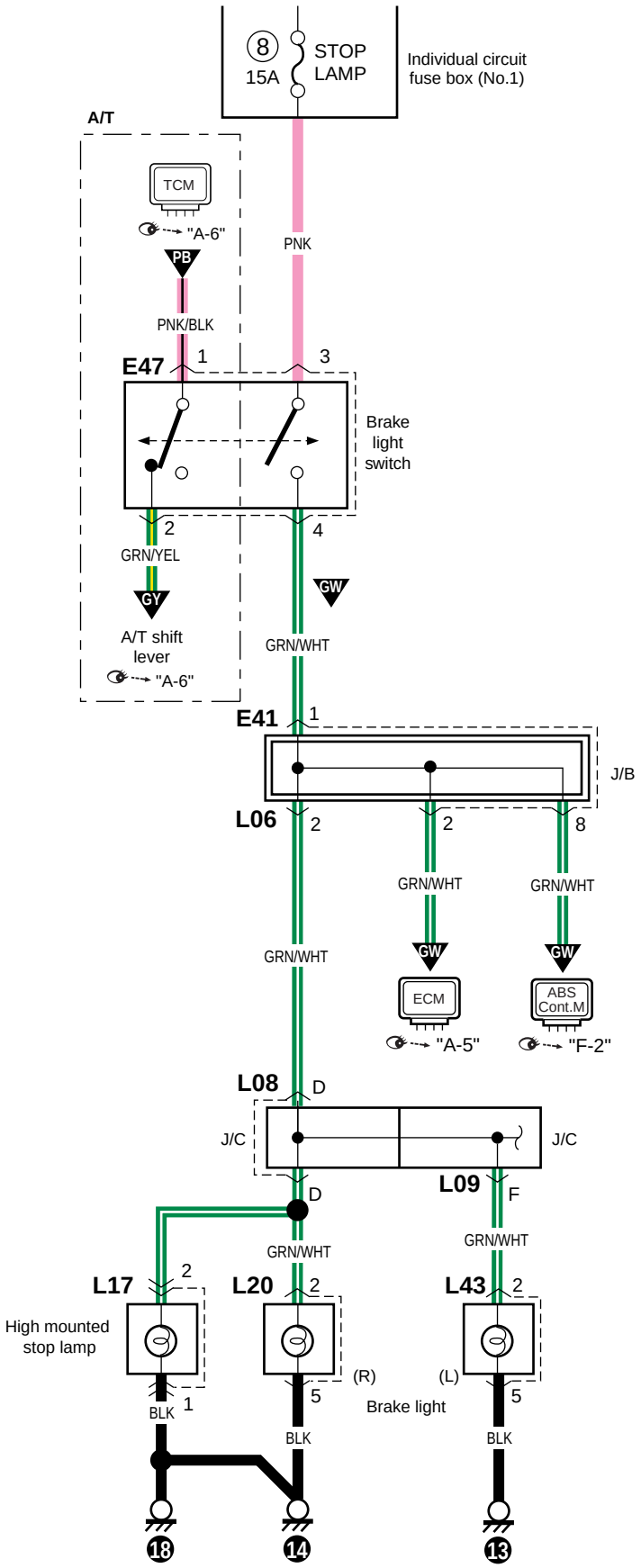
I4RS0A910949-



I4RS0A910950-

D-7 Brake Light System Circuit Diagram

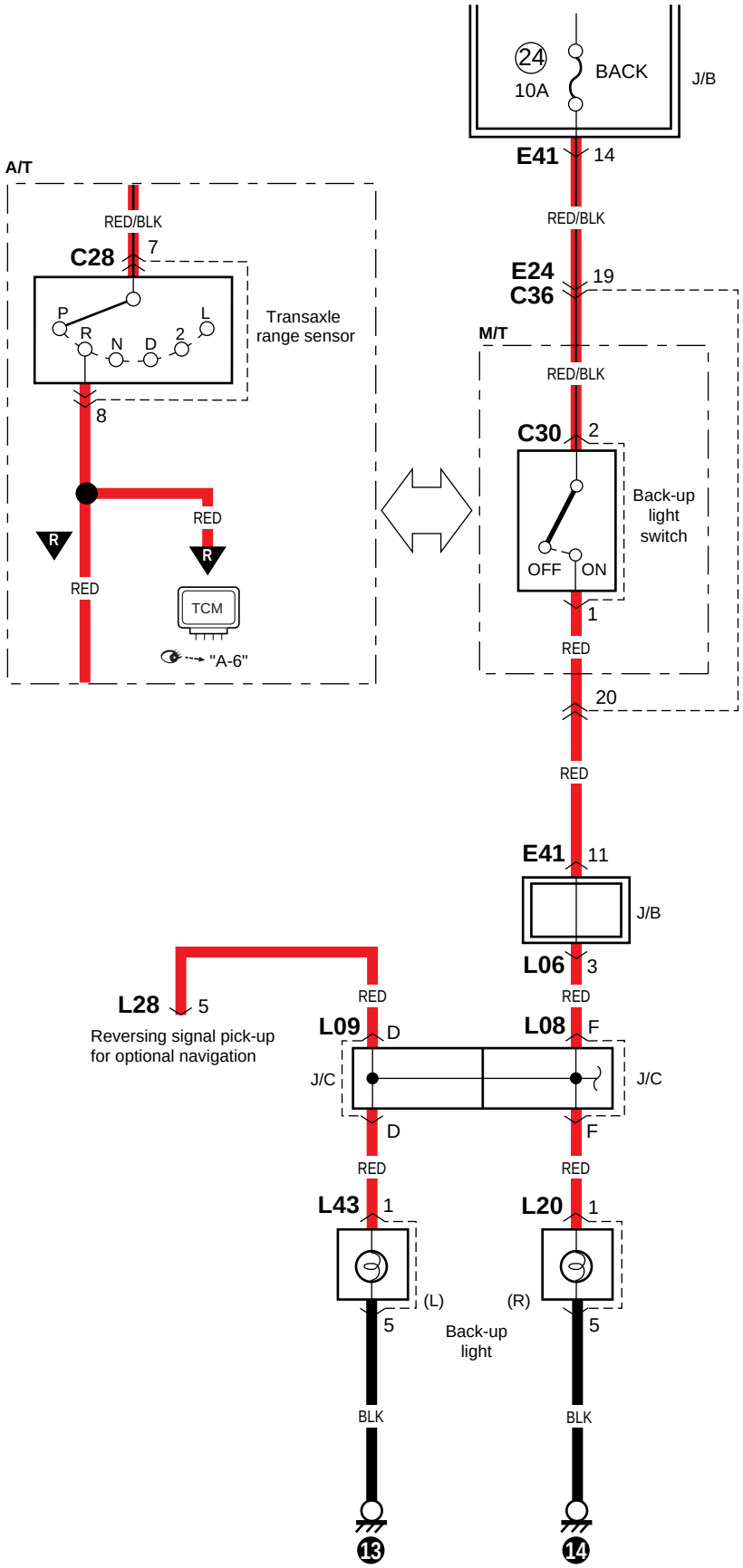
S4RS0A910E026



I4RS0A910951-

D-8 Back-Up Light System Circuit Diagram

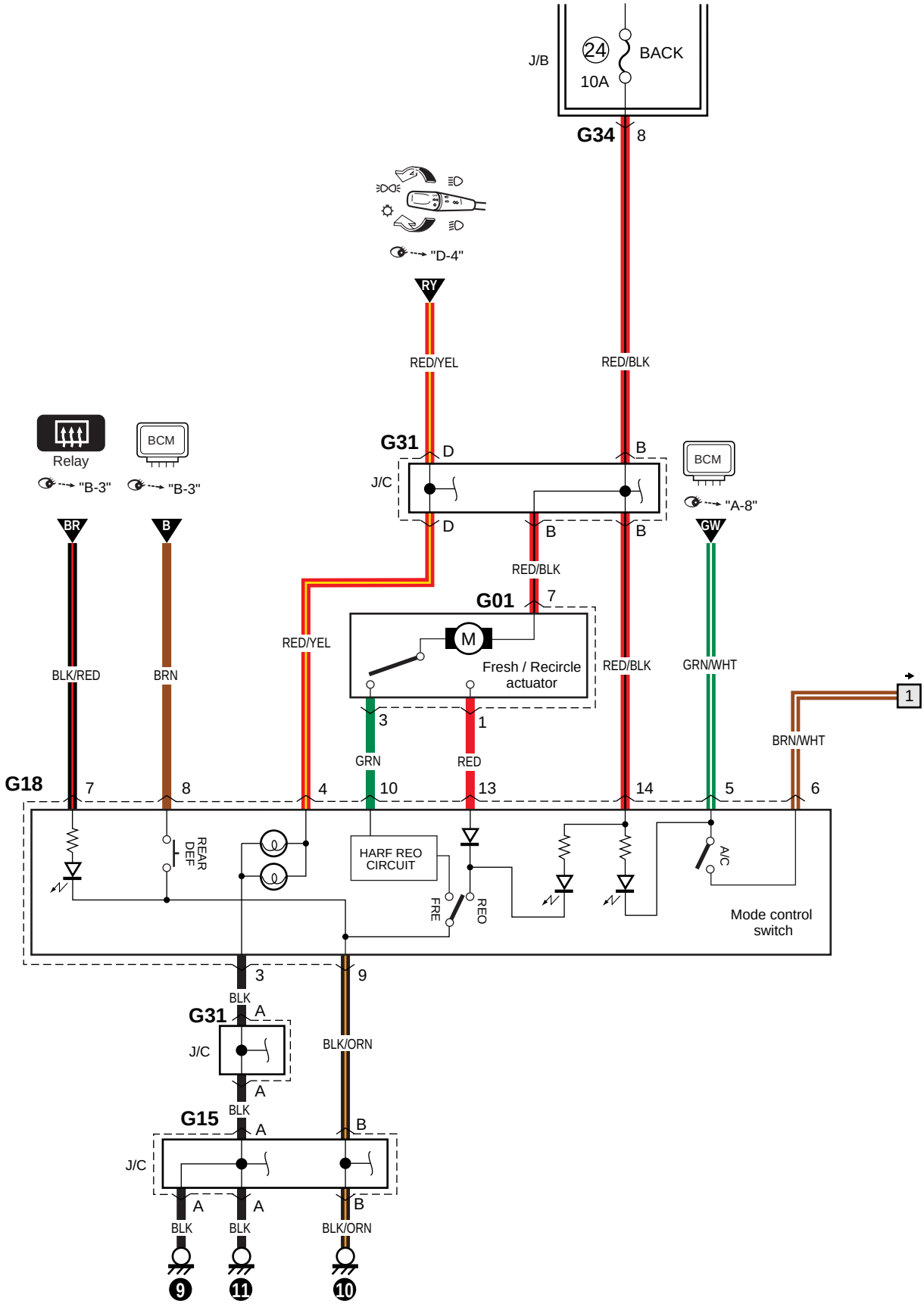
S4RS0A910E027



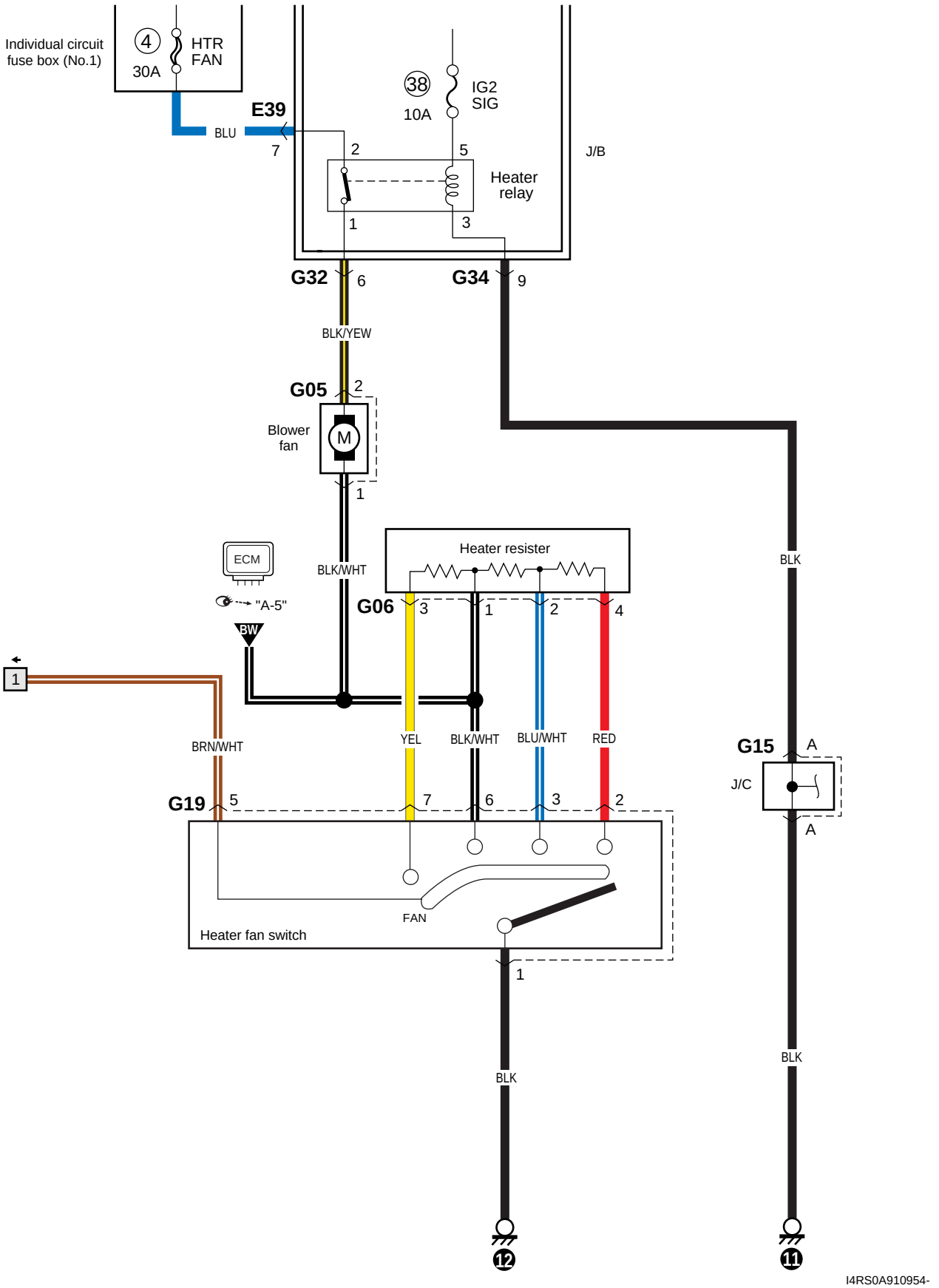
I4RS0A910952-

E-1 Heater System Circuit Diagram

S4RS0A910E028

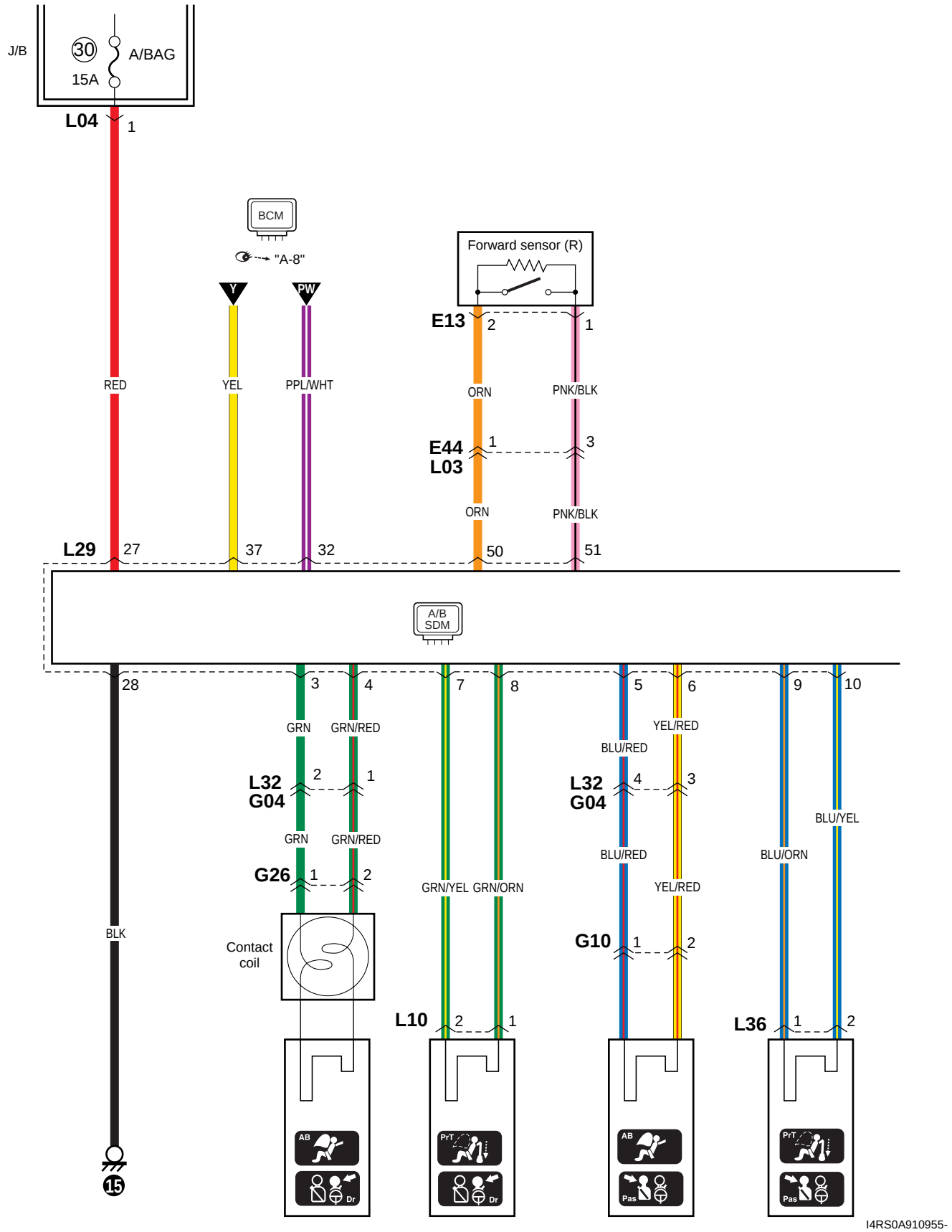


I4RS0A910953-

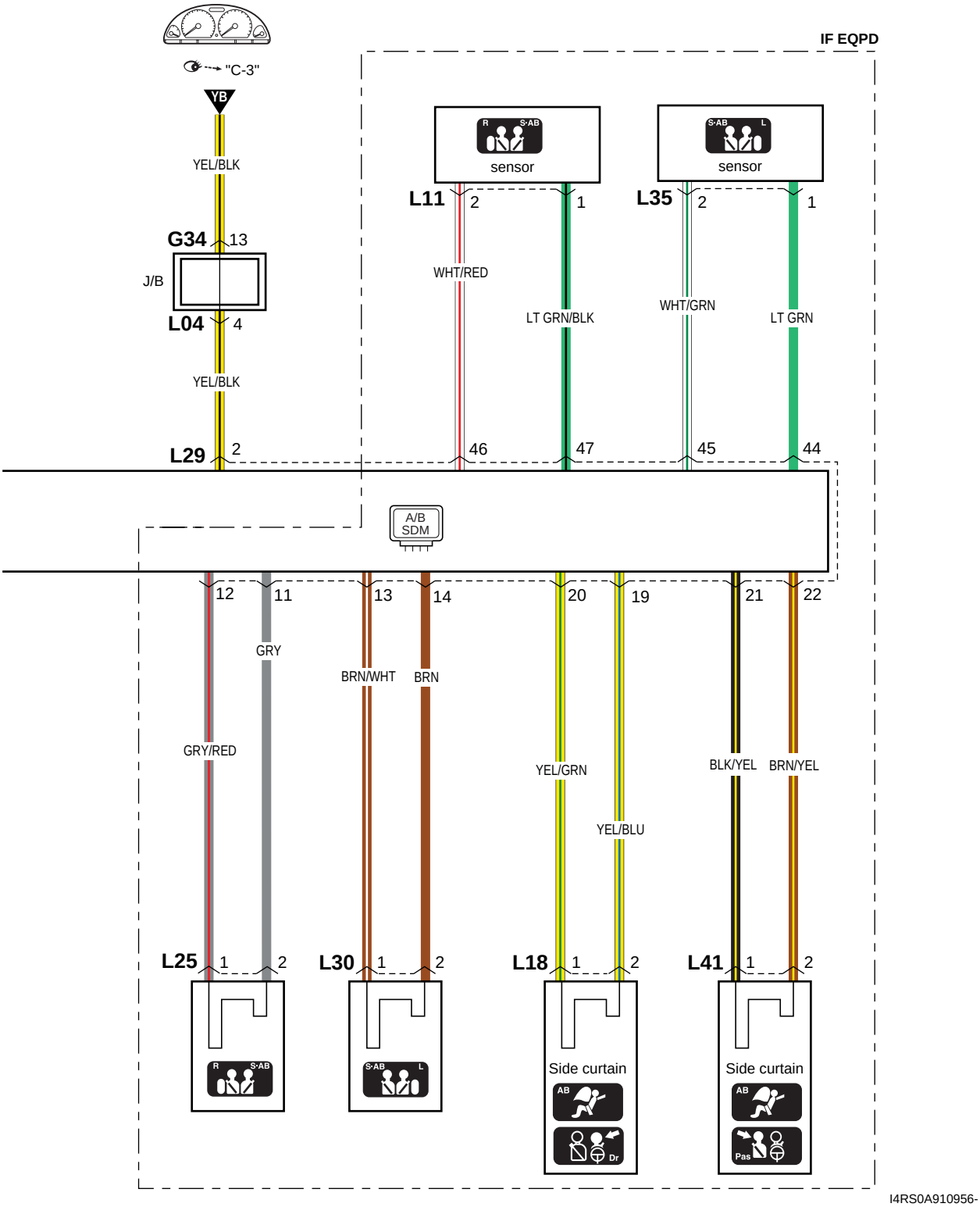

Individual circuit fuse box (No.1)
4
30A
HTR FAN
BLU
E39
7
38
10A
IG2 SIG
2
5
1
3
Heater relay
J/B
G32
6
G34
9
BLK/YEW
G05
2
Blower fan
M
1
ECM
"A-5"
BLK/WHT
Heater resister
G06
3
1
2
4
BW
BLK
1
BRN/WHT
YEL
BLK/WHT
BLU/WHT
RED
G15
A
J/C
A
G19
5
7
6
3
2
FAN
Heater fan switch
1
BLK
BLK
12
11
I4RS0A910954-

F-1 Air-Bag System Circuit Diagram

S4RS0A910E029

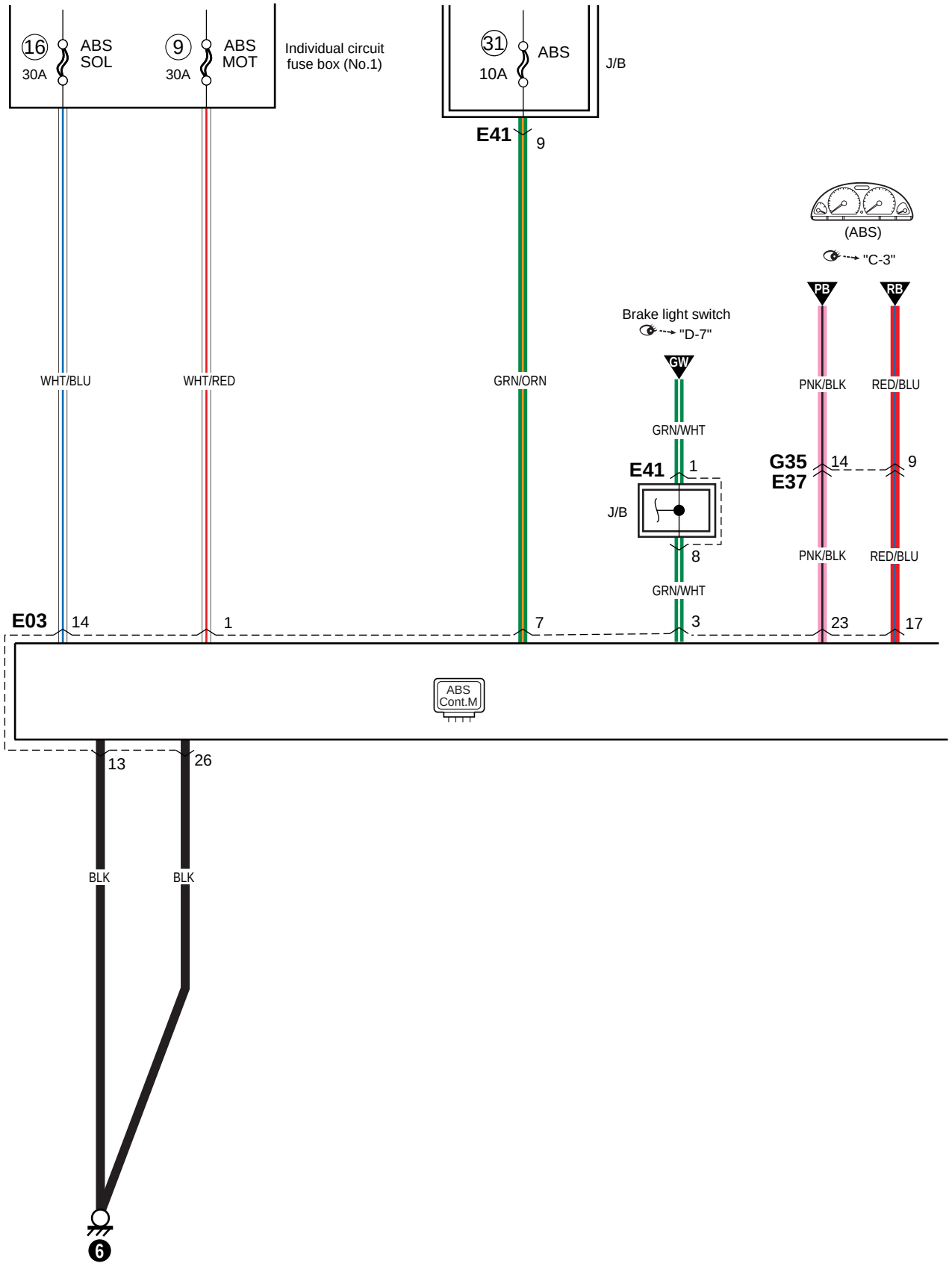


I4RS0A910955-

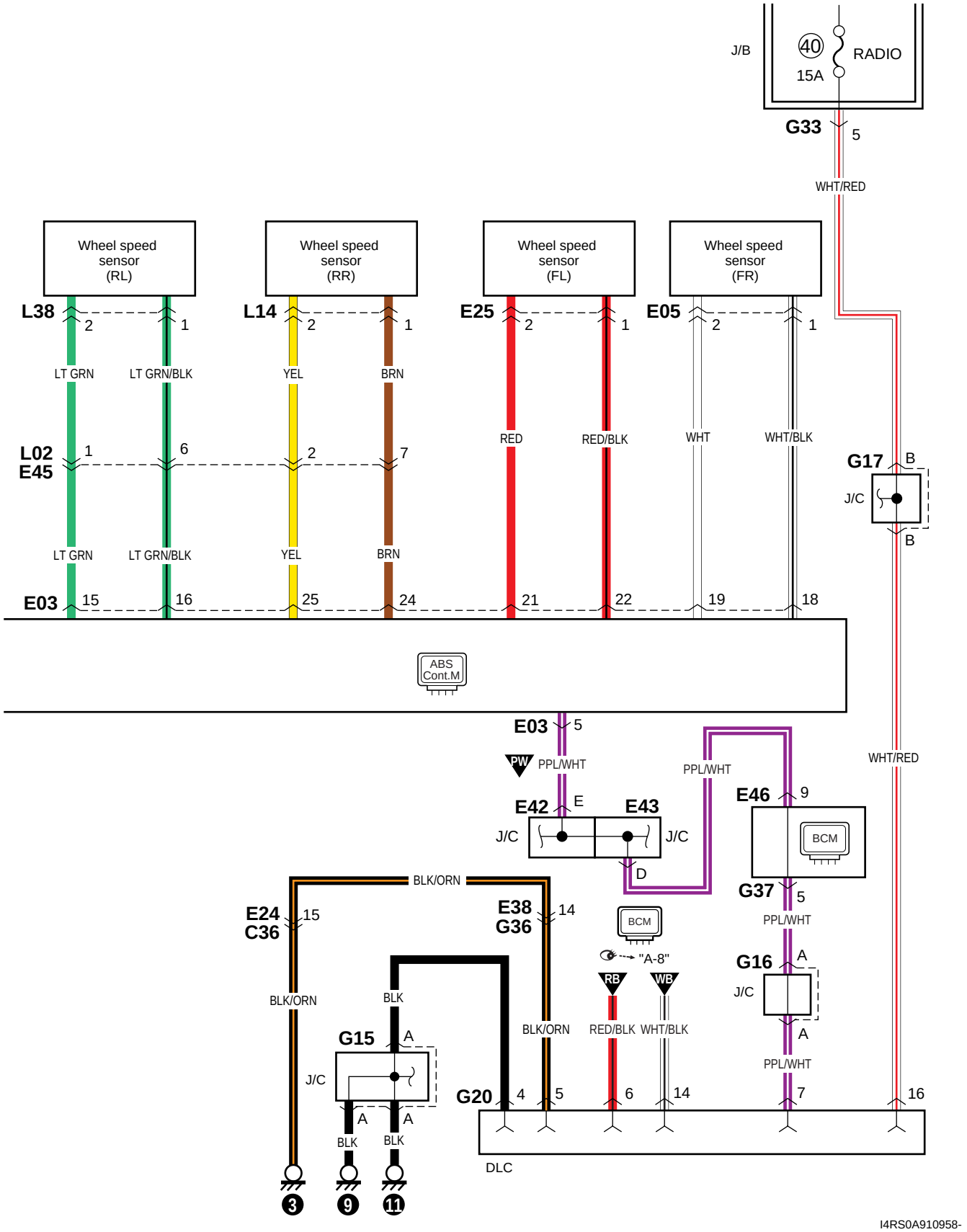

IF EQPD
"C-3"
YB
YEL/BLK
G34
13
J/B
L04
4
YEL/BLK
L29
2
sensor
L11
2
1
WHT/RED
LT GRN/BLK
sensor
L35
2
1
WHT/GRN
LT GRN
46
47
45
44
A/B
SDM
12
11
13
14
20
19
21
22
GRY
BRN/WHT
BRN
GRY/RED
YEL/GRN
YEL/BLU
BLK/YEL
BRN/YEL
L25
1
2
L30
1
2
L18
1
2
L41
1
2
Side curtain
Side curtain
I4RS0A910956-

F-2 Anti-Lock Brake System Circuit Diagram

S4RS0A910E030



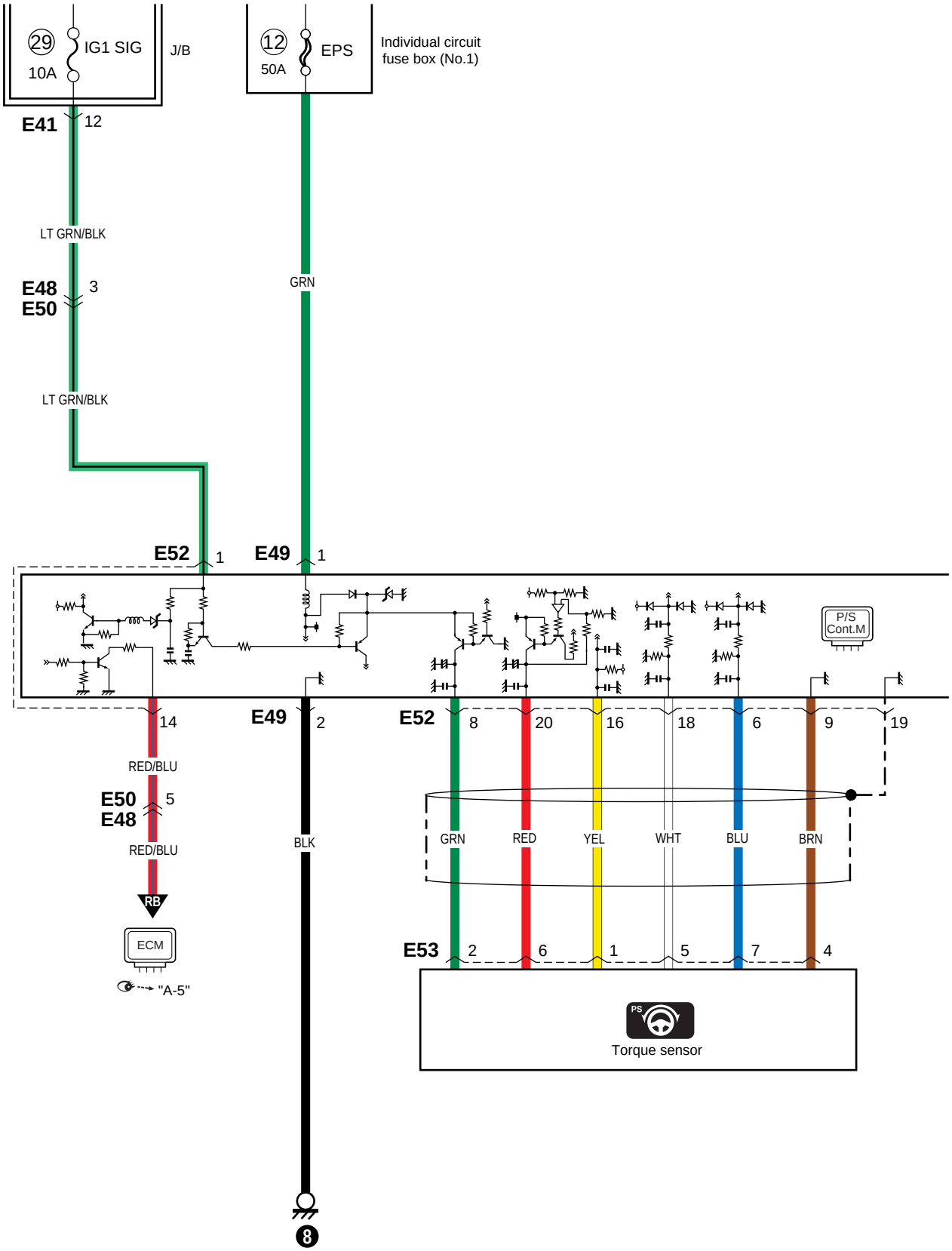
I4RS0A910957-



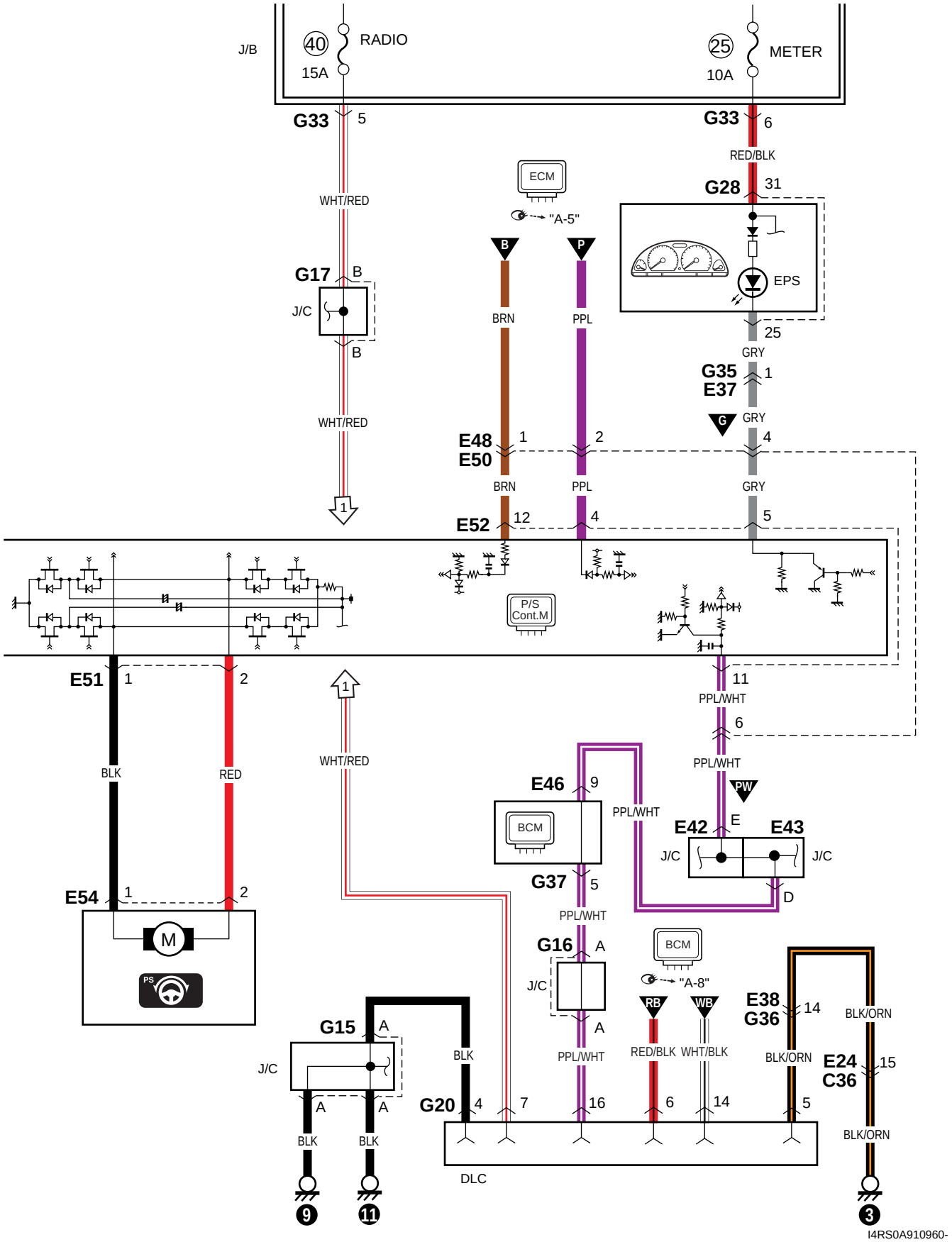
I4RS0A910958-

F-3 Power Steering System Circuit Diagram

S4RS0A910E031

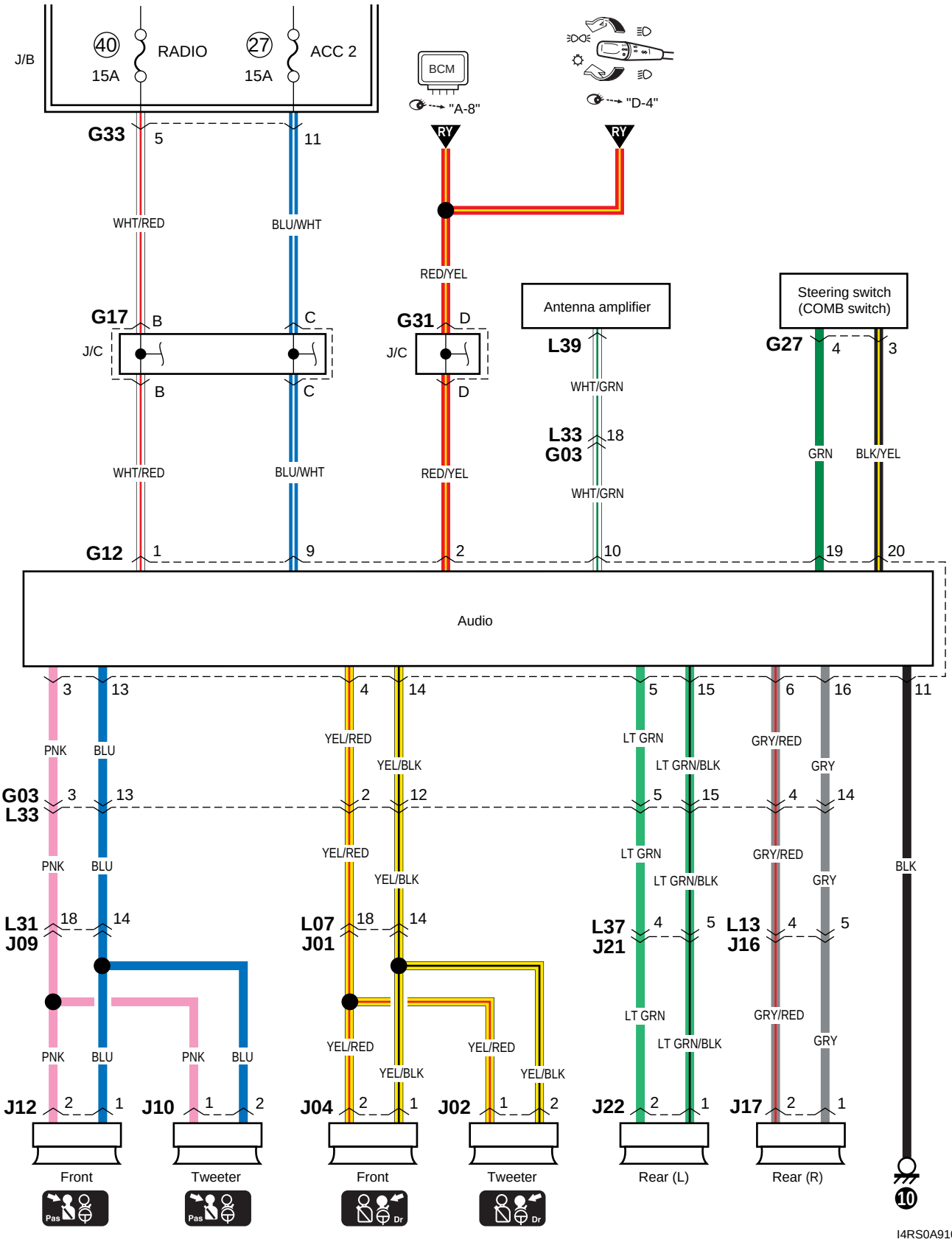


I4RS0A910959-


J/B
40
RADIO
15A
25
METER
10A
G33
5
G33
6
RED/BLK
WHT/RED
ECM
"A-5"
G28
31
G17
B
J/C
B
B
BRN
P
PPL
EPS
25
GRY
G35
E37
1
G
GRY
4
WHT/RED
E48
E50
1
2
BRN
PPL
GRY
1
E52
12
4
5
P/S
Cont.M
E51
1
2
11
PPL/WHT
6
PPL/WHT
BLK
RED
WHT/RED
E46
9
PPL/WHT
PW
BCM
E42
E
E43
J/C
J/C
D
G37
5
E54
1
2
PPL/WHT
M
PS
G16
A
BCM
J/C
"A-8"
A
G15
A
RB
WB
E38
G36
14
BLK/ORN
J/C
BLK
PPL/WHT
RED/BLK
WHT/BLK
BLK/ORN
E24
C36
15
A
A
G20
4
7
16
6
14
5
BLK/ORN
BLK
BLK
DLC
9
11
3
I4RS0A910960-

G-1 Audio System Circuit Diagram

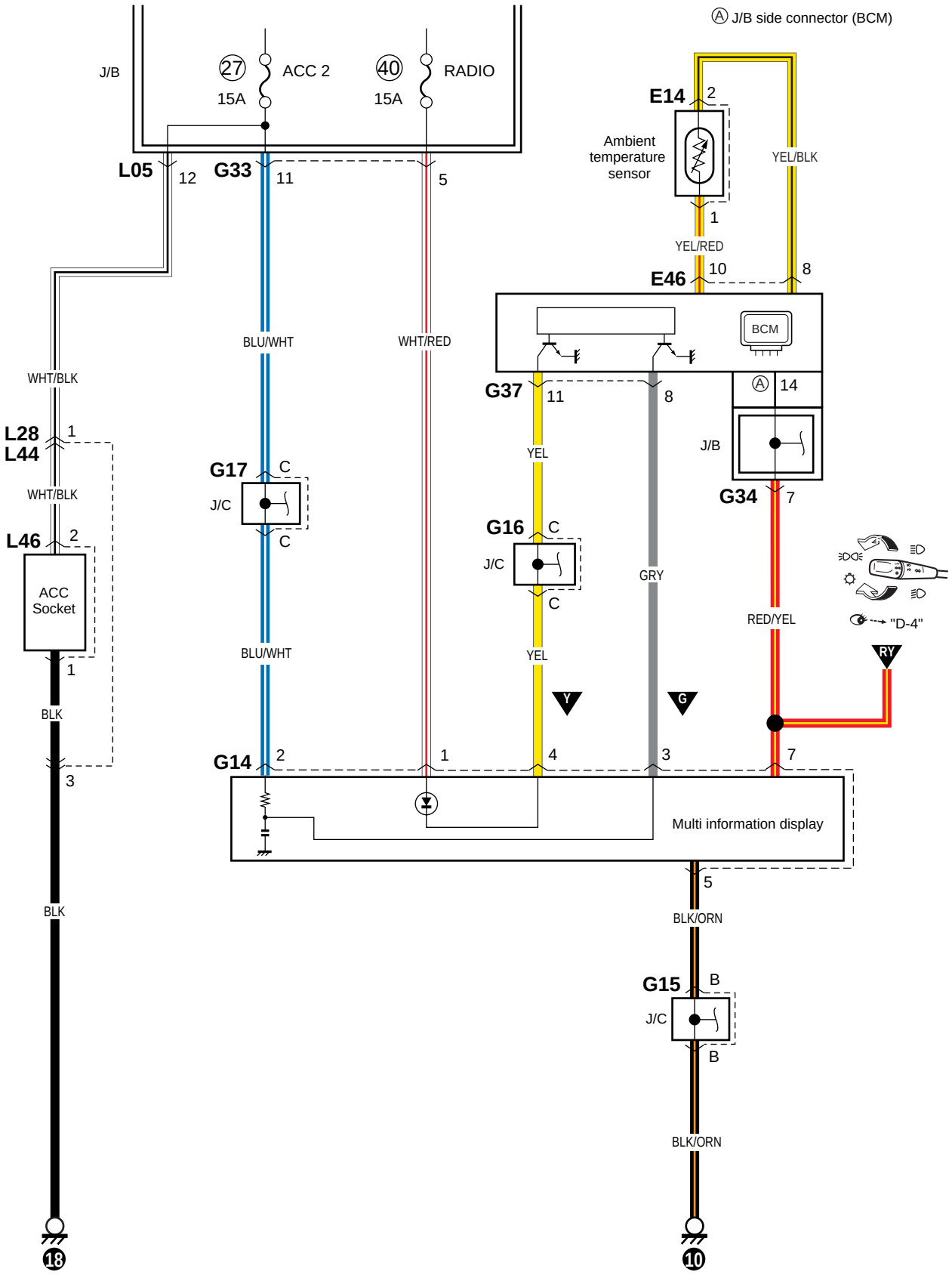
S4RS0A910E032



I4RS0A910961-

G-2 Multi Information Display / Accessory Socket System Circuit Diagram

S4RS0A910E033



I4RS0A910962-

List of Connectors

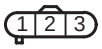
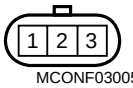
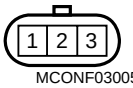
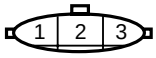
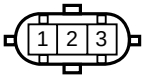
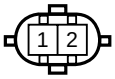
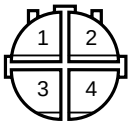
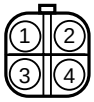
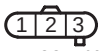
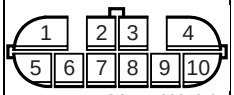
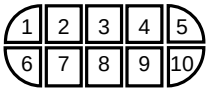
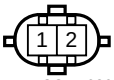
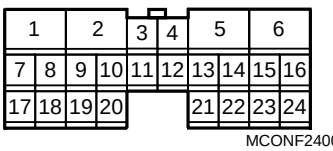
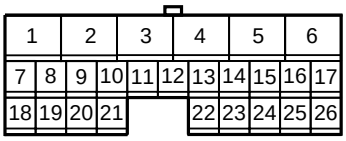
List of Connectors

S4RS0A910F001

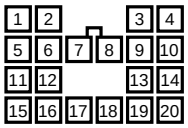
Refer to “C Connector: ”.
Refer to “E Connector: ”.
Refer to “G Connector: ”.
Refer to “J Connector: ”.
Refer to “K Connector: ”.
Refer to “L Connector: ”.
Refer to “O Connector: ”.
Refer to “R Connector: ”.

C Connector

S4RS0A910F002

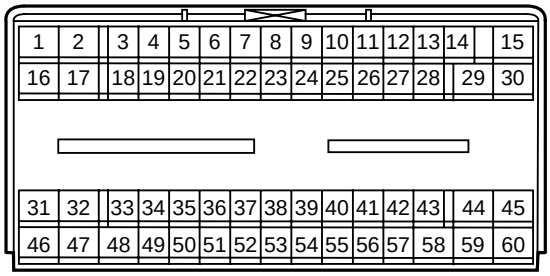
C01  MCONF030051-01	C02  MCONF030055-01	C03  MCONF030055-01	C04 MCONF020065-01	C05 MCONF020065-01	C06 MCONF020065-01
C07 MCONF020065-01	C08  MCONF030016-01	C09 MCONF020057-01	C10 MCONF060018-01	C11 MCONF030062-01	C12  MCONF030084-01
C13 MCONF050025-01	C14  MCONF020156-01	C15  MCONF040008-01	C16  MCONF040024-01	C17 MCONF010076-01	C18 MCONF010027-01
C19 MCONM020042-01	C20 MCONF030052-01	C21 MCONF020194-01	C22 MCONF010057-01	C23 MCONF010019-01	C24 MCONF010077-01
C25  MCONF030052-01	C26 MCONF010054-01	C27 MCONF020064-01	C28  MCONF100053-01 A/T	C29  MCONF100048-01 A/T	C30  MCONF020156-01 M/T
C31 MCONF010078-01	C33 MCONF010047-01	C34  MCONF240011-01	C35  MCONF260014-01		

C36 (TO E24)



MCONF200011-01

C37



MCONF600002-01

C38

MCONN000002-01

C39

MCONN000002-01

C40

MCONN000002-01

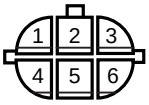
C41

MCONN000002-01

E Connector

S4RS0A910F003

E01

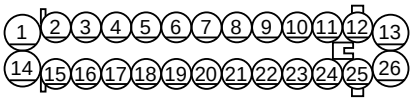


MCONF060062-01

E02

MCONF020195-01

E03



MCONF260011-01

E04

MCONF030062-01

E05

MCONM020043-01

E06

MCONF020196-01

E07

MCONF020013-01

E08

MCONF030101-01

E09

MCONF020197-01

E10

MCONF020008-01

E11

MCONF020008-01

E12

MCONF020198-01

IF EQPD

E13

MCONF020199-01

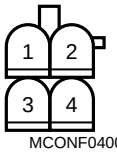
E14

MCONF020200-01

E15

MCONF010079-01

E17



MCONF040094-01

E18

MCONF020198-01

IF EQPD

E19

MCONF020196-01

E20

MCONF020197-01

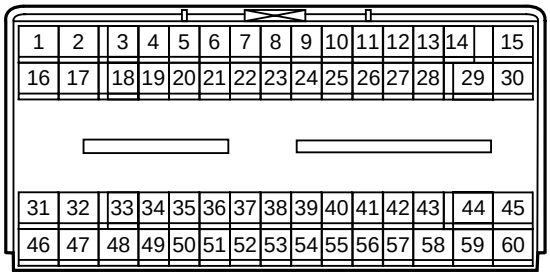
E21

MCONF030101-01

E22

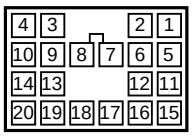
MCONF020013-01

E23



MCONF600003-01

E24 (TO C36)



MCONM200005-01

E25

MCONM020043-01

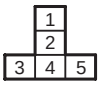
E26

MCONF020114-01

E27

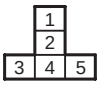
MCONF020201-01

E28



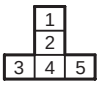
MCONF050015-01

E29



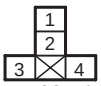
MCONF050015-01

E30



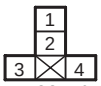
MCONF050015-01

E31



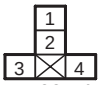
MCONF040004-01

E32



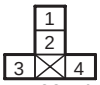
MCONF040004-01

E33



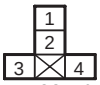
MCONF040004-01

E34



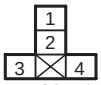
MCONF040004-01

E35



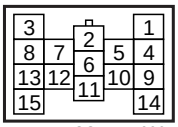
MCONF040004-01

E36



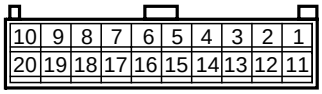
MCONF040004-01

E37 (TO G35)



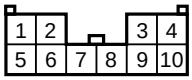
MCONM150001-01

E38 (TO G36)



MCONM200008-01

E39

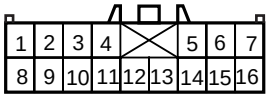


MCONF100003-01

E40

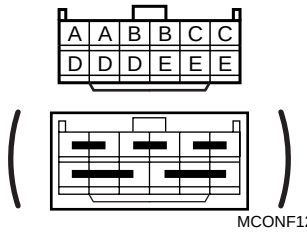
MCONF020202-01

E41



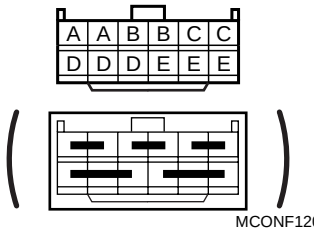
MCONF160034-01

E42



MCONF120027-01

E43

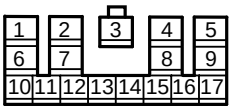


MCONF120027-01

E44 (TO L03)

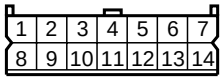
MCONF040095-01

E45 (TO L02)



MCONF170005-01

E46

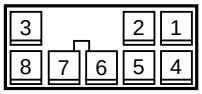


MCONF140012-01

E47

MCONF040016-01

E48 (TO E50)

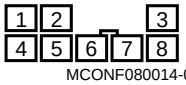


MCONM080012-01

E49

MCONF020203-01

E50 (TO E48)

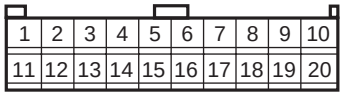


MCONF080014-01

E51

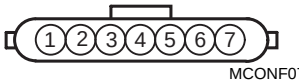
MCONF020204-01

E52



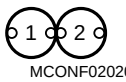
MCONF200021-01

E53



MCONF070015-01

E54



MCONF020205-01

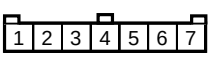
E55

MCONN000002-01

G Connector

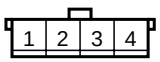
S4RS0A910F004

G01



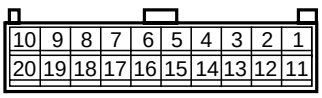
MCONF070001-01

G02



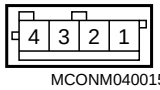
MCONF040096-01

G03 (TO L33)



MCONM200008-01

G04 (TO L32)



MCONM040015-01

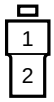
G05

MCONF020206-01

G06

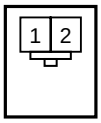
MCONF040097-01

G09



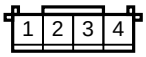
MCONF020112-01

G10



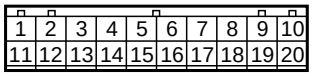
MCONF020207-01

G11



MCONF040098-01

G12

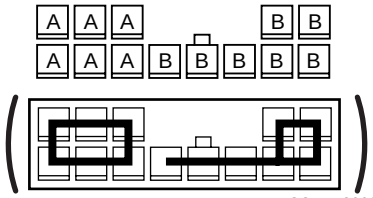


MCONF200014-01

G14

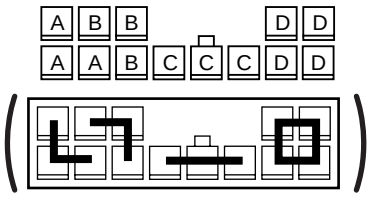
MCONF070004-01

G15



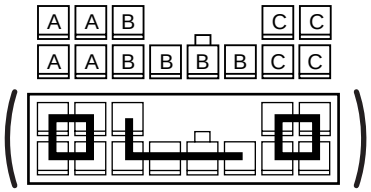
MCONF130007-01

G16



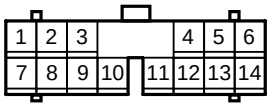
MCONF130008-01

G17



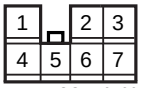
MCONF130009-01

G18



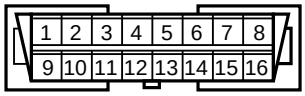
MCONF140018-01

G19



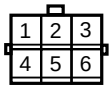
MCONF070016-01

G20



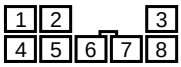
MCONF160023-01

G21



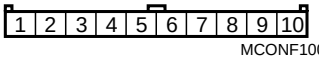
MCONF060063-01

G22



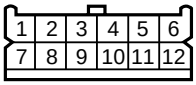
MCONF080014-01

G23



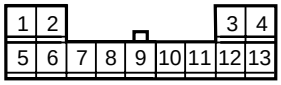
MCONF100038-01

G24



MCONF120026-01

G25



MCONF130010-01

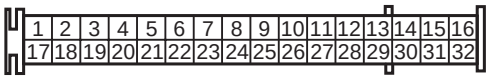
G26

MCONF020111-01

G27

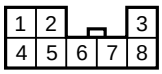
MCONF050021-01

G28



MCONF320005-01

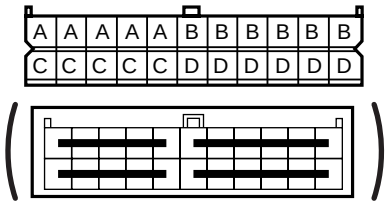
G29



MCONF080002-01

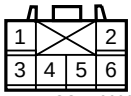
IF EQPD

G31



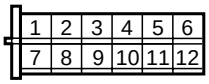
MCONF220011-01

G32



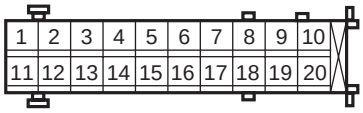
MCONF060064-01

G33



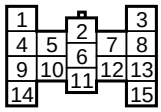
MCONF120028-01

G34



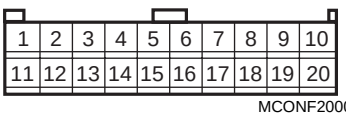
MCONF200020-01

G35 (TO E37)



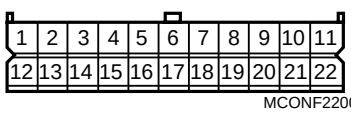
MCONF150002-01

G36 (TO E38)



MCONF200021-01

G37

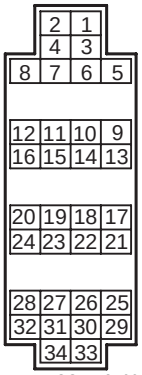


MCONF220009-01

J Connector

S4RS0A910F005

J01 (TO L06)

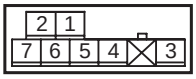


MCONM340002-01

J02

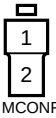
MCONF020134-01

J03



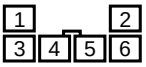
MCONM070005-01

J04



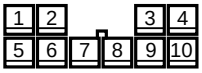
MCONF020112-01

J05



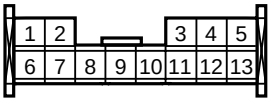
MCONF060046-01

J06



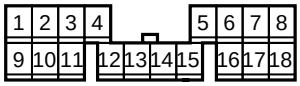
MCONF100054-01

J07



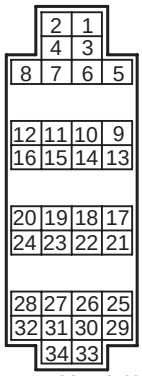
MCONF130011-01

J08



MCONF180011-01

J09 (TO L31)

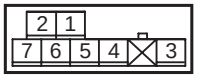


MCONM340002-01

J10

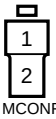
MCONF020134-01

J11



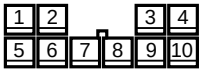
MCONM070005-01

J12



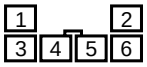
MCONF020112-01

J13



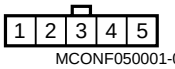
MCONF100054-01

J14



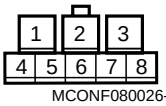
MCONF060046-01

J15



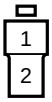
MCONF050001-01

J16 (TO L13)



MCONF080026-01

J17

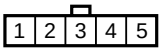


MCONF020112-01

J18

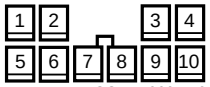
MCONF020208-01

J19



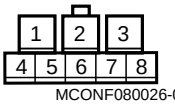
MCONF050001-01

J20



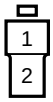
MCONF100055-01

J21 (TO L37)



MCONF080026-01

J22



MCONF020112-01

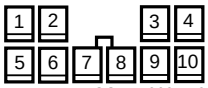
J23

MCONF020208-01

J24

MCONF050001-01

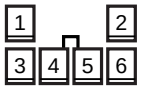
J25



MCONF100055-01

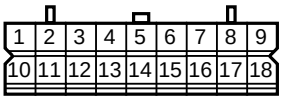
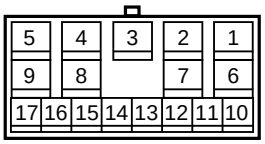
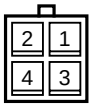
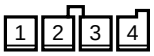
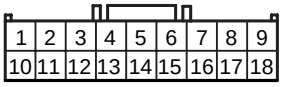
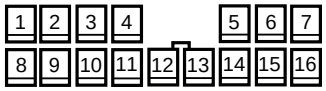
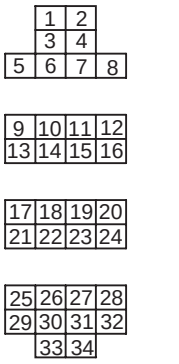
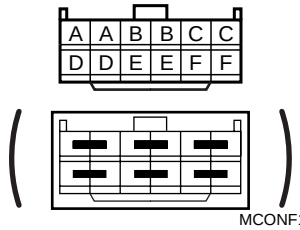
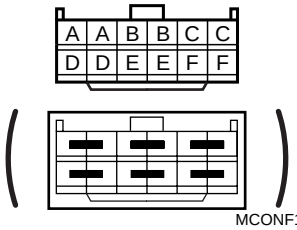
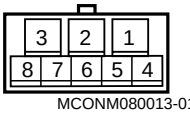
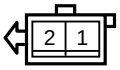
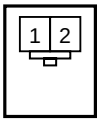
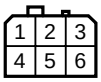
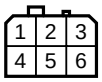
K Connector

S4RS0A910F006

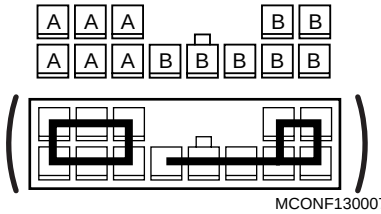
K01	K02
 MCONF060065-01	MCONF030102-01

L Connector

S4RS0A910F007

L01	L02 (TO E45)	L03 (TO E44)	L04
 MCONF180012-01	 MCONM170001-01	 MCONM040022-01	 MCONF040033-01
L05	**L06**	**L07 (TO J01)**	
 MCONF180013-01	 MCONF160014-01	 MCONF340005-01	
L08	**L09**	**L10**	**L11**
 MCONF120029-01	 MCONF120029-01	MCONF020209-01	MCONF020210-01 IF EQPD
L12	**L13 (TO J16)**	**L14**	**L15 (TO R01)**
MCONF010060-01	 MCONM080013-01	MCONM020044-01	MCONM040023-01
L16	**L17**		
MCONF010060-01	 MCONM020045-01		
L18	**L19**	**L20**	**L21 (TO L22)**
 MCONF020207-01 IF EQPD	MCONF020211-01	 MCONF060044-01	MCONF020060-01
L22 (TO L21)	**L23**		
MCONM020043-01	 MCONF060044-01 A/T		

L24



MCONF130007-01

L25

MCONF020212-01

IF EQPD

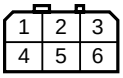
L26

MCONF020151-01

L27

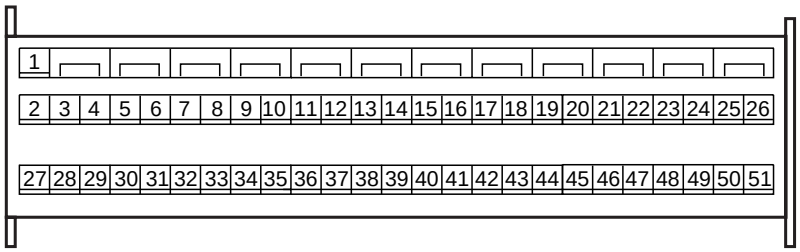
MCONF010021-01

L28 (TO L44)



MCONF060013-01

L29



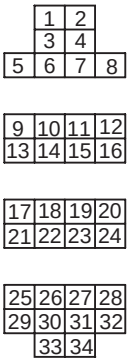
MCONF510002-01

L30

MCONF020212-01

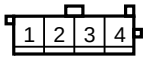
IF EQPD

L31 (TO J09)



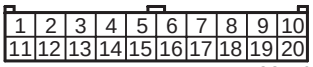
MCONF340005-01

L32 (TO G04)



MCONF040099-01

L33 (TO G03)



MCONF200003-01

L34

MCONF010060-01

L35

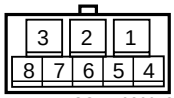
MCONF020210-01

IF EQPD

L36

MCONF020209-01

L37 (TO J21)



MCONM080013-01

L38

MCONM020044-01

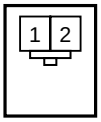
L39

MCONM010004-01

L40

MCONF010060-01

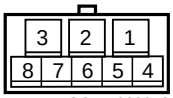
L41



MCONF020207-01

IF EQPD

L42 (TO O01)

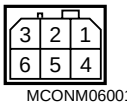


MCONM080013-01

L43

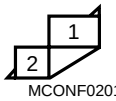
MCONF060044-01

L44 (TO L28)



MCONM060012-01

L46



MCONF020116-01

L47

MCONF020013-01

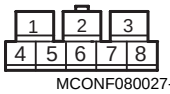
L48

MCONF020013-01

O Connector

S4RS0A910F008

O01 (TO L42)



MCONF080027-01

O02

MCONF010061-01

O03

MCONF040012-01

O04

MCONF040095-01

O05

MCONF040095-01

O06

MCONF010061-01

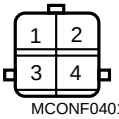
R Connector

S4RS0A910F009

R01 (TO L15)

MCONF040100-01

R02



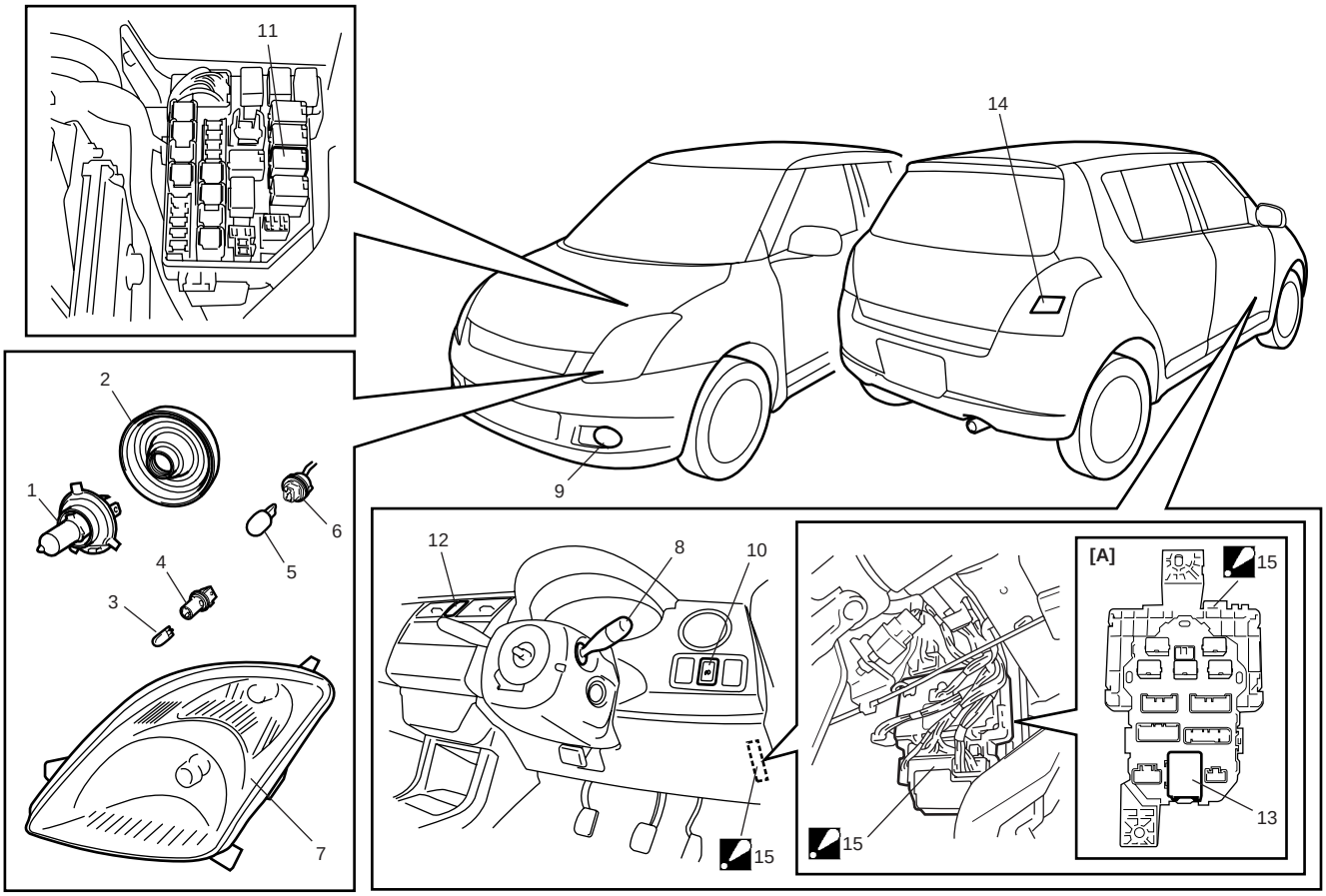
MCONF040101-01

Lighting Systems

Component Location

Lighting System Location

S4RS0A9203001

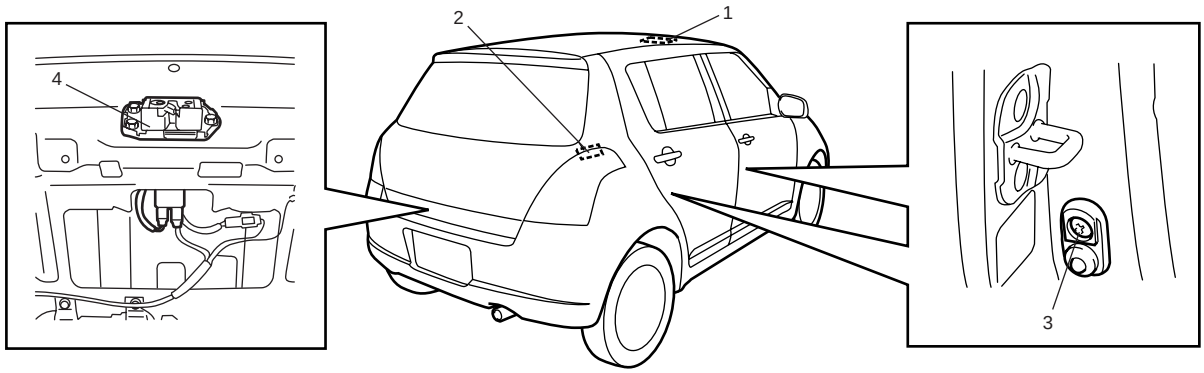


I4RS0A920001-

1. Headlight bulb	7. Headlight unit	13. Turn signal / hazard warning relay
2. Socket cover	8. Lighting switch	14. Rear combination light
3. Clearance light bulb	9. Front fog light (if equipped)	15. Junction block assembly : BCM cannot be removed from junction block.
4. Clearance light bulb socket	10. Front fog light switch (if equipped)	[A]: Junction block assembly viewed from relay side
5. Turn signal light bulb	11. Front fog light relay	
6. Turn signal light bulb socket	12. Hazard warning switch	

Interior Light System Location

S4RS0A9203002



I4RS0A920002-

1. Dome light	3. Door switches (both sides)
2. Luggage compartment light	4. Rear end door switch (included in lock assembly)

Diagnostic Information and Procedures

Headlight Symptom Diagnosis

S4RS0A9204001

Condition	Possible cause	Correction / Reference Item
Headlights do not light up	Bulbs blown	*Replace bulbs.*
	Lighting or dimmer switch faulty	*Check headlight switch referring to "Headlight Switch (in Lighting Switch) Inspection: ".*
	Headlight R and L fuses blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
Only one headlight does not light up	Bulb blown	*Replace bulb.*
	Headlight R or L fuse blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
Only one beam ("Hi" or "Lo") does not light	Bulb blown	*Replace bulb.*
	Lighting or dimmer switch faulty	*Check headlight switch referring to "Headlight Switch (in Lighting Switch) Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Turn Signal and Hazard Warning Light Symptom Diagnosis

S4RS0A9204003

Condition	Possible cause	Correction / Reference Item
Flash rate high or one side only flashes	Bulb blown on “flash rate high”-side	*Replace bulb.*
	Incorrect bulb	*Replace bulb.*
	Turn signal / hazard warning relay faulty	*Check turn signal / hazard warning relay referring to “Turn Signal and Hazard Warning Relay Inspection: ”.*
	Open circuit or high resistance existing either; between turn signal switch and non lighting bulb, or between hazard warning switch and non lighting bulb	*Repair circuit.*
	Wiring or grounding faulty	*Repair circuit.*
No flashing ***NOTE:*** • ***Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to “Diagnosis Using Output Test Function of SUZUKI Scan Tool” under “Scan Tool Data: in Section 10B”.*** • ***Check each part in the order from the top of the following list.***	Circuit fuse(s) blown	*Replace fuse(s) and check for short circuit.*
	Hazard warning switch faulty	*Check hazard warning switch referring to “Hazard Warning Switch Inspection: ”.*
	Turn signal light switch faulty	*Check turn signal light switch referring to “Turn Signal Light Switch (in Lighting Switch) Inspection: ”.*
	Turn signal / hazard warning relay faulty	*Check turn signal / hazard warning relay referring to “Turn Signal and Hazard Warning Relay Inspection: ”.*
	Open circuit or high resistance existing between battery and switch	*Repair circuit.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Flash rate low	Supply voltage low	*Check charging system.*
	Turn signal / hazard warning relay faulty	*Check turn signal / hazard warning relay referring to “Turn Signal and Hazard Warning Relay Inspection: ”.*

Clearance, Tail and License Plate Light Symptom Diagnosis

S4RS0A9204004

Condition	Possible cause	Correction / Reference Item
All lights do not light up	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Lighting and dimmer switch of combination switch faulty	*Check lighting and dimmer switch referring to “Headlight Switch (in Lighting Switch) Inspection: ”.*
	Wiring or grounding faulty	*Repair circuit.*
Some lights do not light up	Bulb(s) blown	*Replace bulb(s).*
	Wiring or grounding faulty	*Repair circuit.*

Back-Up Light Symptom Diagnosis

S4RS0A9204005

Condition	Possible cause	Correction / Reference Item
Back-up lights do not light up	Bulb(s) blown	*Replace bulb(s).*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Back-up light switch (M/T) or transmission range sensor (A/T) faulty	*Check back-up light switch or transmission range sensor referring to "Back Up Lamp Switch Inspection: in Section 5B" or "Transmission Range Sensor (Shift Switch) Inspection and Adjustment: in Section 5A".*
	Wiring or grounding faulty	*Repair circuit.*
Back-up lights stay on	Back-up light switch (M/T) or transmission range sensor (A/T) faulty	*Check back-up light switch or transmission range sensor referring to "Back Up Lamp Switch Inspection: in Section 5B" or "Transmission Range Sensor (Shift Switch) Inspection and Adjustment: in Section 5A".*

Stop (Brake) Lamp Symptom Diagnosis

S4RS0A9204006

Condition	Possible cause	Correction / Reference Item
Stop (brake) lamp do not light up	Bulb(s) blown	*Replace bulb(s).*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Stop (brake) lamp switch faulty	*Check stop (brake) lamp switch referring to "Stop (Brake) Lamp Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
Stop (brake) lamp stay on	Stop (brake) lamp switch faulty	*Check or adjust stop (brake) lamp switch referring to "Stop (Brake) Lamp Switch Inspection: " or "Stop Light Switch Adjustment: in Section 4A".*

Front Fog Light Symptom Diagnosis (If Equipped)

S4RS0A9204007

Condition	Possible cause	Correction / Reference Item
Only one light does not light	Bulb blown	*Replace bulb.*
	Wiring or grounding faulty	*Repair circuit.*
Front fog lights do not light	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Front fog light switch faulty	*Check front fog light switch referring to "Front Fog Light Switch Inspection: ".*
	Front fog light relay faulty	*Check front fog light relay referring to "Front Fog Light Relay Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Interior Light Symptom Diagnosis

S4RS0A9204009

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Dome light does not light up	Bulb blown	*Replace bulb.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Dome light switch faulty	*Check dome light switch.*
	Door switch faulty	*Check door switch referring to "Door Switch (Front / Rear Door) Inspection: in Section 9C".*
	Wiring or grounding	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Luggage compartment light does not light up	Bulb blown	*Replace bulb.*
	Back door switch faulty	*Check switch referring to "Rear End Door Switch Inspection: in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*

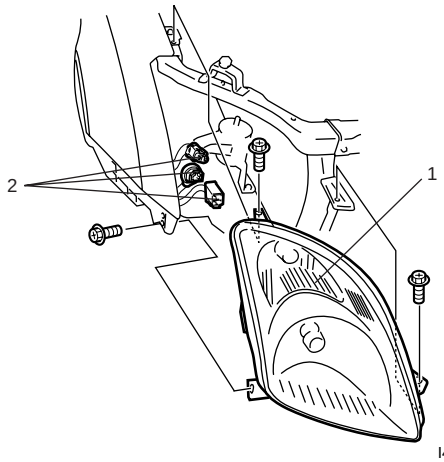
Repair Instructions

Headlight Housing Removal and Installation

S4RS0A9206001

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper. Refer to "Front Bumper and Rear Bumper Components: in Section 9K".
3) Remove headlight mounting bolts.
4) Detach headlight housing (1) from vehicle.
5) Disconnect couplers (2) from headlight housing (1).

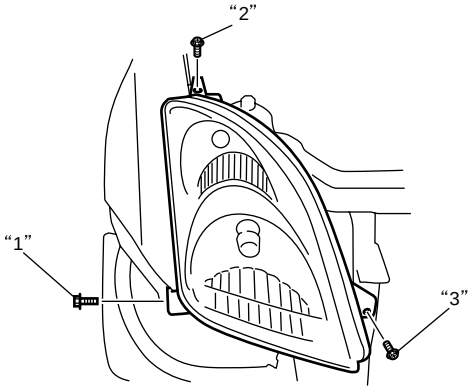


I4RS0A920003-

Installation

Reverse removal procedure noting the following.

- Install headlight mounting bolts, and then tighten headlight mounting bolts ("1" – "3") according to numerical order as shown in figure.



I4RS0A920004-

- After installation, be sure to inspect and adjust aiming referring to "Headlight Aiming Adjustment with Screen: ".

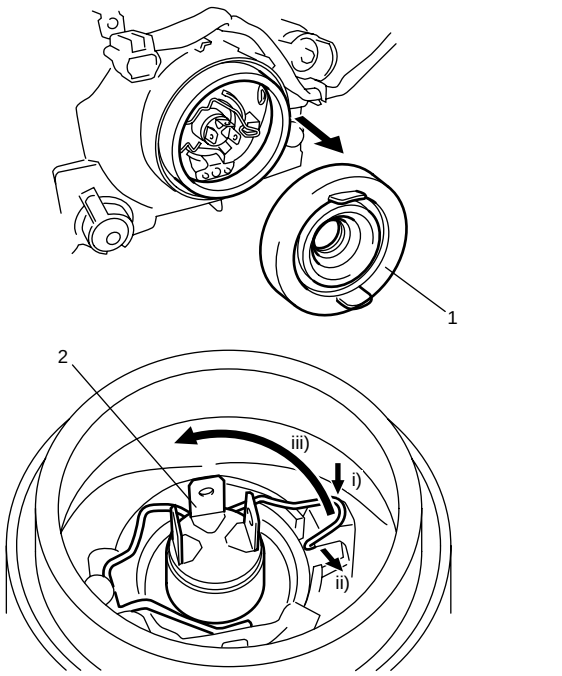
Headlight Bulb Replacement

S4RS0A9206002

WARNING:

- **To avoid danger of being burned, don't touch when the bulb is hot.**
- **Don't touch glass surface of bulb, to avoid deteriorate as the case may be unclear when bulb light on at dirty condition.**

1) Disconnect negative (–) cable at battery.
2) Disconnect coupler from bulb.
3) Remove socket cover (1).
4) Replace bulb (2) and assemble all removed parts.



I4RS0A920005-

Headlight Aiming Adjustment with Screen

S4RS0A9206003

NOTE:

- **Unless otherwise obligated by local regulations, adjust headlight aiming according to the following procedure.**
- **After replacing headlight housing, be sure to adjust aiming.**

1) Make sure the following items.
   - Place vehicle on a flat surface in front of blank wall (screen) (1) ahead of headlight surface.

   Distance "a"
   10 m (32.8 ft.)

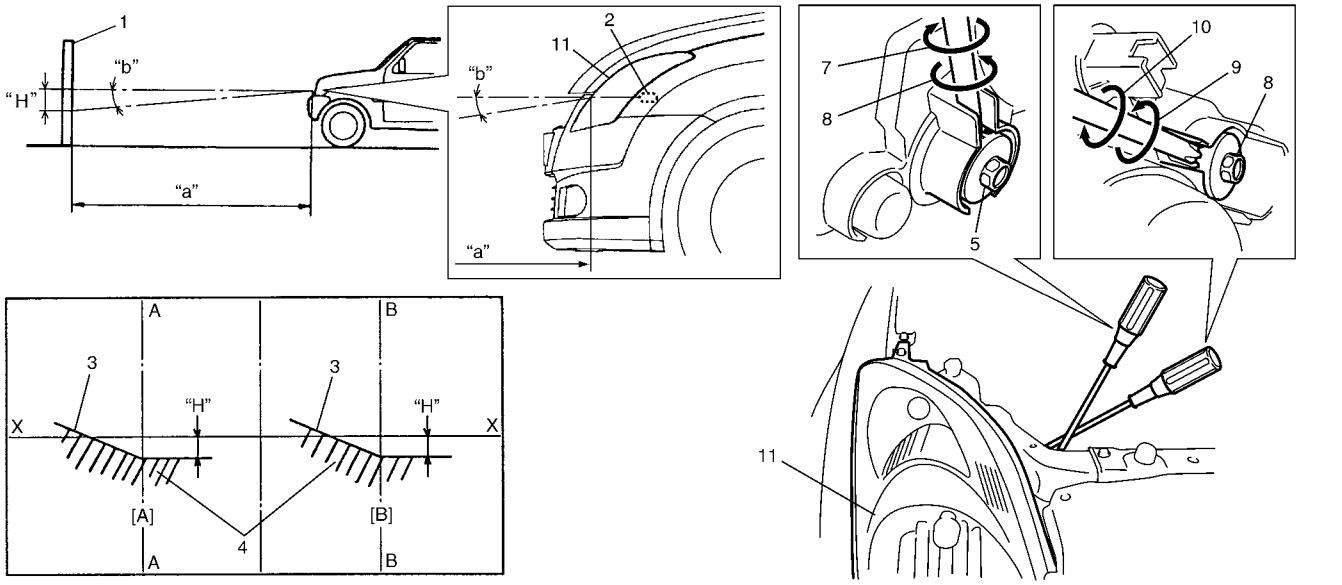
   - Adjust air pressure of all tires to the specified value respectively.
   - Bounce vehicle body up and down by hand to stabilize suspension.
   - Carry out aiming with a driver aboard.

   Driver's weight
   75 kg (165 lb)

2) Check to see if hot spot (high intensity zone) of each low beam axis falls as shown in figure.

   Hot spot specification
   Angle "b": 0.75° (Specification)
   Calculated distance "H": Approx. 130 mm (5.15 in.)

3) Align headlight aiming to specification by adjusting aiming gear if it is not set properly.



I4RS0A920006-

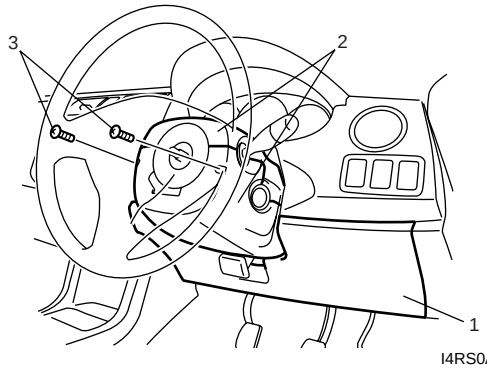
2. Headlight bulb	7. Turning (for down adjustment)	X-X: Horizontal center line of headlight bulbs
3. Cut line (bounding line)	8. Aiming gear (for right / left adjustment)	A-A: Vertical center line of left headlight bulb
4. Hot spot	9. Turning (for right adjustment)	B-B: Vertical center line of right headlight bulb
5. Aiming gear (for up / down adjustment)	10. Turning (for left adjustment)	[A]: Left headlight
6. Turning (for up adjustment)	11. Headlight housing	[B]: Right headlight

Headlight Switch (in Lighting Switch) Removal and Installation

S4RS0A9206004

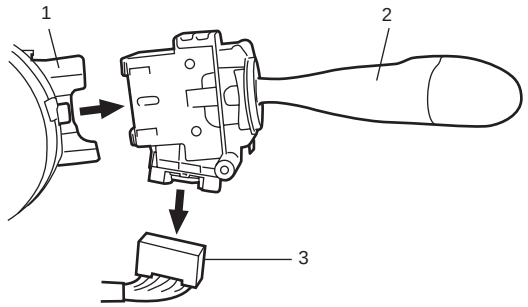
Removal

1) Disconnect negative cable at battery.
2) Remove steering column hole cover (1).
3) Remove steering column covers (2).
   Turn steering wheel to remove steering column cover screws (3).



I4RS0A920007-

4) Remove lighting switch (1) from combination switch assembly (2) and disconnect its coupler (3).



I4RS0A920008-

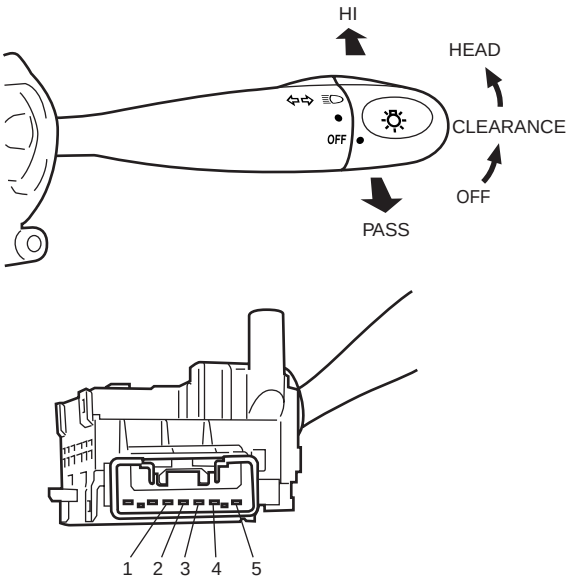
Installation

Reverse removal procedure for installation.

Headlight Switch (in Lighting Switch) Inspection

S4RS0A9206005

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Shaft condition \ Terminal		5	3	1	2	4
OFF	LOW					
	PASS				○	○
	HI					
CLEARANCE	LOW	○	○			
	PASS	○	○		○	○
	HI	○	○			
HEAD	LOW	○	○	○	○	○
	PASS	○	○		○	○
	HI	○	○		○	○

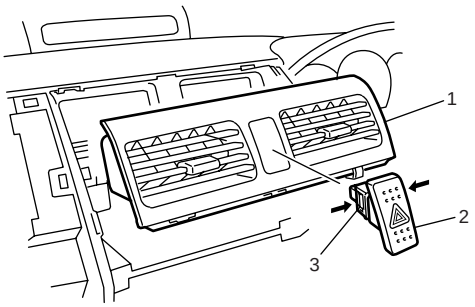
I4RS0A920009-

Hazard Warning Switch Removal and Installation

S4RS0A9206019

Removal

1) Disconnect negative (–) cable at battery.
2) Remove center ventilation louver (1) referring to “Center Ventilation Louver Removal and Installation: in Section 7A”.
3) Disconnect coupler, and then remove hazard warning switch (2) from center ventilation louver (1) while releasing the locks (3).



I4RS0A920010-

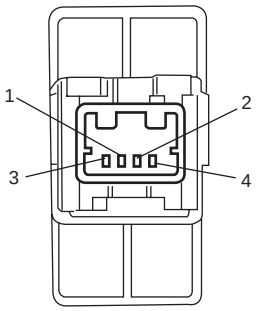
Installation

Reverse removal procedure for installation.

Hazard Warning Switch Inspection

S4RS0A9206010

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Shaft condition \ Terminal	1	2	3	4
OFF			○ W ○	
ON	○	○	○ W ○	

I4RS0A920011-

Stop (Brake) Lamp Switch Inspection

S4RS0A9206011

Check stop (brake) lamp switch for continuity between terminals at each switch position.
If check result is not as specified, replace switch.

Shaft condition \ Terminal	1	2	3	4
FREE	○	○	○	○
PUSH				

I4RS0A920012-

Turn Signal Light Switch (in Lighting Switch) Removal and Installation

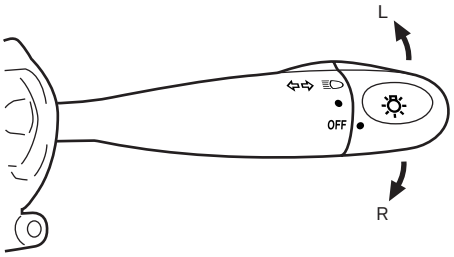
S4RS0A9206012

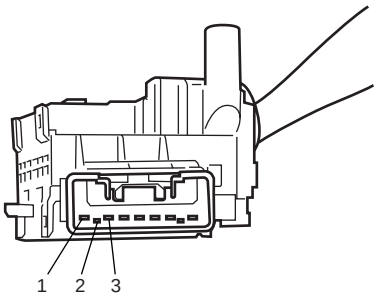
For removal and Installation, refer to “Headlight Switch (in Lighting Switch) Removal and Installation: ”.

Turn Signal Light Switch (in Lighting Switch) Inspection

S4RS0A9206013

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.





Turn signal SW \ Terminal	1	2	3
L		○	○
N			
R	○	○	

I4RS0A920013-

Turn Signal and Hazard Warning Relay Removal and Installation

S4RS0A9206020

Removal

1) Disconnect negative (–) cable at battery.
2) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation: in Section 10B”.
3) Remove turn signal and hazard warning relay.

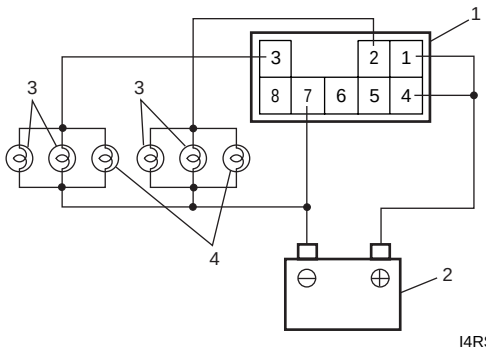
Installation

Reverse removal procedure for installation.

Turn Signal and Hazard Warning Relay Inspection

S4RS0A9206021

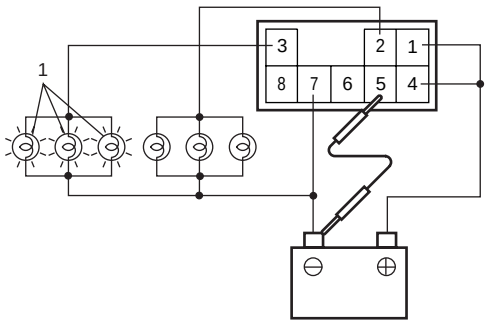
1) Connect turn signal and hazard warning relay (1), battery (2) and six test bulbs ((12V, 21W) (3) and 12 V, 5W (4)) as shown.



I4RS0A920014-

2) Check turn L circuit
Connect terminal “5” and battery negative (–) terminal by a jumper wire.
Check left side bulbs (1) for flashing cycle.
If check result is not as specified, replace turn signal and hazard warning relay.

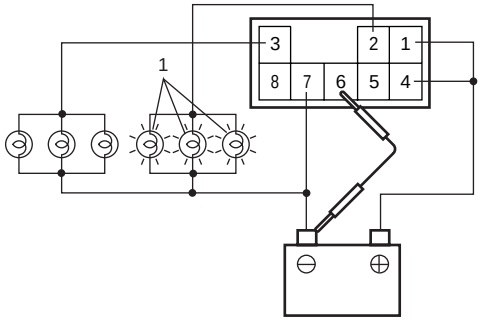
Reference flashing cycle
60 – 120 cycle/minute



I4RS0A920015-

3) Check turn R circuit
Connect terminal “6” and battery negative (–) terminal by a jumper wire.
Check right side bulbs (1) for flashing cycle.
If check result is not as specified, replace turn signal and hazard warning relay.

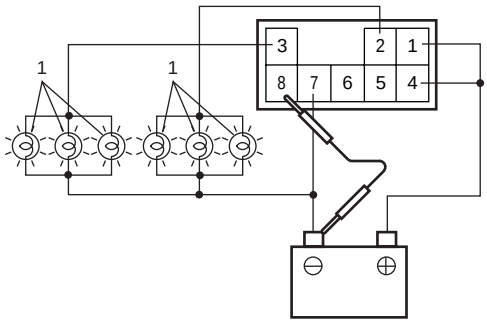
Reference flashing cycle
60 – 120 cycle/minute



I4RS0A920016-

4) Check Hazard ON circuit
Connect terminal “8” and battery negative (–) terminal by a jumper wire.
Check all bulbs (1) for flashing cycle.
If check result is not as specified, replace turn signal and hazard warning relay.

Reference flashing cycle
60 – 120 cycle/minute



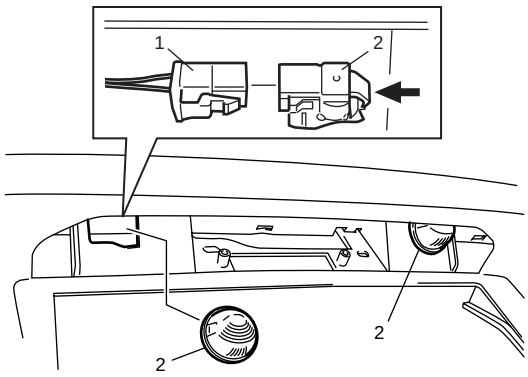
I4RS0A920017-

License Lamp Assembly Removal and Installation

S4RS0A9206022

Removal

1) Disconnect negative (–) cable at battery.
2) Remove rear bumper. Refer to “Front Bumper and Rear Bumper Components: in Section 9K”
3) Disconnect coupler (1) from license lamp assembly (2).
4) Push locking part to arrow direction, and then remove license lamp assembly (2).



I4RS0A920018-

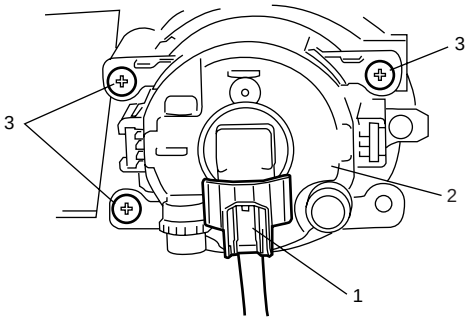
Installation
Reverse removal procedure for installation.

Front Fog Light Assembly Removal and Installation

S4RS0A9206016

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper. Refer to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect couplers (1) from fog light (2).
4) Remove fog light screws (3), and remove front fog light assembly (2).



I4RS0A920019-

Installation
Reverse removal procedure for installation nothing the following:

- After installing, adjust aiming referring to “Front Fog Light Aiming Adjustment with Screen: ”.

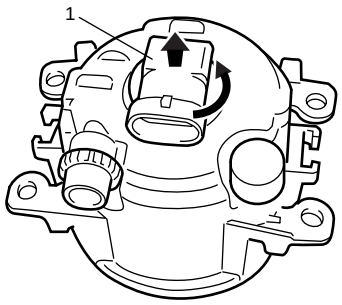
Front Fog Light Bulb Replacement

S4RS0A9206017

WARNING:

- **To avoid danger of being burned, don't touch when the bulb is hot.**
- **Don't touch glass surface of bulb to avoid deteriorate as the case may be unclear when bulb light on at dirty condition.**

1) Remove fog light referring to "Front Fog Light Assembly Removal and Installation: ".
2) Remove fog light bulb (1) as shown.



I4RS0A920020-

3) Replace fog light bulb and assemble all removed parts.

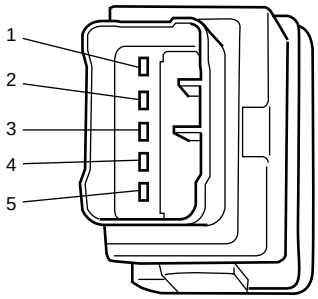
Front Fog Light Switch Inspection

S4RS0A9206018

NOTE:

Front fog lights light up only when headlight switch is in HEADLIGHT position (low or high beams) or SMALL position. Front fog lights turn OFF automatically when headlight switch is turned to OFF position. If front fog light switch holds ON position, front fog lights turn ON automatically when headlight switch is tuned to HEADLIGHT position (low or high beams) or SMALL position again.

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



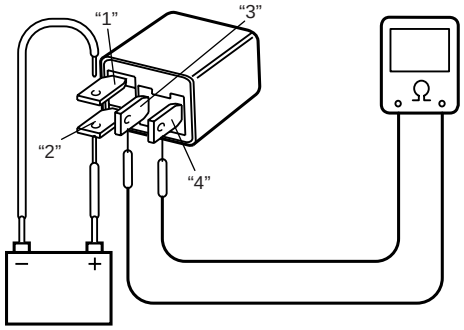
Terminal / Switch Position	2	3	1	5	4
OFF		○	○	○	○
ON (PUSH IN)	○	○	○		

I4RS0A920021-

Front Fog Light Relay Inspection

S4RS0A9206009

1) Check that there is no continuity between terminal "3" and "4". If there is continuity, replace relay.
2) Connect battery positive (+) terminal to terminal "2" of relay.
3) Connect battery negative (–) terminal to terminal "1" of relay.
4) Check continuity between terminal "3" and "4". If there is no continuity when relay is connected to the battery, replace relay.



I4RS0A920022-

Front Fog Light Aiming Adjustment with Screen

S4RS0A9206023

Basic Aiming

NOTE:

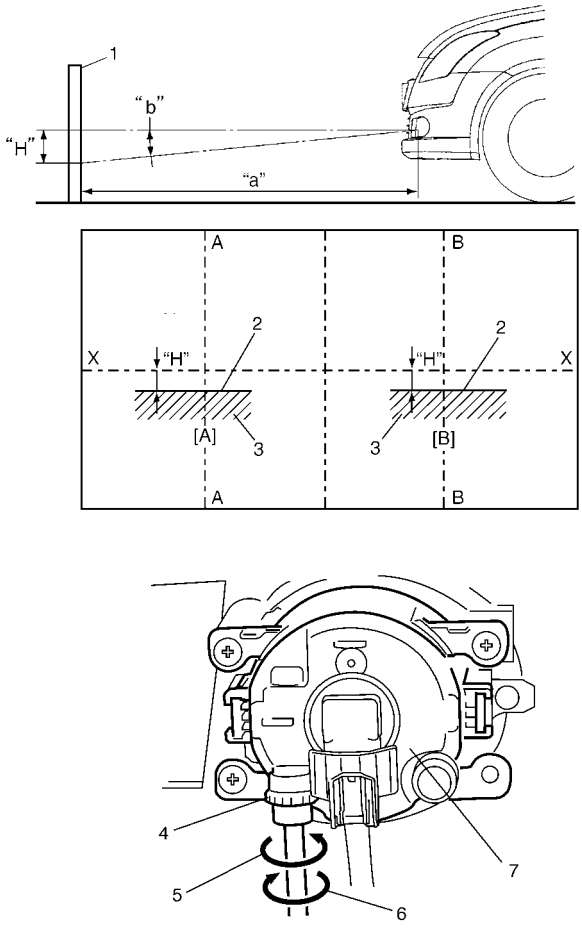
- **Unless otherwise obligated by local regulations, adjust front fog light aiming according to the following procedure.**
- **An example in case that the light-to-wall distance 10 m is shown in the illustration. The beam descending distance "H" is calculated when "a" is 10 m with the specification angle "b" (1.14°).**

1) Make sure the following items.
   - Place vehicle on a flat surface in front of blank wall (screen) (1) ahead of front fog light surface.

     Distance between screen and front fog light
     "a": 10 m (32.8 ft.)
   - Adjust air pressure of all tires to the specified value respectively.
   - Bounce vehicle body up and down by hand to stabilize suspension.
   - Carry out aiming with a driver aboard.

     Driver's weight
     75 kg (165 lb)
2) Check to see if hot spot (high intensity zone) of each front fog light axis falls as shown in the figure.

   Hot spot specification
   Angle "b": 1.14° (Specification)
   Calculated distance "H": Approx. 199 mm (7.83 in.)
3) If it is not set properly, align front fog light to specification by rotating aiming gear.



I4RS0B920011-

2.	Bounding line
3.	Hot spot
4.	Aiming gear (for up / down adjustment)
5.	Turning (for up adjustment)
6.	Turning (for down adjustment)
7.	Front fog light assembly
X-X:	Horizontal center line of front fog light bulb
A-A:	Vertical center line of left front fog light bulb
B-B:	Vertical center line of right front fog light bulb
[A]:	Left front fog light
[B]:	Right front fog light

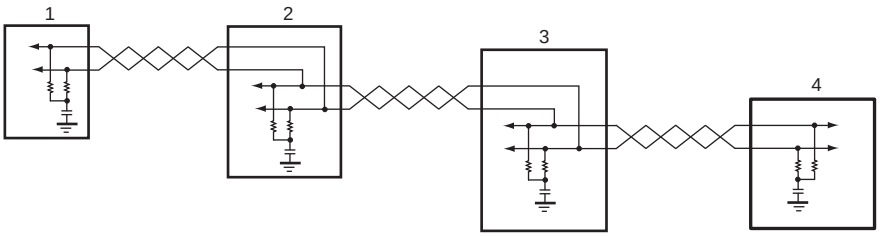
Instrumentation / Driver Info. / Horn

General Description

CAN Communication Data of Combination Meter

S4RS0A9301001

Communication of ECM (3), TCM (if equipped) (4), BCM (2) and combination meter (1) is established by CAN (Controller Area Network).



I4RS0A930035-

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneoulsy. In addition, it has a functionality to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. Combination meter receives the following information from each control module.

Data which combination meter receives from ECM

- Engine revolution speed signal
- Engine coolant temperature signal
- Vehicle speed signal
- Malfunction indicator lamp (MIL) control signal
- Immobilizer lamp control signal

Data which combination meter receives from TCM (A/T model)

- Transmission range sensor signal (A/T select lever position indicator)
- Malfunction indicator lamp (MIL) control signal

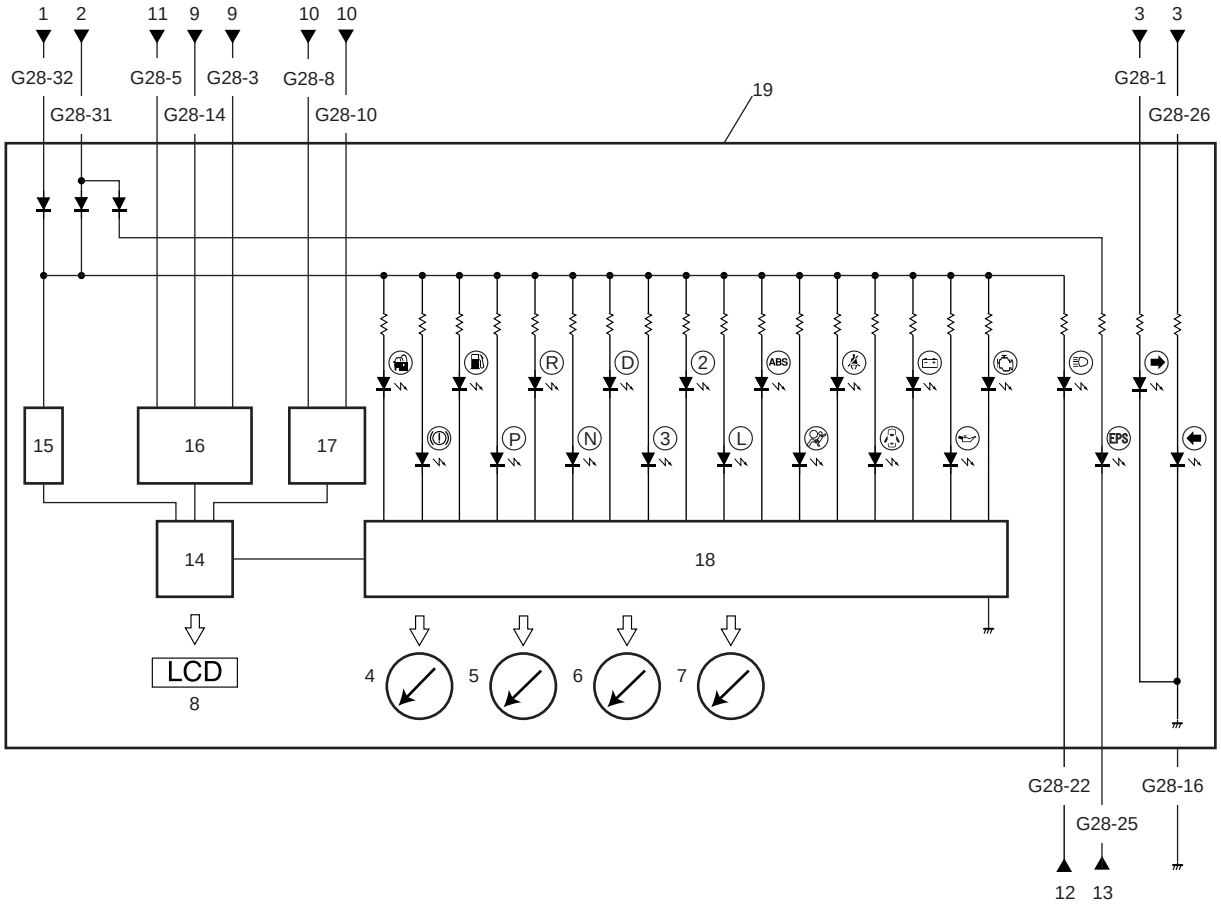
Data which combination meter receives from BCM

- Brake fluid level switch signal (brake warning light control signal)
- Parking brake switch signal (brake warning light control signal)
- Driver side seat belt buckle switch signal (Seat belt warning light control signal)
- Charging system warning lamp signal (Charge warning light control signal)
- Engine oil pressure switch signal (Oil pressure warning light control signal)
- Lighting switch signal
- Door switch signal (door ajar warning lamp)

Schematic and Routing Diagram

Combination Meter Circuit Diagram

S4RS0A9302001



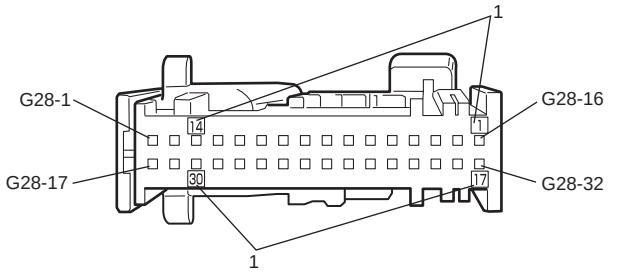
I4RS0A930002-

1. Main fuse	6. Fuel meter	11. SDM	16. Interface circuit
2. METER fuse	7. ECT meter	12. Combination switch (high beam)	17. CAN driver
3. Combination switch	8. ODO-TRIP	13. EPS control module	18. Stepper motor and LED output driver
4. Tacho meter	9. ABS control module	14. CPU	19. Combination meter
5. Speedometer	10. BCM	15. Power supply	

Terminal arrangement of coupler viewed from combination meter side

NOTE:

Molded numbers (1) have no relation to the terminal numbers.



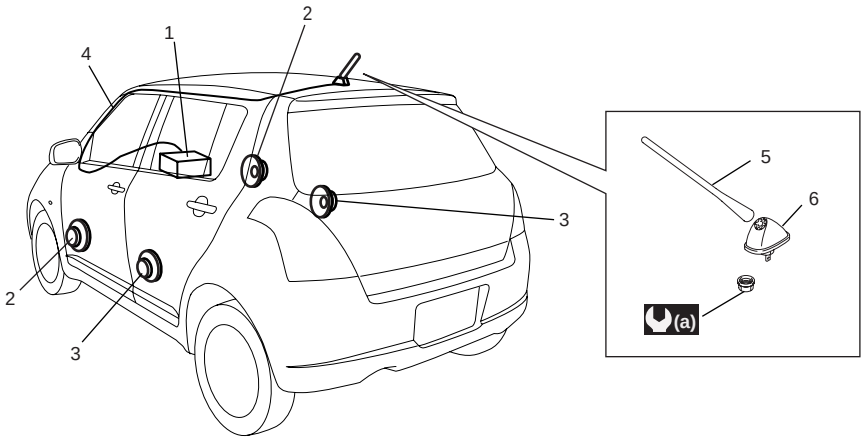
I4RS0A930003-

Terminal	Circuit	Terminal	Circuit
G28-1	To turn signal light switch (turn R)	G28-17	—
G28-2	—	G28-18	—
G28-3	To ABS control module (EBD warning lamp control signal)	G28-19	—
G28-4	—	G22-20	—
G28-5	To SDM (air bag indicator control signal)	G28-21	—
G28-6	—	G28-22	To lighting switch (high beam)
G28-7	—	G28-23	—
G28-8	CAN communication line (Active High Signal)	G28-24	—
G28-9	—	G28-25	To EPS control module (EPS indicator control signal)
G28-10	CAN communication line (Active Low Signal)	G28-26	To turn signal light switch (turn L)
G28-11	—	G28-27	—
G28-12	—	G28-28	—
G28-13	—	G28-29	—
G28-14	To ABS control module (ABS warning lamp control signal)	G28-30	—
G28-15	—	G28-31	To METER fuse
G28-16	GND	G28-32	To RADIO fuse

Component Location

Audio System Component Location

S4RS0A9303001



I4RS0A930004-

1. Radio assembly	4. Antenna feeder	(a) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
2. Front speaker	5. Antenna	
3. Rear speaker	6. Antenna base with antenna amplifier	

Diagnostic Information and Procedures

Speedometer and VSS Symptom Diagnosis

S4RS0A9304001

NOTE:

Make sure that any DTC is not detected by both ECM and TCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Speedometer shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	VSS faulty (M/T vehicle)	*Check VSS referring to "Vehicle Speed Sensor (VSS) Inspection (M/T model): in Section 1C".*
	Output shaft speed sensor / VSS faulty (A/T vehicle)	*Check output shaft speed sensor / VSS referring to "Output Shaft Speed Sensor (VSS) Inspection: in Section 5A".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Tacho meter Symptom Diagnosis

S4RS0A9304015

NOTE:

Make sure that any DTC is not detected by ECM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Tacho meter shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Engine Coolant Temperature (ECT) Meter Symptom Diagnosis

S4RS0A9304016

NOTE:

Make sure that any DTC is not detected by ECM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Engine coolant temperature (ECT) meter shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Fuel Meter Symptom Diagnosis

S4RS0A9304017

NOTE:

Make sure that any DTC is not detected by ECM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Fuel meter shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Low Fuel Warning Light Symptom Diagnosis

S4RS0A9304018

NOTE:

- **Make sure that any DTC is not detected by ECM an before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.**
- **Confirm that fuel meter is in good condition before referring to the following possible causes.**
  - **When fuel level meter circuit is shorted to ground circuit, fuel level meter indicates empty and low fuel warning lamp comes ON even if fuel tank does not empty.**
  - **The low fuel warning light comes ON when fuel level is lower than specification below.**

Low fuel warning light operation:

Low fuel warning light operation:	Fuel amount:	Resistance of fuel level sensor:
ON	Approx. 6.5 liter	Approx. 251 Ω

Condition	Possible cause	Correction / Reference Item
Low fuel warning light does not come ON when fuel level is lower than specification	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Low fuel warning light comes ON steady	Low fuel	*Refill fuel.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Oil Pressure Warning Light Symptom Diagnosis

S4RS0A9304019

NOTE:

Make sure that any DTC is not detected by BCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Oil pressure warning light does not light up when ignition switch is turned to ON position at engine off	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Oil pressure switch faulty	*Check oil pressure switch referring to "Oil Pressure Switch Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Oil pressure warning light stays ON	Oil pressure switch faulty	*Check oil pressure switch referring to "Oil Pressure Switch Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Brake and Parking Brake Warning Light Symptom Diagnosis

S4RS0A9304020

NOTE:

Make sure that any DTC is not detected by BCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Brake warning light does not light up when brake fluid level is low or parking brake is pulled up or for 5 speeds after turning ON ignition switch (with ABS vehicle only)	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Brake fluid level switch faulty	*Check brake fluid level switch referring to "Brake Fluid Level Switch Inspection: ".*
	Parking brake switch faulty	*Check parking brake switch referring to "Parking Brake Switch Inspection: ".*
	ABS system faulty	*Refer to "ABS Check: in Section 4E".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Brake warning light stays ON	Brake fluid level switch faulty	*Check brake fluid level switch referring to "Brake Fluid Level Switch Inspection: ".*
	Parking brake switch faulty	*Check parking brake switch referring to "Parking Brake Switch Inspection: ".*
	EBD system faulty	*Refer to "EBD Warning Lamp (Brake Warning Lamp) Check: in Section 4E".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Seat Belt Reminder Light Symptom Diagnosis (If Equipped)

S4RS0A9304021

NOTE:

Make sure that any DTC is not detected by BCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Seat belt reminder light does not light up	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Seat belt switch faulty	*Check seat belt switch referring to "Front Seat Belt Inspection: in Section 8A".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Seat belt reminder light stays ON	Seat belt switch faulty	*Check seat belt switch referring to "Front Seat Belt Inspection: in Section 8A".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

A/T Shift Position Indicator (A/T Vehicle Only) Symptom Diagnosis

S4RS0A9304022

NOTE:

Make sure that any DTC is not detected by TCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
All A/T shift position indicator does not light up	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Charge Warning Light Symptom Diagnosis

S4RS0A9304023

NOTE:

Make sure that any DTC is not detected by BCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Charge warning light does not come ON	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Charge warning light stay ON	Charging system faulty	*Check charging system.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Main Beam (High Beam) Indicator Symptom Diagnosis

S4RS0A9304024

Condition	Possible cause	Correction / Reference Item
Main beam (high beam) indicator does not come ON	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Combination switch faulty	*Check combination switch referring to "Headlight Switch (in Lighting Switch) Inspection: in Section 9B".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Main beam (high beam) indicator stay ON	Combination switch faulty	*Check combination switch referring to "Headlight Switch (in Lighting Switch) Inspection: in Section 9B".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Warning Buzzer Circuit Symptom Diagnosis

S4RS0A9304025

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Warning buzzer shows no sounding	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Driver side door switch faulty	*Check driver side door switch referring to "Door Switch (Front / Rear Door) Inspection: ".*
	Lighting switch faulty	*Check lighting switch referring to "Headlight Switch (in Lighting Switch) Inspection: in Section 9B".*
	Key remainder switch faulty	*Check key remainder switch referring to "Ignition Switch Inspection: ".*
	Wiring or ground faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Cigarette Lighter Symptom Diagnosis (If Equipped)

S4RS0A9304010

Condition	Possible cause	Correction / Reference Item
Cigarette lighter shows no operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Cigarette lighter faulty	*Check cigarette lighter.*
	Ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Horn Symptom Diagnosis

S4RS0A9304011

Condition	Possible cause	Correction / Reference Item
Horn does not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Horn switch faulty	*Check horn switch.*
	Horn relay faulty	*Check horn relay.*
	Wiring or grounding faulty	*Repair circuit.*
	Horn faulty	*Replace horn.*

Information Display Symptom Diagnosis (If Equipped)

S4RS0A9304012

NOTE:

This thermometer indicates the ambient temperature in back of front bumper member. Under any one of the following listed conditions, however, even when the ambient temperature goes up, the thermometer display does not rise so as to correct the rise of the ambient temperature caused by the radiant heat of the engine. When the ambient temperature drops, the thermometer reading follows the change in the temperature.
Be sure to bear this in mind when diagnosing trouble.

- **The vehicle speed is 30 km/h (18 mph) or lower.**
- **VSS signal is faulty.**
- **The ignition switch is turned on again within 2 hours.**

Condition	Possible cause	Correction / Reference Item
No displaying of information display	Circuit fuse Blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Information display unit faulty	*Replace unit.*
Incorrect thermometer display	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection: ".*
	VSS signal faulty	*Check VSS referring to "DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: in Section 1A" or "DTC P0722: Output Speed Sensor (VSS) Circuit No Signal: in Section 5A".*
	Wiring and/or grounding faulty	*Repair as necessary.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Display does not change at –30 °C	Outside air temperature is –30 °C (–22 °F) or less	—
	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection: ".*
	Outside air temperature sensor wiring circuit open circuit and/or short to power circuit	*Repair as necessary.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Display does not change at 50 °C	Outside air temperature is 50 °C (122 °F) or more	—
	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection: ".*
	Outside air temperature sensor wiring circuit short to ground circuit	*Repair as necessary.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Audio System Symptom Diagnosis (If Equipped)

S4RS0A9304013

Radio

NOTE:

Electronic part / system with undiagnosed problem may cause electromagnetic interference. Electromagnetic interference condition may have poor radio reception. To test for presence of electromagnetic interference in part / system, perform the following procedures.

1. **Turn ignition switch to OFF.**
2. **Systematically disconnect the electronic part / system connector(s) one at a time.**
3. **Turn ignition switch to ON.**
4. **Check any improvement in radio reception.**

Condition	Possible cause	Correction / Reference Item
Poor radio reception	Out of service area (Poor location)	—
	Antenna faulty	*Replace antenna.*
	Antenna amplifier faulty	*Replace antenna amplifier.*
	Electrical part / system faulty	*Repair or replace electrical part / system referring to after-mentioned NOTE.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Radio does not operate and speaker does not sound	Circuit fuse(s) blown	*Replace fuse(s) and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Radio does not operate, but speaker sound	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Radio is operative, but all speakers does not sound	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Individual speaker is noisy or inoperative	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker faulty	*Replace speaker.*
	Radio assembly faulty	*Replace radio assembly.*
Sound quality is poor	Out of service area (Poor location)	—
	Speaker installed incorrectly	*Install correctly.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker faulty	*Replace speaker.*
	Radio assembly faulty	*Replace radio assembly.*

CD Player

Condition	Possible cause	Correction / Reference Item
CD-ROM does not insert	Another CD-ROM already inserted	*Eject CD-ROM.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Extraneous material come to be mixed CD player	*Clear extraneous material from CD player or replace radio assembly.*
	Radio assembly faulty	*Replace radio assembly.*
CD-ROM does not eject	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Extraneous material come to be mixed in CD player	*Clear extraneous material from CD player or replace radio assembly.*
	Radio assembly faulty	*Replace radio assembly.*
CD player does not load CD-ROM	CD-ROM faulty	—
	CD-ROM inserted with incorrect side up	*Insert correctly.*
	Temperature in cabin is too hot	—
	Water droplets form on internal lens	*Dry about 1 hour with power on.*
	Radio assembly faulty	*Replace radio assembly.*

Condition	Possible cause	Correction / Reference Item
Sound skips or is noisy	CD-ROM faulty	—
	Driving vibration	—
	Water droplets form on internal lens	*Dry about 1 hour with power on.*
	Radio assembly installed incorrectly	*Install correctly.*
	Radio assembly faulty	*Replace radio assembly.*
CD player is operative, but all speakers does not sound	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Individual speaker is noisy or inoperative	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker faulty	*Replace speaker.*
	Radio assembly faulty	*Replace radio assembly.*
Sound quality or volume is poor	CD-ROM faulty	—
	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker installed incorrectly	*Install correctly.*
	Speaker faulty	*Replace speaker.*

Remote Audio Control Switch (If Equipped) Symptom Diagnosis

S4RS0A9304014

Condition	Possible cause	Correction / Reference Item
Audio system is operative, but remote control switch does not control audio system	Remote audio control switch faulty	*Check remote audio control switch referring to "Remote Audio Control Switch Inspection: ".*
	Contact coil faulty	*Replace contact coil.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*

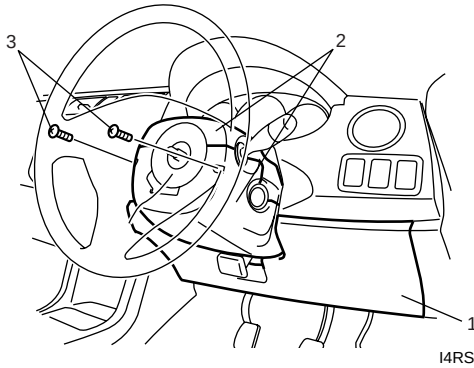
Repair Instructions

Ignition Switch Removal and Installation

S4RS0A9306001

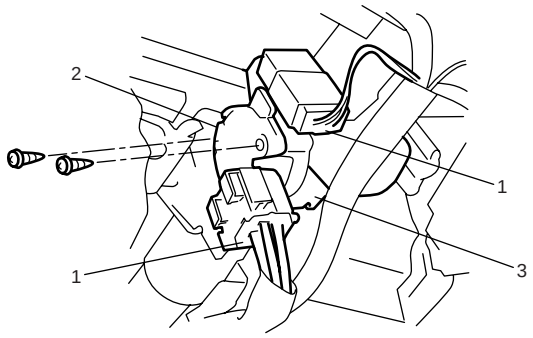
Removal

1) Disconnect negative cable at battery.
2) Confirm that ignition key is removed.
3) Remove steering column hole cover (1).
4) Turn steering wheel to remove steering column cover screws (3) and then remove steering column covers (2).



I4RS0A920007-

5) Disconnect couplers (1) from ignition switch (2).
6) Remove ignition switch (2) from key cylinder (3).



I4RS0A930008-

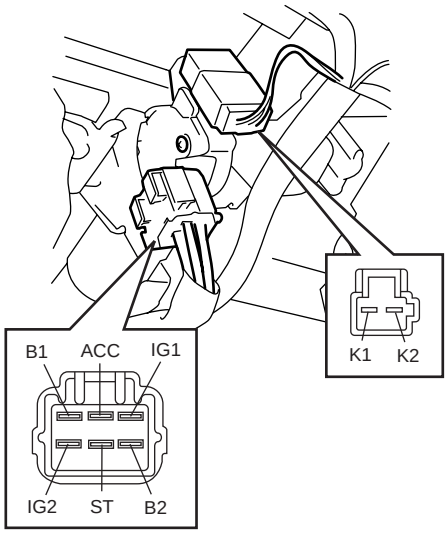
Installation

Reverse removal procedure.

Ignition Switch Inspection

S4RS0A9306002

- Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Key \ Terminal	Position	B1	B2	ACC	IG1	IG2	ST	K1	K2
OFF	LOCK	○							
ON	LOCK	○						○	○
	ACC	○		○					
	ON	○	○	○	○	○			
	START	○	○	○			○		

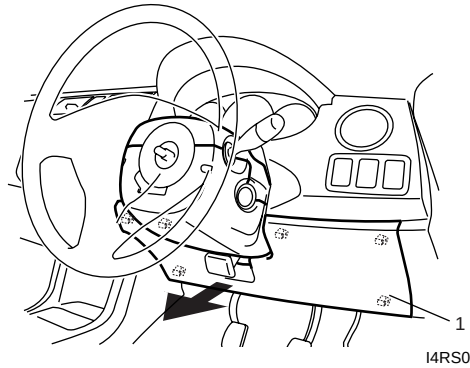
I4RS0A930009-

Combination Meter Removal and Installation

S4RS0A9306003

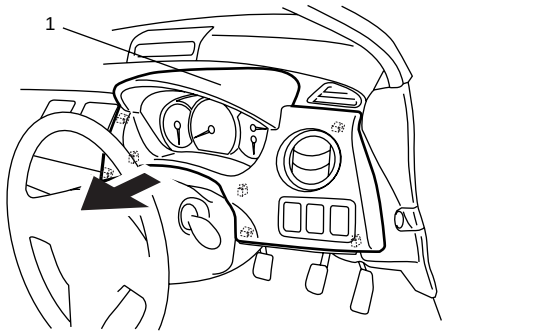
Removal

1) Disconnect negative (–) cable at battery.
2) Remove column hole cover (1) pulling it in arrow direction shown in figure.



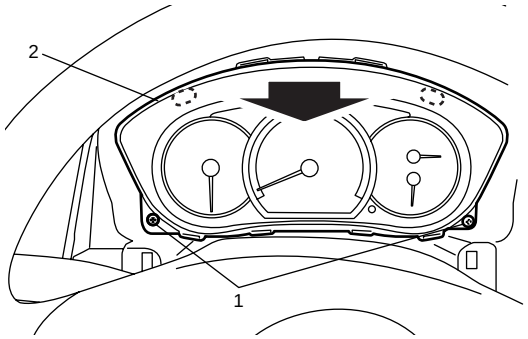
I4RS0A930010-

3) Remove combination meter cluster panel (1) pulling it in arrow direction shown in figure.



I4RS0A930011-

4) Remove screws (1) fastening combination meter.
5) Remove combination meter (2) pulling it arrow direction as shown.



I4RS0A930012-

Installation

Reverse removal procedure.

Fuel Level Sensor Removal and Installation

S4RS0A9306004

Removal

Remove fuel pump assembly referring to “Fuel Pump Assembly Removal and Installation: in Section 1G”.

Installation

Install fuel pump assembly referring to “Fuel Pump Assembly Removal and Installation: in Section 1G”.

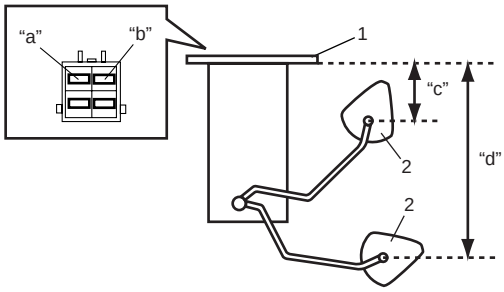
Fuel Level Sensor Inspection

S4RS0A9306005

- Check that resistance between terminals “a” and “b” of fuel level sensor changes with change of float position.
- Check resistance between terminals “a” and “b” at each float position in the following.
  If the measured value is out of specification, replace fuel pump.

Fuel level sensor specifications

Float Position		Resistance (Ω)
Full Upper “c”	**31.0 mm (1.22 in.)**	**40 ± 2**
Full Lower “d”	**172.0 mm (6.77 in.)**	**280 ± 3**



I4RH01930003-

1. Fuel pump	
2. Float	

Oil Pressure Switch Removal and Installation

S4RS0A9306006

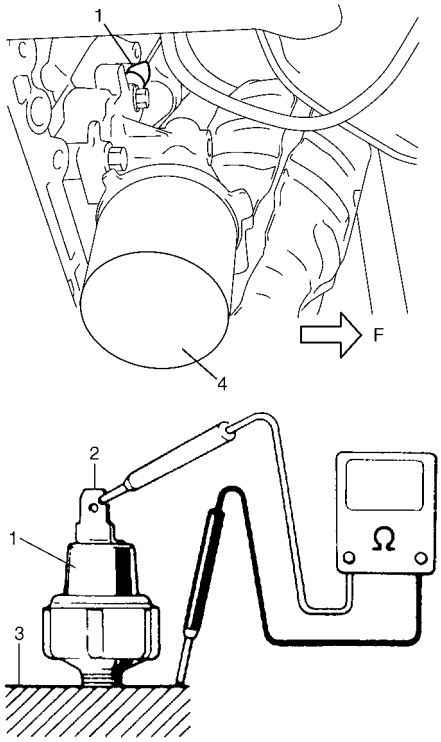
For removal and installation, refer to "Oil Pressure Check: in Section 1E".

Oil Pressure Switch Inspection

S4RS0A9306007

1) Disconnect oil pressure switch (1) lead wire.
2) Check for continuity between oil pressure switch terminal (2) and cylinder block (3) as shown. If check result is not as specified, replace oil pressure switch (1).

Oil pressure sensor specification
During engine running: No continuity
At engine stop: Continuity



I3RM0A930009-

4. Engine oil filter	F: Front

VSS Removal and Installation

S4RS0A9306008

For removal and installation, refer to "Vehicle Speed Sensor (VSS) Removal and Installation: in Section 5B" or "Output Shaft Speed Sensor (VSS) Removal and Installation: in Section 5A".

VSS Inspection

S4RS0A9306009

Refer to "Vehicle Speed Sensor (VSS) Inspection (M/T model): in Section 1C" or "Output Shaft Speed Sensor (VSS) Inspection: in Section 5A".

Engine Coolant Temperature (ECT) Sensor Inspection

S4RS0A9306010

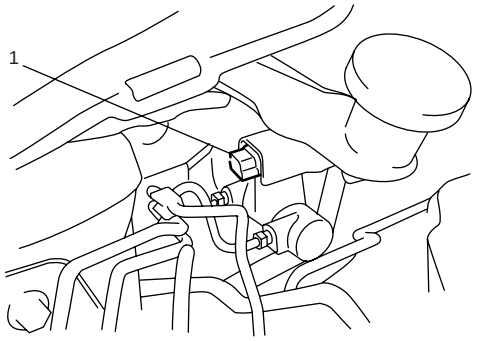
Check engine coolant temperature sensor for resistance, refer to "Engine Coolant Temperature (ECT) Sensor Inspection: in Section 1C".

Brake Fluid Level Switch Inspection

S4RS0A9306011

Check for continuity between terminals of brake fluid level switch coupler (1). If found defective, replace switch.

Brake fluid level switch specification
OFF position (float up): No continuity
ON position (float down): Continuity



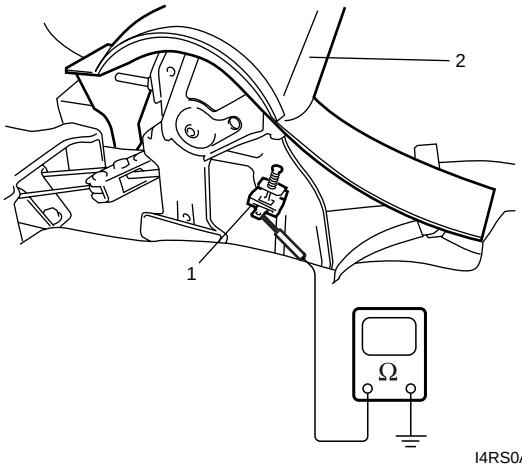
I4RS0A930013-

Parking Brake Switch Inspection

S4RS0A9306012

Check for continuity between parking brake switch terminal and body ground as shown in figure. If found defective, replace switch.

Parking brake switch specification
OFF position (parking brake released): No continuity
ON position (parking brake lever pulled up): Continuity



I4RS0A930014-

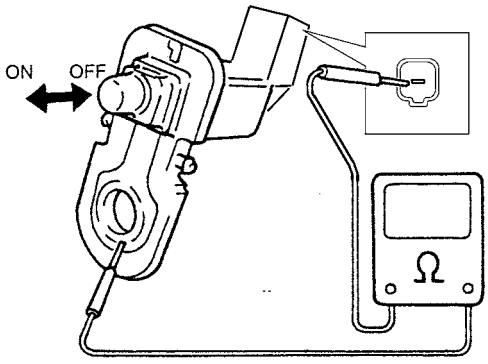
1.	Parking brake switch
2.	Parking brake lever

Door Switch (Front / Rear Door) Inspection

S4RS0A9306013

Remove door switch from body and check switch for continuity. If found defective, replace switch.

Door switch (front / rear door) specification
OFF position (Door closed): No continuity
ON position (Door open): Continuity



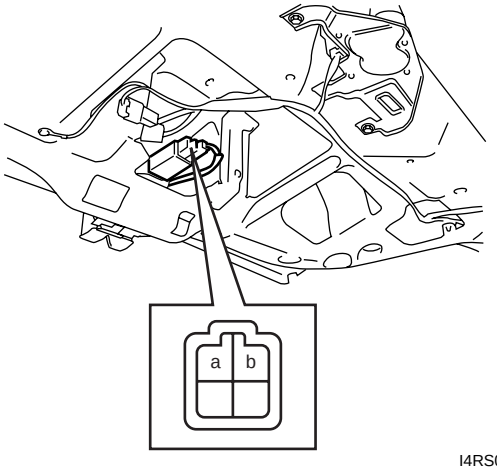
I3RH0A930004-

Rear End Door Switch Inspection

S4RS0A9306014

Check for continuity between terminal “a” and “b” shown in the following.
If check result is not as specified, replace switch.

Rear end door switch specification
Rear end door closed: No continuity
Rear end door opened: Continuity



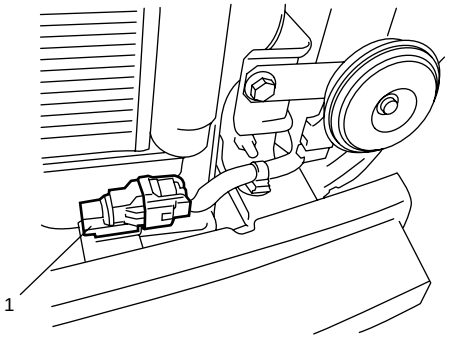
I4RS0A930015-

Outside Air Temperature Sensor Removal and Installation

S4RS0A9306016

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect connector from outside air temperature sensor.
4) Remove outside air temperature sensor (1) from front bumper member.



I4RS0A930016-

Installation

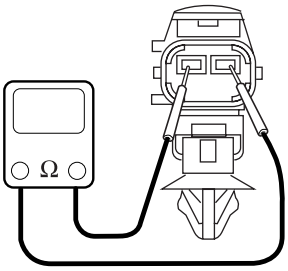
Reverse removal procedure for installation.

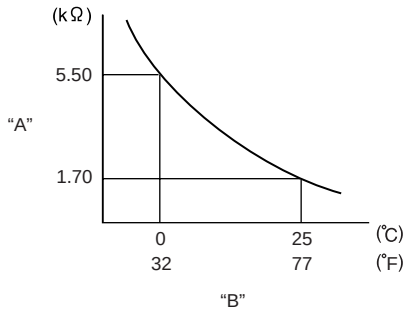
Outside Air Temperature Sensor Inspection

S4RS0A9306017

Measure resistance of outside air temperature sensor using an ohmmeter.
If resistance is out of specification, replace outside air temperature sensor.

Outside air temperature sensor resistance
1.62 kΩ – 1.78 kΩ at 25 °C (77 °F)





I4RS0A930017-

"A":	Resistance
"B":	Temperature

Instrument Panel Removal and Installation

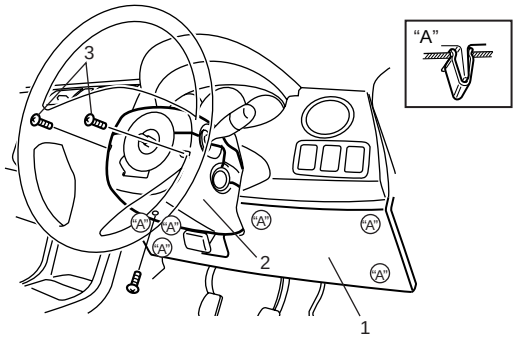
S4RS0A9306018

WARNING:

Refer to "Air Bag Warning: in Section 00" before starting service work.

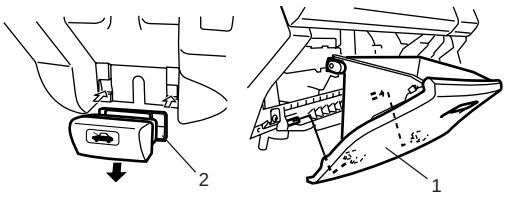
Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to "Disabling Air Bag System: in Section 8B".
3) Remove steering column hole cover (1).
4) Turn steering wheel to remove steering column cover screws (3).
5) Remove steering column covers (2).



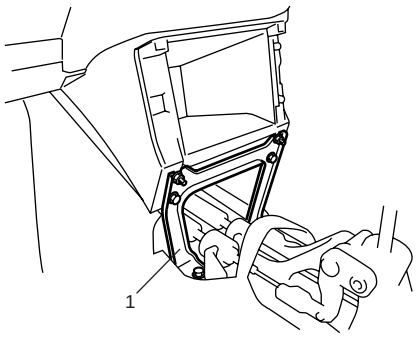
I4RS0A930018-

6) Remove glove box (1).
7) Remove hood latch release lever (2).



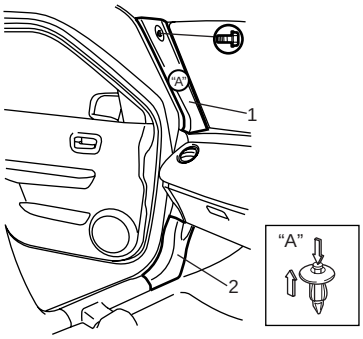
I4RS0A930019-

8) Remove console box referring to "Console Box Components: in Section 9H".
9) Remove instrument panel center lower bracket (1).



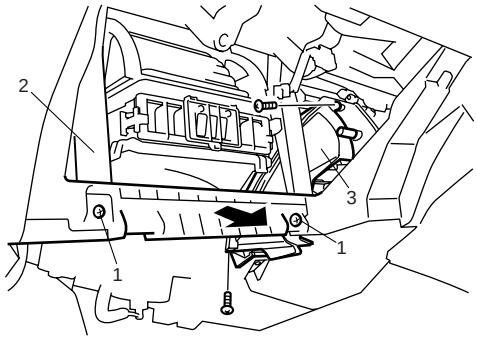
I4RS0A930020-

10) Remove front pillar trims (1) and dash side trims (2).



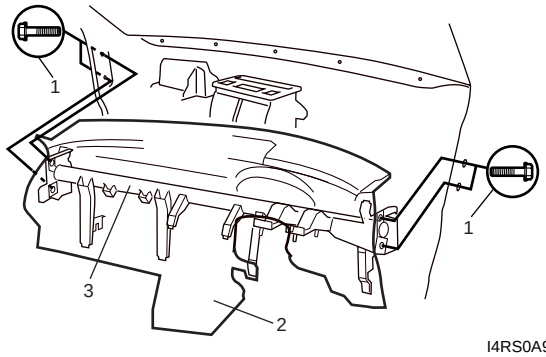
I4RS0A930021-

11) Remove instrument panel mounting screws (1).
12) Detach instrument panel from steering support member (2) and then remove foot duct (3).



I4RS0A930022-

13) Disconnect instrument panel harness connectors, heater control cables and antenna cable instrument panel removal.
14) Remove steering column mounting nuts referring to “Steering Column Removal and Installation: in Section 6B”.
15) Remove instrument panel ground wire.
16) Remove instrument panel mounting bolts (1).
17) Remove instrument panel (2) with steering support member (3) and instrument panel harness.



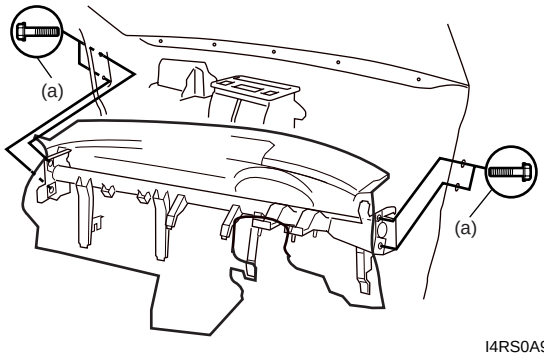
I4RS0A930023-

Installation

Reverse removal procedure noting the following.

- When installing each part, be careful not to catch any cable or wiring harness.
- Tighten instrument panel mounting bolts to specified torque

Tightening torque
Instrument panel mounting bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A930024-

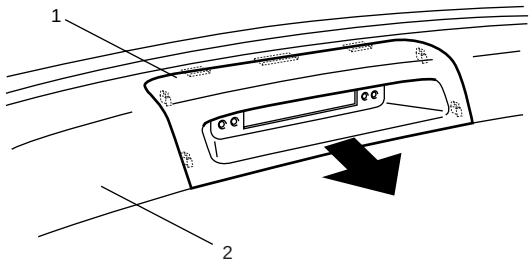
- Tighten steering column mounting nuts referring to “Steering Column Removal and Installation: in Section 6B”.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Information Display Removal and Installation

S4RS0A9306019

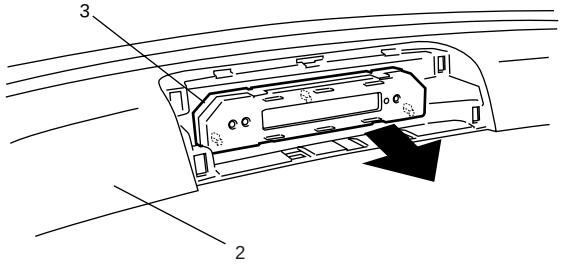
Removal

1) Remove information display garnish (1) from instrument panel (2) pulling it arrow direction as shown.



I4RS0A930032-

2) Remove information display (3) from instrument panel (2) pulling it in arrow direction shown in figure.
3) Disconnect information display coupler.



I4RS0A930025-

Installation

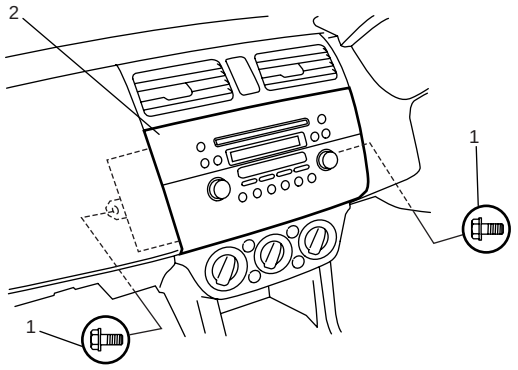
Reverse removal procedure.

Radio Assembly Removal and Installation

S4RS0A9306020

Removal

1) Disconnect negative (–) cable at battery.
2) Remove globe box referring to “Instrument Panel Removal and Installation: ”.
3) Remove 2 mounting bolts (1).
4) Disconnect electrical connectors from radio assembly.
5) Remove radio assembly (2) from instrument panel.



I4RS0A930026-

Installation

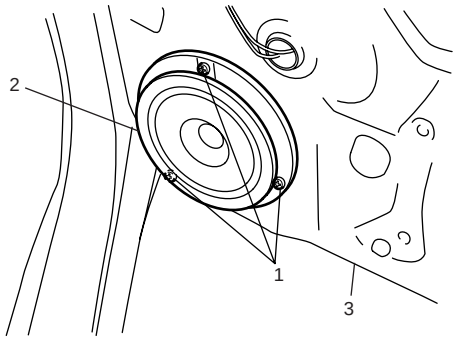
Reverse removal procedure.

Front Speaker Removal and Installation

S4RS0A9306021

Removal

1) Remove door trim referring to Step 1) to 3) of “Front Door Glass Removal and Installation: in Section 9E”.
2) Remove 3 front speaker mounting screws (1).
3) Remove front speaker (2) from front door (3).
4) Disconnect front speaker coupler from front speaker (2).



I4RS0A930027-

Installation

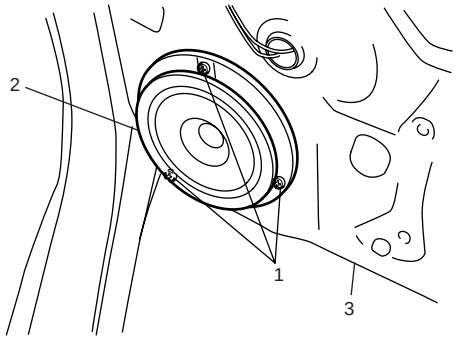
Reverse removal procedure.

Rear Speaker Removal and Installation

S4RS0A9306022

Removal

1) Remove door trim referring to Step 1) to 3) of “Rear Door Glass Removal and Installation: in Section 9E”.
2) Remove 3 rear speaker mounting screws (1).
3) Remove rear speaker (2) from rear door (3).
4) Disconnect rear speaker coupler from rear speaker (2).



I4RS0A930027-

Installation

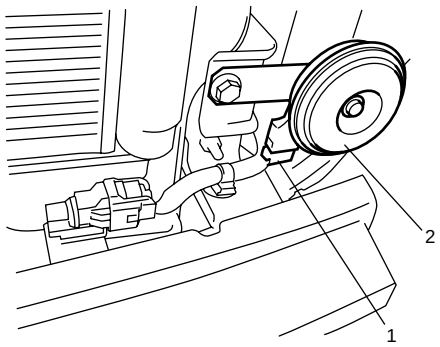
Reverse removal procedure.

Horn Removal and Installation

S4RS0A9306027

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect horn connector (1).
4) Remove horn (2).



I4RS0A930028-

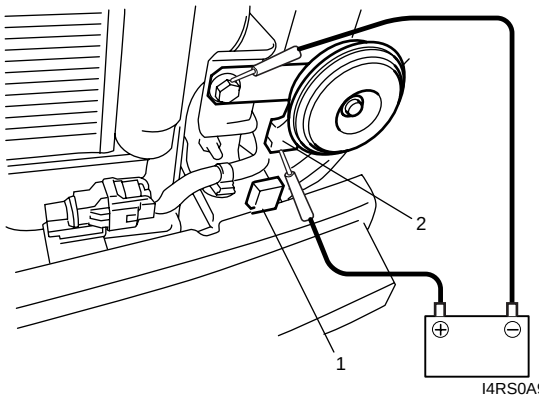
Installation

Reverse removal procedure for installation.

Horn Inspection

S4RS0A9306029

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Disconnect horn connector (1).
4) Connect battery positive (+) to terminal of horn connector (2) and negative (–) terminal to body ground.
   If horn is not sounding, replace horn.

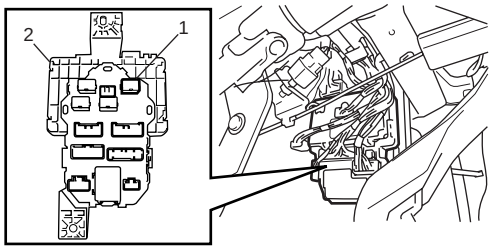


I4RS0A930030-

Horn Relay Inspection

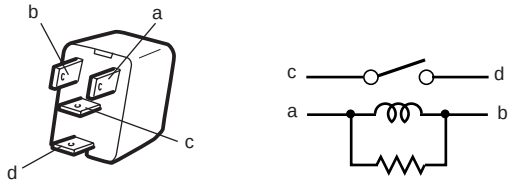
S4RS0A9306028

1) Disconnect negative (–) cable at battery.
2) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation: in Section 10B”.
3) Remove horn relay (1) from junction block assembly (2).



I4RS0A930029-

4) Check that there is no continuity between terminal “c” and “d”. If there is continuity, replace relay.
5) Check that there is continuity between terminals “c” and “d” when a 12 V battery is connected to terminals “a” and “b”. If malfunction is found, replace it with a new one.



I3JA01920006-

Antenna Amplifier Removal and Installation

S4RS0A9306025

NOTE:

Antenna amplifier incorporated with antenna base.

Removal

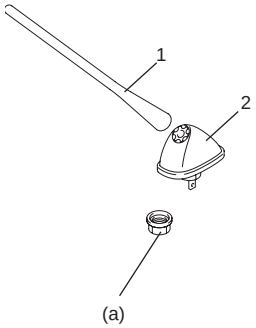
1) Remove head lining referring to “Head Lining Removal and Installation: in Section 9H”.
2) Remove antenna (1) from antenna base (2).
3) Disconnect antenna feeder from antenna base (2).
4) Remove antenna base (2) from vehicle.

Installation

Reverse removal procedure noting the following.

- Tighten antenna base mounting nut to specified torque.

  Tightening torque
  Antenna base mounting nut (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



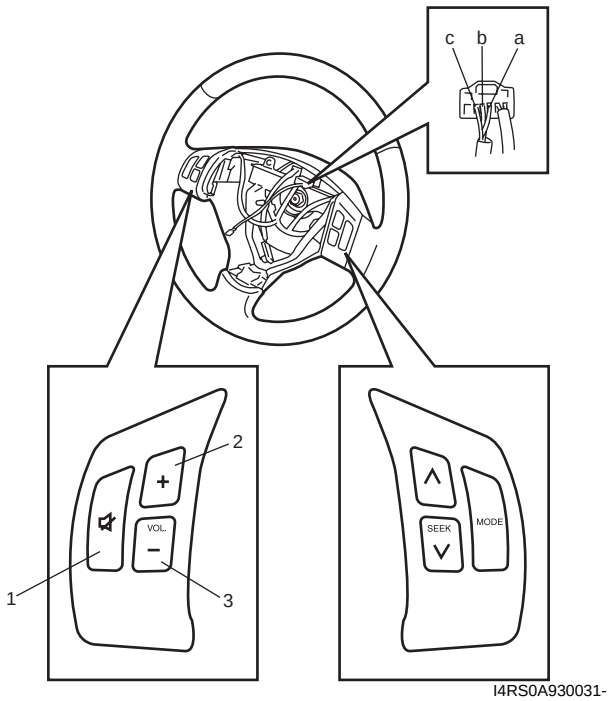
I4RH01930009-

Remote Audio Control Switch Inspection

S4RS0A9306026

1) Remove driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
2) Disconnect remote audio control switch connector from contact coil.
3) Check switch for resistance between “a” and “c” terminals under each condition below.
   If check result is not satisfactory, replace remote audio control switch.

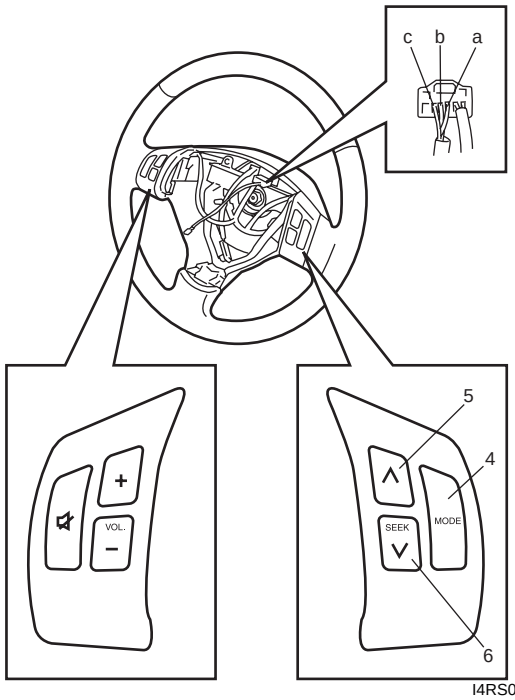
   “ENTER”, “+” and “–” switch resistance
   All switches released (OFF): 4700 – 5600 kΩ
   “ENTER” switch (1) pushing on (ON): 50 – 60 Ω
   “+” switch (2) pushing on (ON): 120 – 140 Ω
   “–” switch (3) pushing on (ON): 220 – 260 Ω



I4RS0A930031-

4) Check switch for resistance between “b” and “c” terminals under each condition below.
If check result is not satisfactory, replace remote audio control switch.

“MODE”, “Λ” and “V” switch resistance
All switches released (OFF): 4700 – 5600 kΩ
“MODE” switch (4) pushing on (ON): 370 – 460 Ω
“Λ” switch (5) pushing on (ON): 680 – 820 Ω
“V” switch (6) pushing on (ON): 1400 – 1700 Ω



I4RS0A930033-

Specifications

Tightening Torque Specifications

S4RS0A9307001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Instrument panel mounting bolts	23	2.3	17.0	☞
Antenna base mounting nut	10	1.0	7.5	☞

NOTE:

The specified tightening torque is also described in the following.
“Audio System Component Location: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Wipers / Washers

Diagnostic Information and Procedures

Front Wiper and Washer Symptom Diagnosis

S4RS0A9404001

Condition	Possible cause	Correction / Reference Item
Wiper malfunctions	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiper motor faulty	*Check wiper motor referring to "Windshield Wiper Motor Inspection: ".*
	Combination switch (wiper switch) faulty	*Check wiper switch referring to "Windshield Wiper and Washer Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
Washer malfunctions	Washer hose or nozzle clogged	*Clean or repair clogged hose or nozzle.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Washer motor faulty	*Check washer motor referring to "Washer Pump Inspection: ".*
	Combination switch (washer switch) faulty	*Check washer switch referring to "Windshield Wiper and Washer Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Rear Wiper and Washer (If Equipped) Symptom Diagnosis

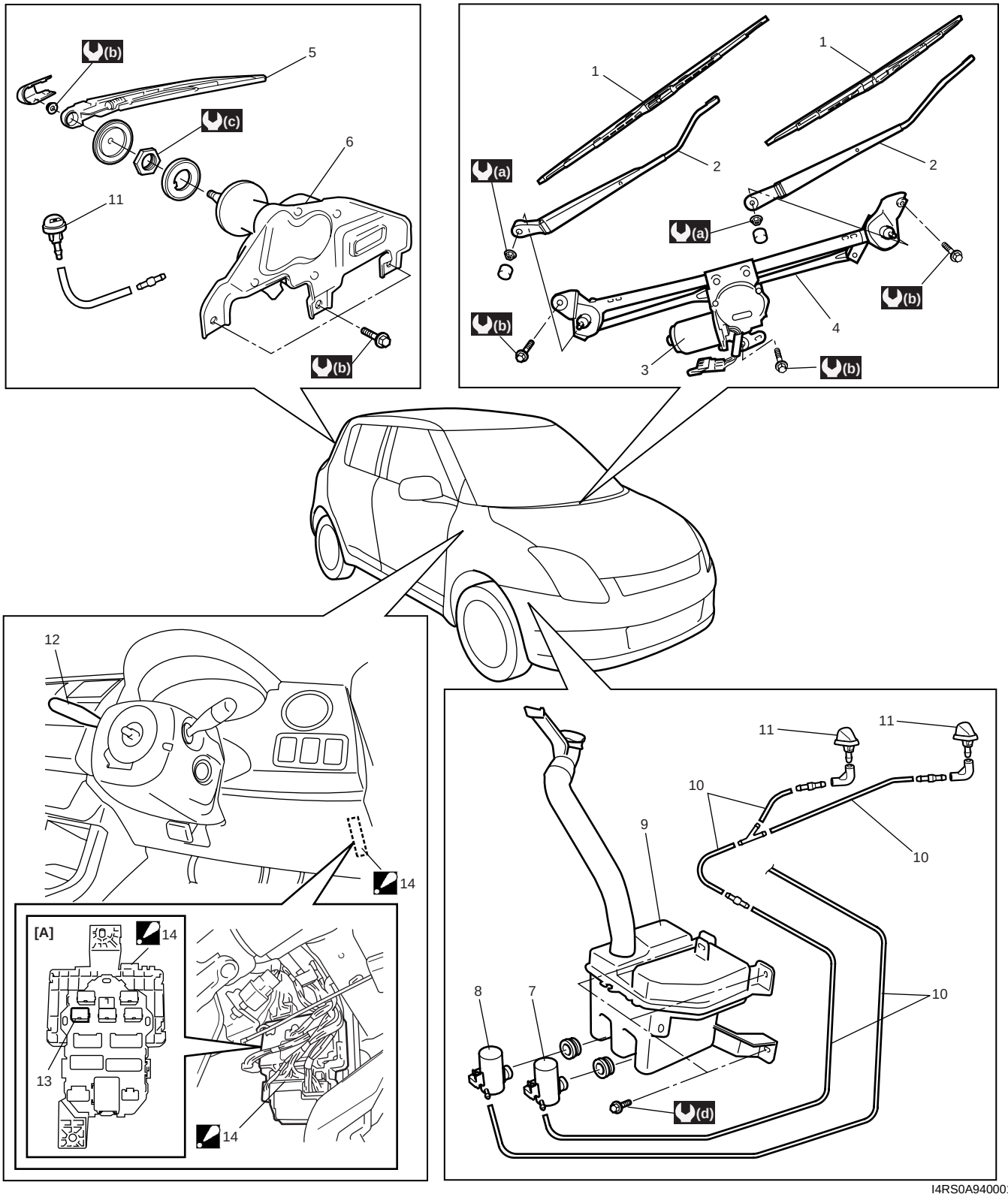
S4RS0A9404002

Condition	Possible cause	Correction / Reference Item
Wiper malfunctions ***NOTE:*** • ***Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".*** • ***Check each part in the order from the top of the following list.***	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiper motor faulty	*Check wiper motor referring to "Rear Wiper Motor (If Equipped) Inspection: ".*
	Combination switch (wiper switch) faulty	*Check wiper switch referring to "Rear Wiper and Washer Switch Inspection: ".*
	Rear wiper relay faulty	*Check rear wiper relay referring to "Rear Wiper Relay Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Washer malfunctions	Washer hose or nozzle clogged	*Clean or repair clogged hose or nozzle.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Washer motor faulty	*Check washer motor referring to "Washer Pump Inspection: ".*
	Combination switch (washer switch) faulty	*Check washer switch referring to "Rear Wiper and Washer Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

Repair Instructions

Wipers and Washers Components

S4RS0A9406001



I4RS0A940001-

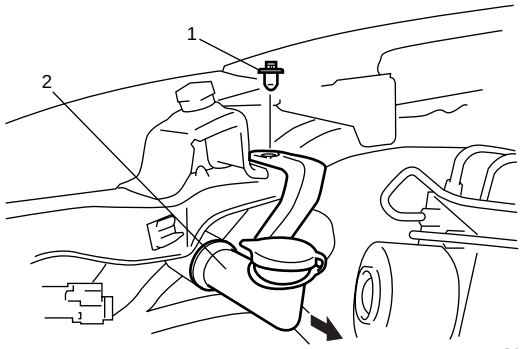
1. Windshield wiper blade	8. Washer pump for rear washer (if equipped)	[A]: Junction block assembly viewed from relay side
2. Windshield wiper arm	9. Washer tank	(a) : 16 N·m (1.6 kg-m, 11.5 lb-ft)
3. Windshield wiper motor	10. Washer hose	(b) : 8 N·m (0.8 kg-m, 6.0 lb-ft)
4. Windshield wiper link	11. Washer nozzle	(c) : 5 N·m (0.5 kg-m, 4.0 lb-ft)
5. Rear wiper arm with blade assembly (if equipped)	12. Wiper switch	(d) : 4 N·m (0.4 kg-m, 3.0 lb-ft)
6. Rear wiper motor (if equipped)	13. Rear wiper relay (if equipped)	
7. Washer pump for windshield washer	14. Junction block assembly (including in BCM) : BCM cannot be removed from junction block.	

Washer Tank and Washer Pump Removal and Installation

S4RS0A9406002

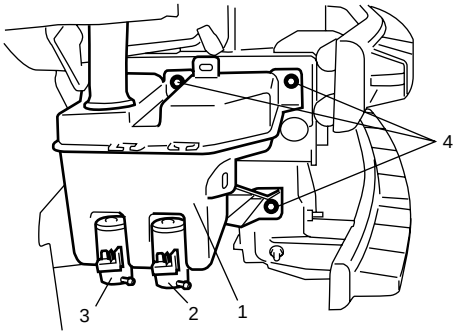
Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
3) Remove grommet (1) and upper part (2) of washer tank.



I4RS0A940002-

4) Remove washer tank attaching bolts (4).
5) Disconnect washer pump lead wire couplers and hoses.
6) Remove washer tank (1).
7) Remove windshield washer pump (2) and rear washer pump (3) (if equipped) from washer tank (1).



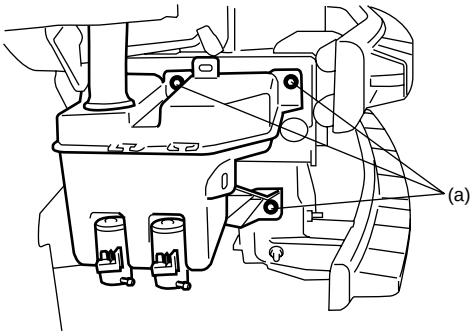
I4RS0A940003-

Installation

Install washer tank and washer pump by reversing removal procedure, noting the following instructions.

- Insert bolts in such direction as shown in figure.
- Tighten all fasteners to specified torque.

Tightening torque
Washer tank bolt (a): 4 N·m (0.4 kg-m, 3.0 lb-ft)

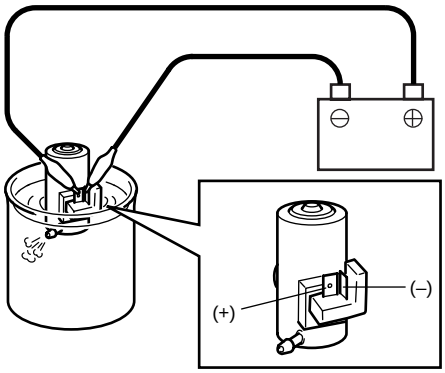


I4RS0A940004-

Washer Pump Inspection

S4RS0A9406003

1) Connect battery positive (+) and negative (–) terminals to pump (+) and (–) terminals respectively.
2) Check front and rear washer pumps for operation. If pump does not operate, replace washer pump.



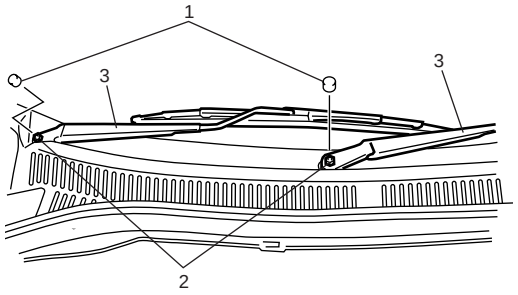
I4RS0A940005-

Windshield Wiper Removal and Installation

S4RS0A9406012

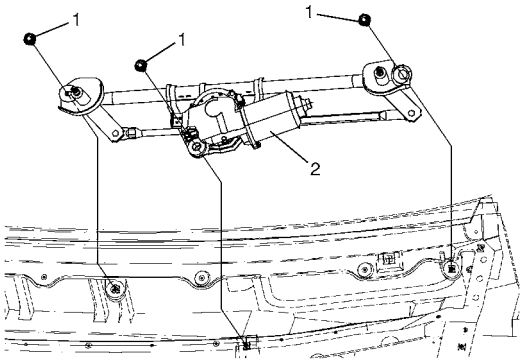
Removal

1) Disconnect negative (–) cable at battery.
2) Remove wiper pivot caps (1) and wiper arm nuts (2), and remove windshield wiper arms with wiper blades (3).



I4RS0A940006-

3) Remove cowl top garnish referring to “Cowl Top Components: in Section 9K”.
4) Disconnect coupler from windshield wiper motor.
5) Remove bolts (1), and remove windshield wiper assembly (2).

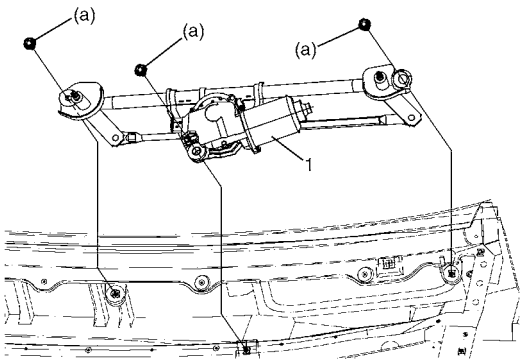


I4RS0A940007-

Installation

1) Install windshield wiper assembly (1), and tighten bolts to specified torque.

Tightening torque
Windshield wiper bolt (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)

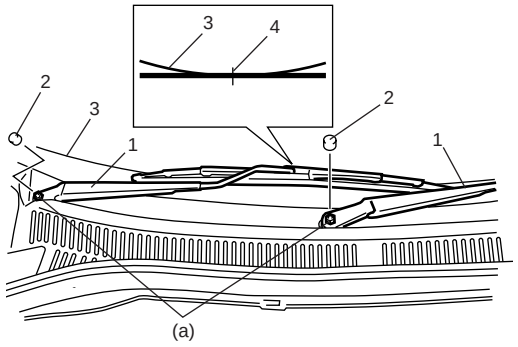


I4RS0A940008-

2) Connect coupler to windshield wiper motor.
3) Install cowl top garnish referring to “Cowl Top Components: in Section 9K”.
4) Install windshield wiper arms with wiper blades (1) to specified position as shown in figure, and then tighten windshield wiper nuts to specified torque.

Tightening torque
Windshield wiper arm nut (a): 16 N·m (1.6 kg-m, 11.5 lb-ft)

5) Install wiper pivot caps (2) to windshield wiper arm nuts



I4RS0A940009-

3.	Ceramic line
4.	Wiper blade center

6) Connect negative (–) cable to battery.

Windshield Wiper Motor Inspection

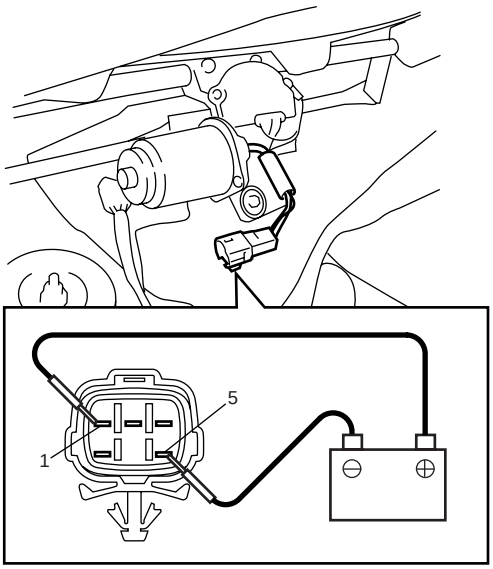
S4RS0A9406004

NOTE:

Make sure that battery voltage is 12 V or more.

1) Disconnect negative (–) cable at battery.
2) Remove windshield wiper arms with wiper blades referring to “Windshield Wiper Removal and Installation: ”.
3) Remove cowl top garnish referring to “Cowl Top Components: in Section 9K”.
4) Disconnect coupler from windshield wiper motor.
5) Reinstall windshield wiper arms with wiper blade. For details, refer to Step 4) of “Installation” in “Windshield Wiper Removal and Installation: ”.
6) Check windshield wiper motor for operation as follows
   - For motor operation in low speed
     a. Connect battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “5”.
     b. Check if wiper arm reciprocation speed is as specification. If check result is not as specified, replace motor.

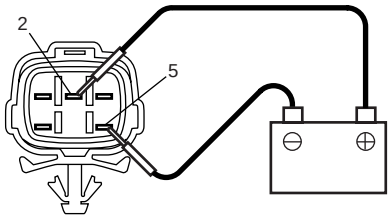
Specification
41 – 51 r/min (rpm)



I4RS0A940010-

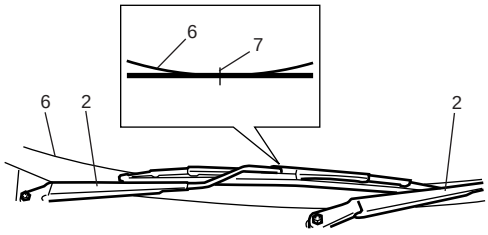
- For motor operation in high speed
  a. Connect battery positive (+) terminal to “2” and its negative (–) terminal to terminal “5”.
  b. Check if motor revolution speed is as specification. If check result is not as specified, replace motor.

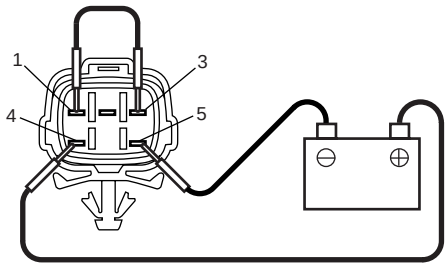
  Specification
  60 – 76 r/min (rpm)



I4RS0A940011-

- For automatic stop operation
  a. Connect battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “5” and let the motor turn.
  b. Disconnect terminal “1” from battery positive (+) terminal, and let the motor stop.
  c. Connect terminals “1” and “3” with a jumper wire, and connect terminal “4” to battery positive (+) terminal.
     Observe the motor turns once again then stops at a specified position as shown.





I4RS0A940012-

2.	Windshield wiper arms with wiper blades
6.	Ceramic line
7.	Wiper blade center

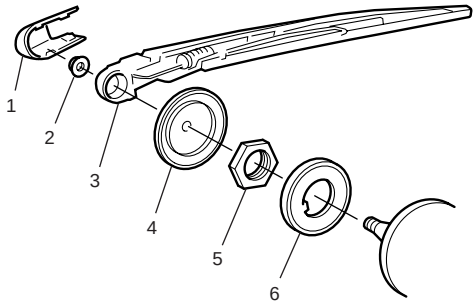
  d. Repeat Step 1) to 3) several times and check that the motor stops at the specified position every time.
     If check result is not satisfied, replace motor.

Rear Wiper (If Equipped) Removal and Installation

S4RS0A9406013

Removal

1) Disconnect negative (–) cable at battery.
2) Remove arm cover (1), rear wiper arm nut (2), rear wiper arm with blade assembly (3), rear wiper pivot cap (4), rear wiper nut (5) and rear wiper seal (6).



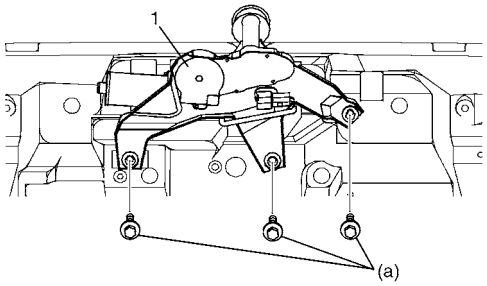
I4RS0A940013-

3) Remove rear end door trim referring to “Rear End Door Lock Assembly Removal and Installation: in Section 9F”.
4) Disconnect coupler from rear wiper motor.
5) Remove rear wiper motor.

Installation

1) Install rear wiper motor (1) and tighten rear wiper motor mounting bolts to specified torque.

Tightening torque
Rear wiper motor mounting bolt (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)

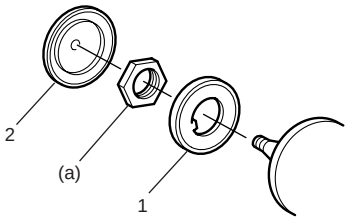


I4RS0A940014-

2) Connect coupler to rear wiper motor
3) Install rear end door trim referring to “Rear End Door Lock Assembly Removal and Installation: in Section 9F”.
4) Install rear wiper seal (1), and tighten rear wiper nut to specified torque.

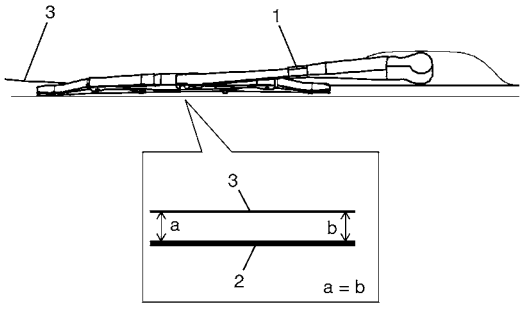
Tightening torque
Rear wiper nut (a): 5 N·m (0.5 kg-m, 4.0 lb-ft)

5) Install rear wiper pivot cap (2).



I4RS0A940015-

6) Install rear wiper arm with blade assembly (1) to specified position as shown in figure.

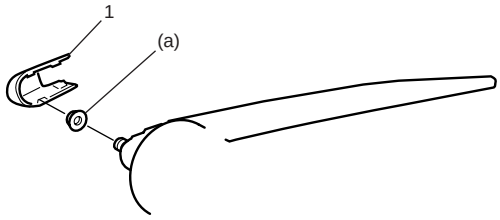


I4RS0A940016-

2.	Rear wiper blade
3.	Ceramic line

7) Tighten rear wiper arm nut to specified torque, and then install arm cover (1).

Tightening torque
Rear wiper arm nut (a): 8 N·m (0.8 kg-m, 6.0 lb-ft)



I4RS0A940017-

8) Connect negative (–) cable to battery.

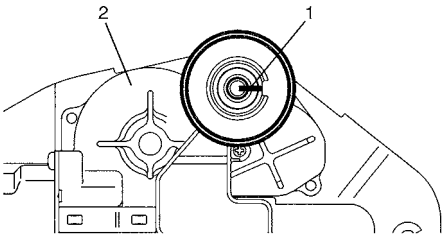
Rear Wiper Motor (If Equipped) Inspection

S4RS0A9406005

NOTE:

Make sure that battery voltage is 12 V or more.

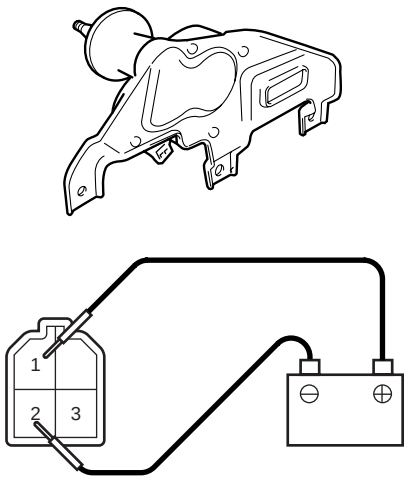
1) Make a mark (1) on rear wiper motor (2) stop position as shown.



I4RS0A940018-

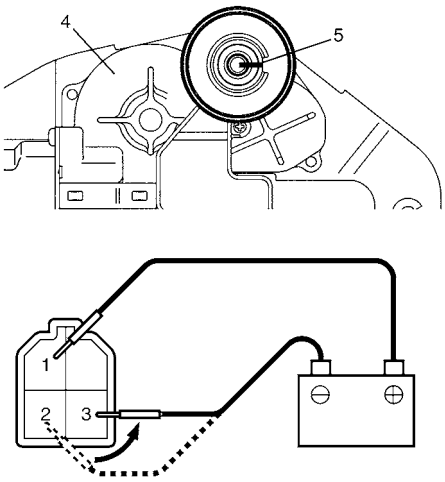
2) Check rear wiper motor for operation as follows.
   - For motor operation
     a. Connect battery positive terminal to terminal “1” and its negative terminal to terminal “2”.
     b. Check motor revolution speed as specification. If check result is not as specified, replace motor.

Specification
35 – 45 r/min (rpm)



I4RS0A940019-

- For automatic stop operation
  a. Connect battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “2” and let the motor turn.
  b. Disconnect terminal “2” from battery negative (–) terminal and let the motor stop.
  c. Observe the motor (4) turns once again then stops at a specified position as shown.



I4RS0A940020-

5. Mark

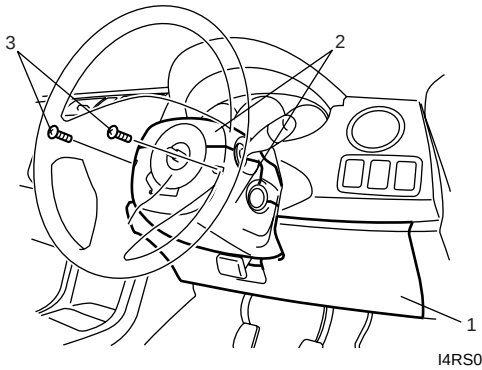
  d. Repeat Step a. to c. several times and check that the motor stops at the specified position every time.
  If check result is not satisfied, replace motor.

Windshield Wiper and Washer Switch Removal and Installation

S4RS0A9406006

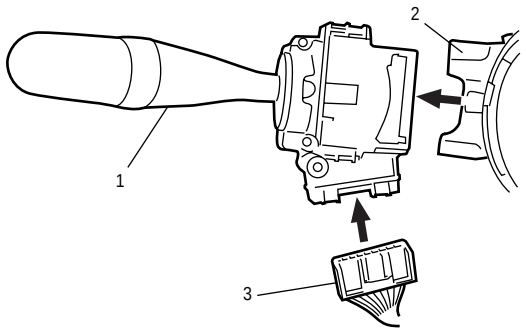
Removal

1) Disconnect negative (–) cable at battery.
2) Remove steering column hole cover (1).
3) Remove steering column covers (2).
Turn steering wheel to access steering column cover rear end screws (3).



I4RS0A940021-

4) Remove windshield wiper and washer switch (1) from combination switch assembly (2) and disconnect its coupler (3).



I4RS0A940022-

Installation

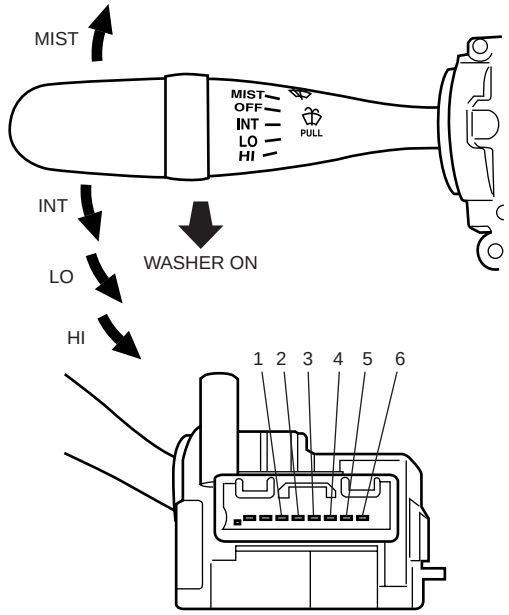
Reverse removal procedure.

Windshield Wiper and Washer Switch Inspection

S4RS0A9406007

Windshield Wiper and Washer Switch

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



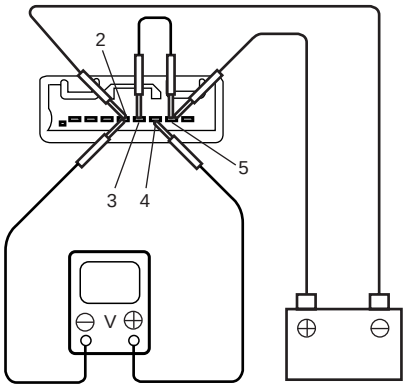
Wiper SW \ Terminal	5	6	4	3
OFF			○	○
INTO			○	○
LO	○		○	
HI	○	○		
MIST	○		○	

Washer SW \ Terminal	1	2
ON		
OFF	○	○

I4RS0A940023-

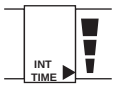
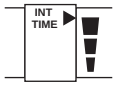
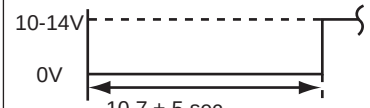
Intermittent Wiper Relay Circuit

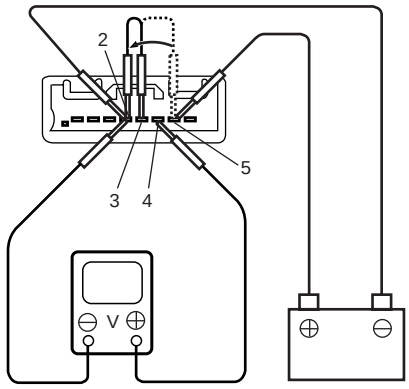
1) Turn the windshield wiper switch to “INT” position.
2) Connect battery positive (+) terminal to terminal “5” and its negative (–) terminal to terminal “2”.
3) Connect voltmeter positive lead to terminal “4” and its negative lead to terminal “2”.
4) Check that the voltmeter indicates the battery voltage (10 – 14 V).
5) Connect terminal “3” and terminal “5” by a jumper wire.



I4RS0A940024-

6) Disconnect end of the jumper wire from terminal “5”.
7) Connect disconnected jumper wire end to terminal “2”, then check that voltage between terminal “4” and terminal “2” changes as shown.
If check result is not satisfied, replace switch.

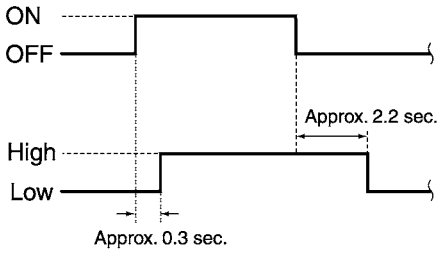
INT time control switch position	Voltage
	
	

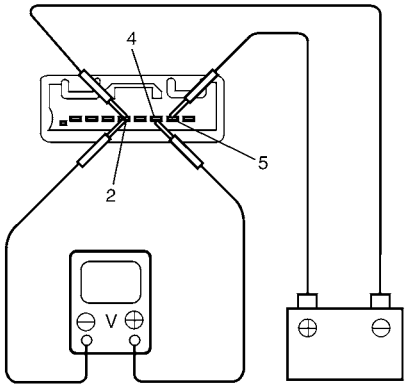


I4RS0A940025-

Washer Linked Circuit

1) Make sure that front wiper switch is at “OFF” position.
2) Connect battery positive (+) terminal to terminal “5” and its negative (–) terminal to terminal “2”.
3) Connect voltmeter positive lead to terminal “4” and its negative lead to terminal “2”.
4) When front wiper switch is ON, check that voltage changes as shown in figure.
If check result is not satisfied, replace switch.





I4RS0A940026-

Rear Wiper and Washer Switch Removal and Installation

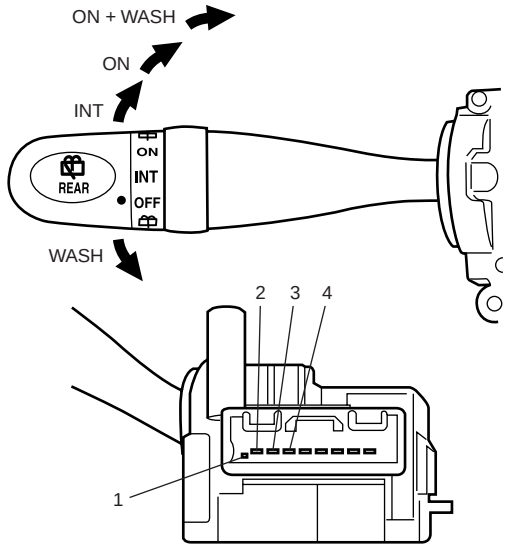
S4RS0A9406008

For removal and installation, refer to “Windshield Wiper and Washer Switch Removal and Installation: ”.

Rear Wiper and Washer Switch Inspection

S4RS0A9406009

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Position \ Terminal	1	2	4	3
OFF				
INTO	○		○	
ON		○	○	
ON + WASH		○	○	○
WASH			○	○

I4RS0A940027-

Rear Wiper Relay Removal and Installation

S4RS0A9406015

Removal

1) Disconnect negative (–) cable at battery.
2) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation: in Section 10B”.
3) Remove rear wiper relay.

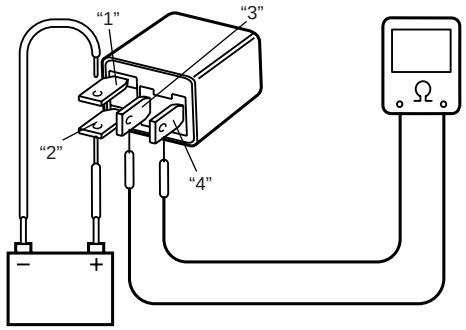
Installation

Reverse removal procedure for installation.

Rear Wiper Relay Inspection

S4RS0A9406014

1) Check that there is no continuity between terminal “3” and “4”. If there is continuity, replace relay.
2) Connect battery positive (+) terminal to terminal “2” of relay.
3) Connect battery negative (–) terminal to terminal “1” of relay.
4) Check continuity between terminal “3” and “4”. If there is no continuity when relay is connected to the battery, replace relay.



I4RS0A940028-

Specifications

Tightening Torque Specifications

S4RS0A9407001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Washer tank bolt	4	0.4	3.0	☞
Windshield wiper bolt	8	0.8	6.0	☞
Windshield wiper arm nut	16	1.6	11.5	☞
Rear wiper motor mounting bolt	8	0.8	6.0	☞
Rear wiper nut	5	0.5	4.0	☞
Rear wiper arm nut	8	0.8	6.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Wipers and Washers Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Glass / Windows / Mirrors

General Description

Rear End Door Window Defogger System Description

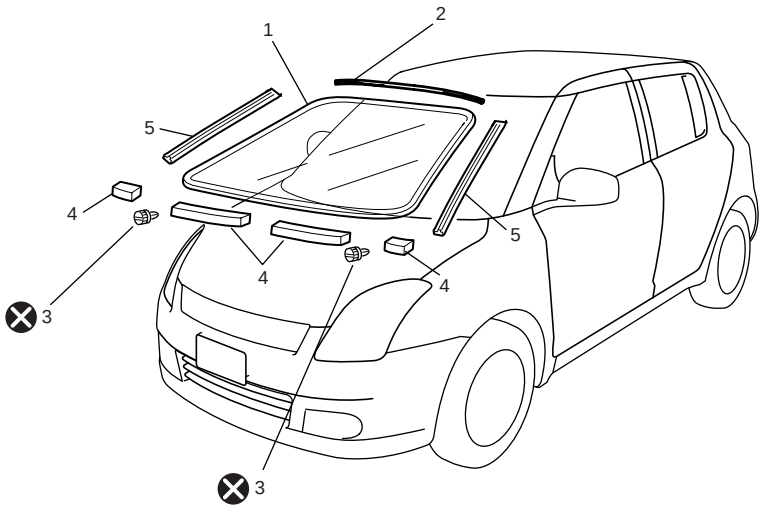
S4RS0A9501002

The rear end door window defogger is controlled by BCM. For the BCM description refer to “BCM General Description: in Section 10B”.

Windshield Construction

S4RS0A9501001

The windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For the windshield replacement, it is important to use an adhesive which provides sufficient adhesion strength and follow the proper procedure.



I4RS0A950001-

1. Windshield glass	3. Windshield glass stopper	5. Windshield side garnish
2. Windshield molding	4. Spacer	⊗ : Do not reuse.

CAUTION:

- **Described is the glass replacement by using 3 types of primers and 1 type of adhesive made by YOKOHAMA (one component urethane adhesive to be used with primer in combination). When using primer and adhesive made by other manufacturers, be sure to refer to handling instructions supplied with them. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.**
- **Should coated surface be scratched or otherwise damaged, be sure to repair damaged part, or corrosion may start from there.**

Use the specific adhesive which has the following property.

Glass adhesive shearing strength
40 kg/cm^2 (569 lb/in^2) or more

Adhesive materials and tools required for removal and installation.

- One component urethane adhesive and primers used in combination (For one sheet of windshield).
  - Adhesive (470 g (15.7 oz.))
  - Primer for glass (30 g (1.0 oz.))
  - Primer for body (30 g (1.0 oz.))
  - Primer for molding (30 g (1.0 oz.))
- Eyeleteer
- Piano string

- Windshield knife
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

Diagnostic Information and Procedures

Rear End door Window Defogger Symptom Diagnosis

S4RS0A9504001

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Rear end door window defogger does not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Rear end door window defogger switch faulty	*Check rear end door window defogger switch referring to "Rear End Door Window Defogger Switch Inspection: ".*
	Rear end door window defogger relay faulty	*Check rear end door window defogger relay referring to "Rear End Door Window Defogger Relay Inspection: "*
	Defogger wire faulty	*Check defogger wire referring to "Rear End Door Window Defogger Wire Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Power Window Control System Symptom Diagnosis

S4RS0A9504002

Condition	Possible cause	Correction / Reference Item
All power windows do not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Power window main switch faulty	*Check power window main switch referring to "Power Window Main Switch Inspection: ".*
	Ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection: in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*
Only one power window does not operate	Power window main switch faulty	*Check power window main switch referring to "Power Window Main Switch Inspection: ".*
	Power window sub switch faulty	*Check power window sub switch referring to "Power Window Sub Switch Inspection: ".*
	Wiring and/or coupler faulty	*Check wiring and/or coupler.*
	Power window regulator faulty	*Check window regulator.*
	Power window motor faulty	*Check power window motor.*
	Wiring or grounding faulty	*Repair circuit.*

Power Door Mirror Control System (If Equipped) Symptom Diagnosis

S4RS0A9504003

Condition	Possible cause	Correction / Reference Item
All power mirrors do not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Power door mirror switch faulty	*Check power door mirror switch referring to "Power Door Mirror Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
One power mirror does not operate	Power door mirror switch faulty	*Check power door mirror switch referring to "Power Door Mirror Switch Inspection: ".*
	Power door mirror actuator faulty	*Check actuator refraining to "Power Door Mirror Actuator Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*

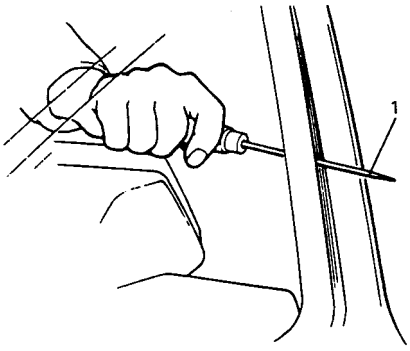
Repair Instructions

Windshield Removal and Installation

S4RS0A9506001

Removal

1) Clean both inside and outside of glass and around it.
2) Remove wiper arms and cowl top garnish.
3) Remove windshield side garnish.
4) Using tape, cover body surface around glass to prevent any damage.
5) Remove rear view mirror, sun visor and front pillar trims (right & left).
6) If necessary, remove instrument panel. Refer to "Instrument Panel Removal and Installation: in Section 9C".
7) If necessary, remove head lining. Refer to "Head Lining Removal and Installation: in Section 9H".
8) Remove (or cut) windshield molding.
9) Drill hole with eyeleteer (1) through adhesive and let piano string through it.

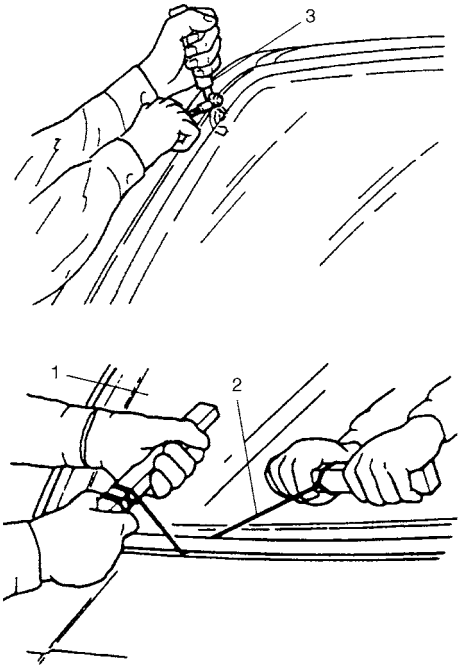


I2RH01950040-

10) Cut adhesive all around windshield (1) with piano string (2). When using tool, windshield knife (3), to cut adhesive, be careful not to cause damage to windshield. Use wire to cut adhesive along lower part of windshield.

NOTE:

Use piano string (2) as close to glass as possible so as to prevent damage to body and instrument panel.

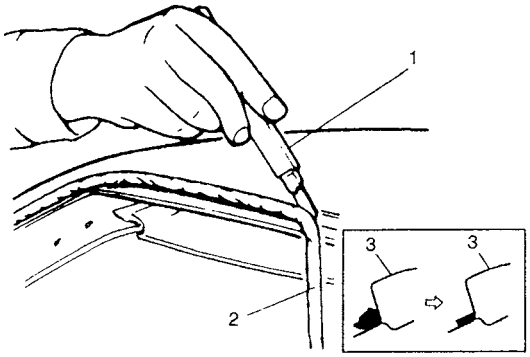


I3RH0A950006-

11) Using knife (1), smoothen adhesive (2) remaining on body side (3) so that it is 1 – 2 mm (0.039 – 0.078 in.) thick all around.

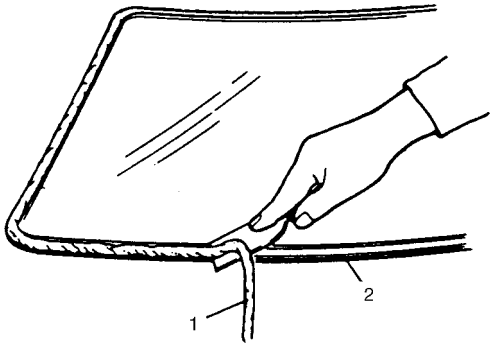
NOTE:

Before using knife (1), clean it with alcohol or the like to remove oil from it.



I2RH01950042-

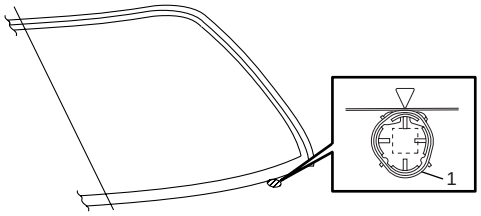
12) When reusing windshield, remove the adhesive (1) from it, using care not to damage primer coated surface (2).



I2RH01950043-

Installation

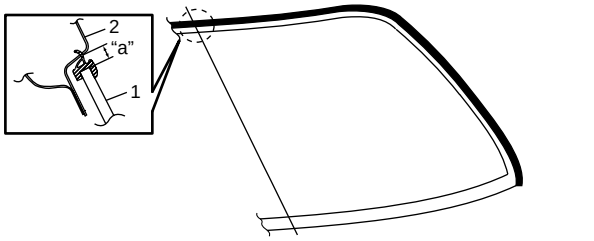
1) Using cleaning solvent, clean windshield edge where windshield glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Install new glass stoppers (1) (2 pieces) to lower side of windshield.



I4RH01950001-

3) To determine installing position of glass (1) to body (2), position glass against body so that clearance between upper end of glass (1) and body (2) is approximately 5 mm (0.197 in.) and clearances between each side end (right & left) of glass (1) and body (2) are even. Then mark mating marks on glass (1) and body (2) as shown. Upper clearance can be adjusted by moving glass stoppers position.

Windshield clearance
"a": approx. 5 mm (0.197 in.)

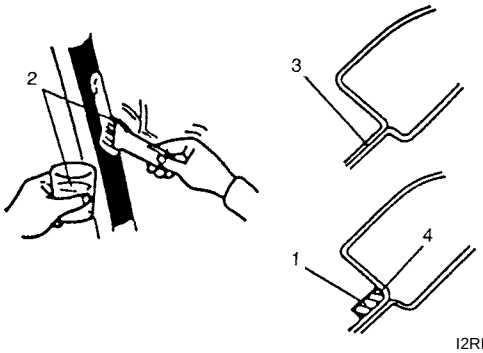


I2RH01950045-

4) Clean contact surfaces of old adhesive (4), paint or bare metal thoroughly.
If surfaces of paint or bare metal come out, apply primer (2) for body with caution not to apply primer (2) to surface of adhesive remaining on body.

NOTE:

- **Be sure to refer to primer maker's instruction for proper handling and drying time.**
- **Do not touch body and old adhesive surfaces where glass is to be adhered.**



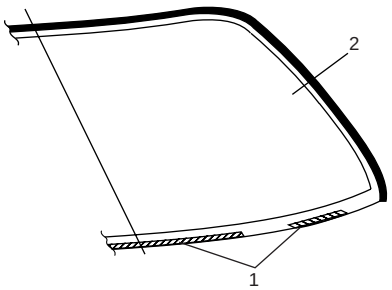
I2RH01950046-

1.	Do not apply primer
3.	Apply primer

5) Install new molding to glass.
6) Clean glass surface to be adhered to body with clean cloth. If cleaning solvent is used, let it dry for 10 minutes or more.

Cleaning Area for windshield (distance from the edge of glass or molding)
30 – 50 mm (1.18 – 1.97 in.)

7) Install new spacers (1) to windshield (2).



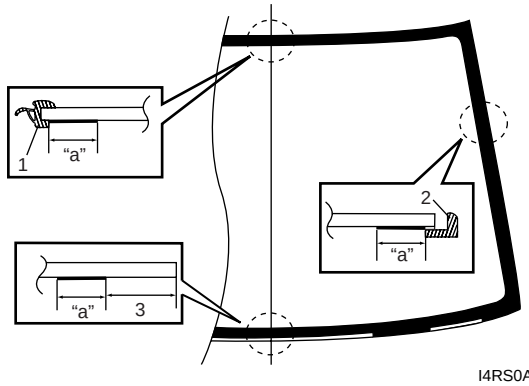
I4RS0A950002-

8) Using new brush, apply sufficient amount of primer onto glass along glass edge.

NOTE:

- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not apply primer on outside of ceramic coated surface.**
- **Do not touch primer coated surface.**

Width applied primer for windshield
"a": 15 mm (0.59 in.)



I4RS0A950003-

1.	Molding
2.	Windshield side garnish clip
3.	32.5 mm (1.28 in.)

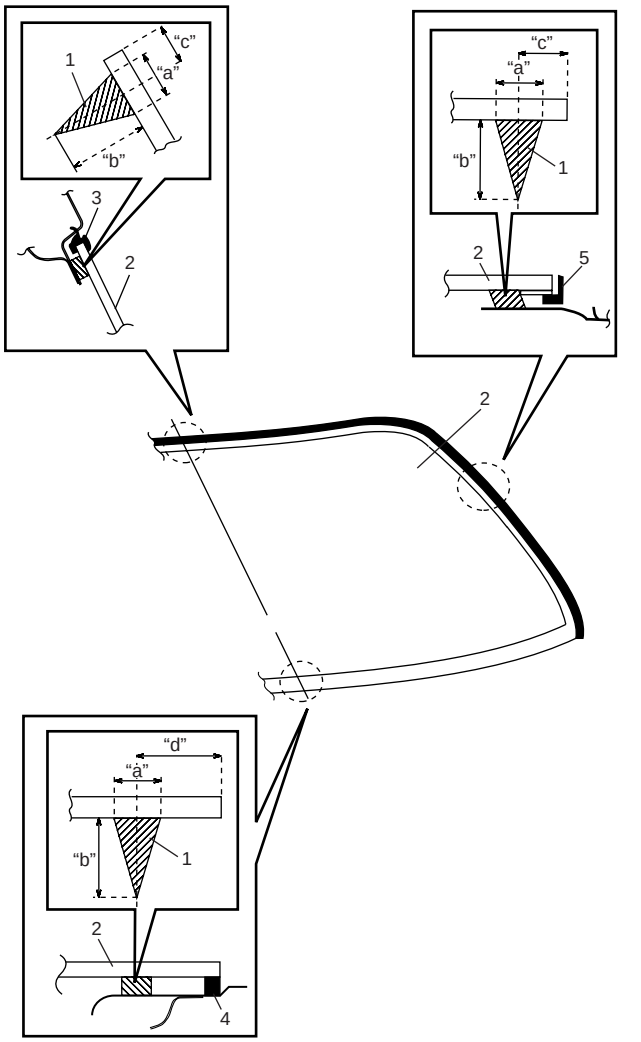
9) Apply primer for molding along molding surface all around.

10) Apply adhesive (1) referring to figure.

NOTE:

- **Press glass (2) against fittings surface of body panel quickly after adhesive (1) is applied.**
- **Use of rubber sucker grip is helpful to hold and carry glass after adhesive (1) is applied.**
- **Perform steps 8) to 9) within 10 min. to ensure sufficient adhesion.**
- **Be sure to refer to adhesive maker's instruction for proper handling and drying time.**
- **Start from bottom side of glass (2).**
- **Be careful not to damage primer.**

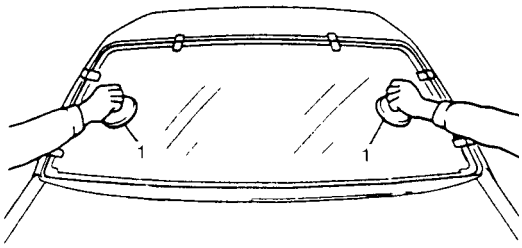
Adhesive amount specifications and position for windshield
Width "a": Approx. 7 mm (0.27 in.)
Height "b": Approx. 15 mm (0.59 in.)
Position "c": Approx. 11 mm (0.43 in.) for front, rear and upper sections
Position "d": Approx. 35 mm (1.38 in.) for bottom section



I4RS0A950004-

3.	Molding
4.	Windshield glass spacer
5.	Windshield side garnish clip

11) Holding rubber sucker grips (1), place glass onto body by aligning mating marks marked in step 3) and press it.



I2RH01950050-

12) Check for water leakage by pouring water over windshield through hose. If leakage is found, dry windshield and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

NOTE:

- **Do not use high pressure water.**
- **Do not blow compressed air directly at adhesive applied part when drying.**
- **Do not use infrared lamp or like for drying.**

I2RH01950051-

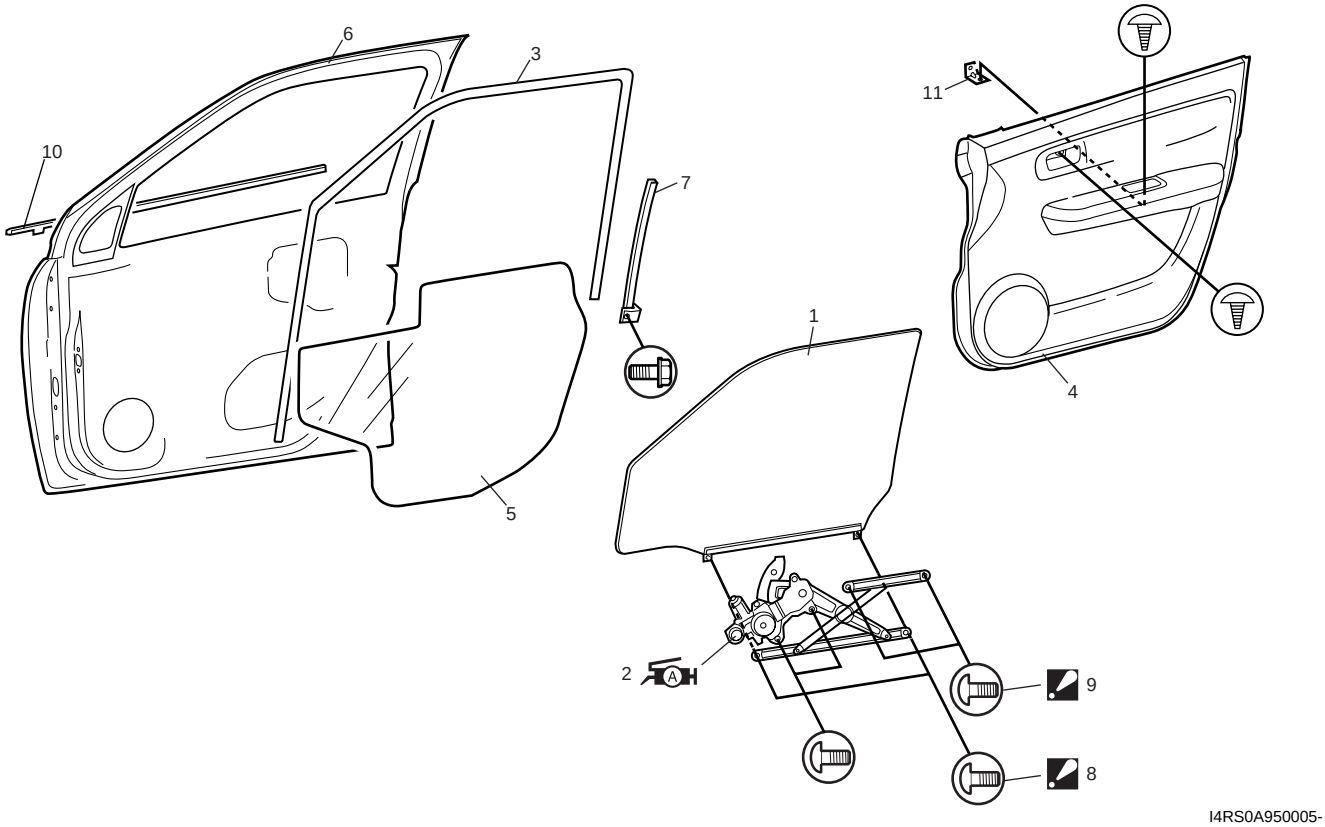
CAUTION:

Upon completion of installation, note the following.

- **Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.**
- **If molding is not securely in place, hold it down with a tape until adhesive is completely set.**
- **Each adhesive has its own setting time.**
- **Be sure to refer to its maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.**
- **Refrain from driving till adhesive is completely set so as to ensure proper and sufficient adhesion.**

Front Door Window Components

S4RS0A9506003



I4RS0A950005-

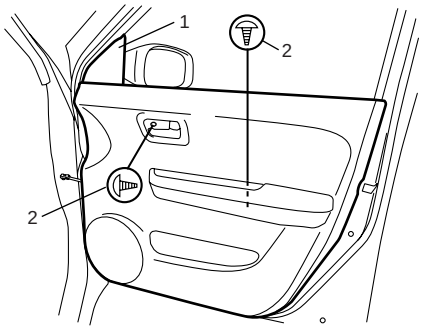
1. Door glass	5. Door sealing cover	9. Front door window regulator mounting screw : Tighten rear screw first, and then tighten front screw.
2. Window regulator assembly : Apply lithium grease 99000-25010 to sliding part.	6. Door panel	10. Front door outer weather-strip
3. Glass run	7. Front door sash	11. Door trim bracket
4. Door trim	8. Door glass mounting screw : Tighten rear screw first, and then tighten front screw.	

Front Door Glass Removal and Installation

S4RS0A9506004

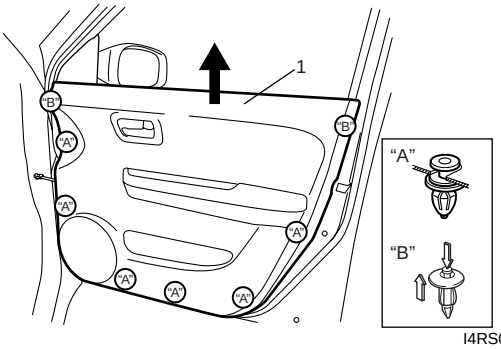
Removal

1) Remove door mirror trim (1).
2) Remove door trim mounting screws (2).



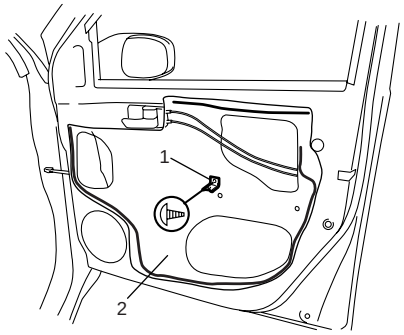
I4RS0A950006-

3) Remove door trim (1) as shown.
   And disconnect power window switch lead wire at coupler.



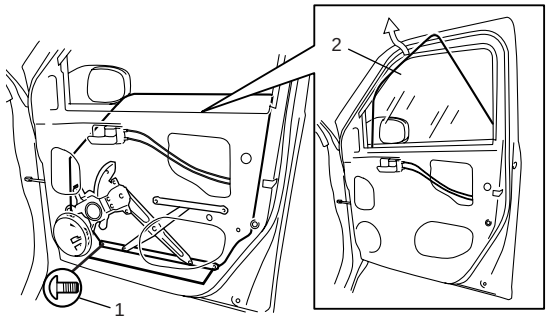
I4RS0A950007-

4) Remove door trim bracket (1).
5) Remove door sealing cover (2).



I4RS0A950008-

6) Remove door glass mounting screws (1).
7) Remove door glass (2) while tilting it as shown.

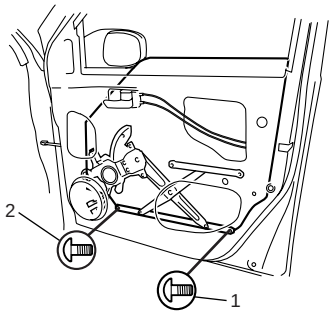


I4RS0A950009-

Installation

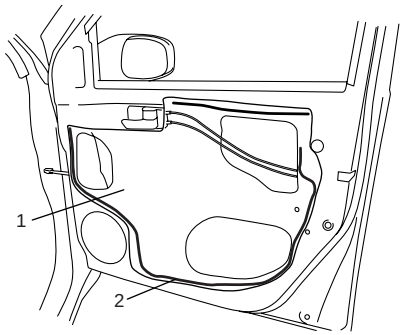
Reverse removal procedure noting the following instructions.

- If there is deformity for glass run, replace it with a new one.
- Tighten door glass rear mounting screw (1) first, and then tighten door glass front mounting screw (2).



I4RS0A950010-

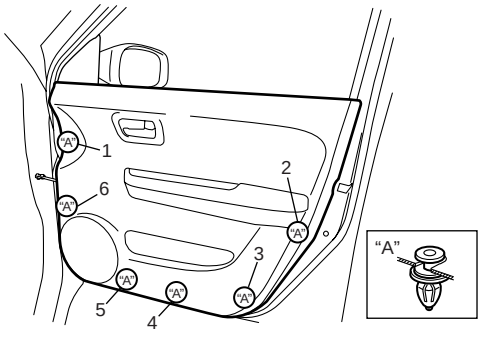
- Secure door sealing cover (1) with adhesive (2).



I4RS0A950011-

- Install front door trim.

Front door trim attaching order
(1) → (2) → (3) → (4) → (5) → (6)



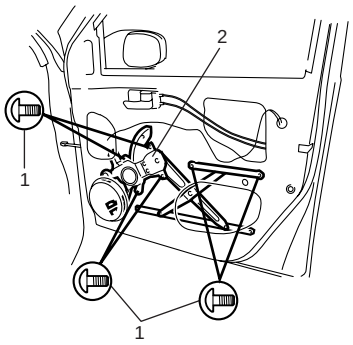
I4RS0A950012-

Front Door Window Regulator Removal and Installation

S4RS0A9506005

Removal

1) Remove door glass referring to “Front Door Glass Removal and Installation: ”.
2) Disconnect power window motor lead wire at coupler.
3) Remove regulator mounting screws (1), and then remove front door window regulator (2).



I4RS0A950013-

Installation

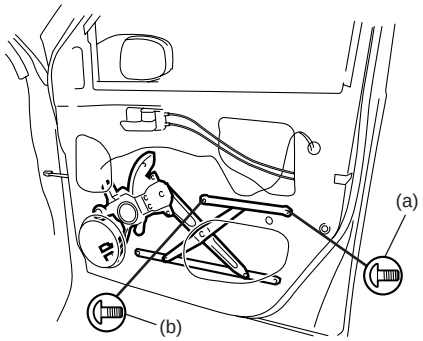
Reverse removal procedure noting the following instruction.

- Apply grease to sliding portions of window regulator.

  : Grease 99000–25010

- Tighten front door window regulator attaching screws.

  Front door window regulator screw tightening order
  (a) → (b)



I4RS0A950014-

Front Door Window Regulator Inspection

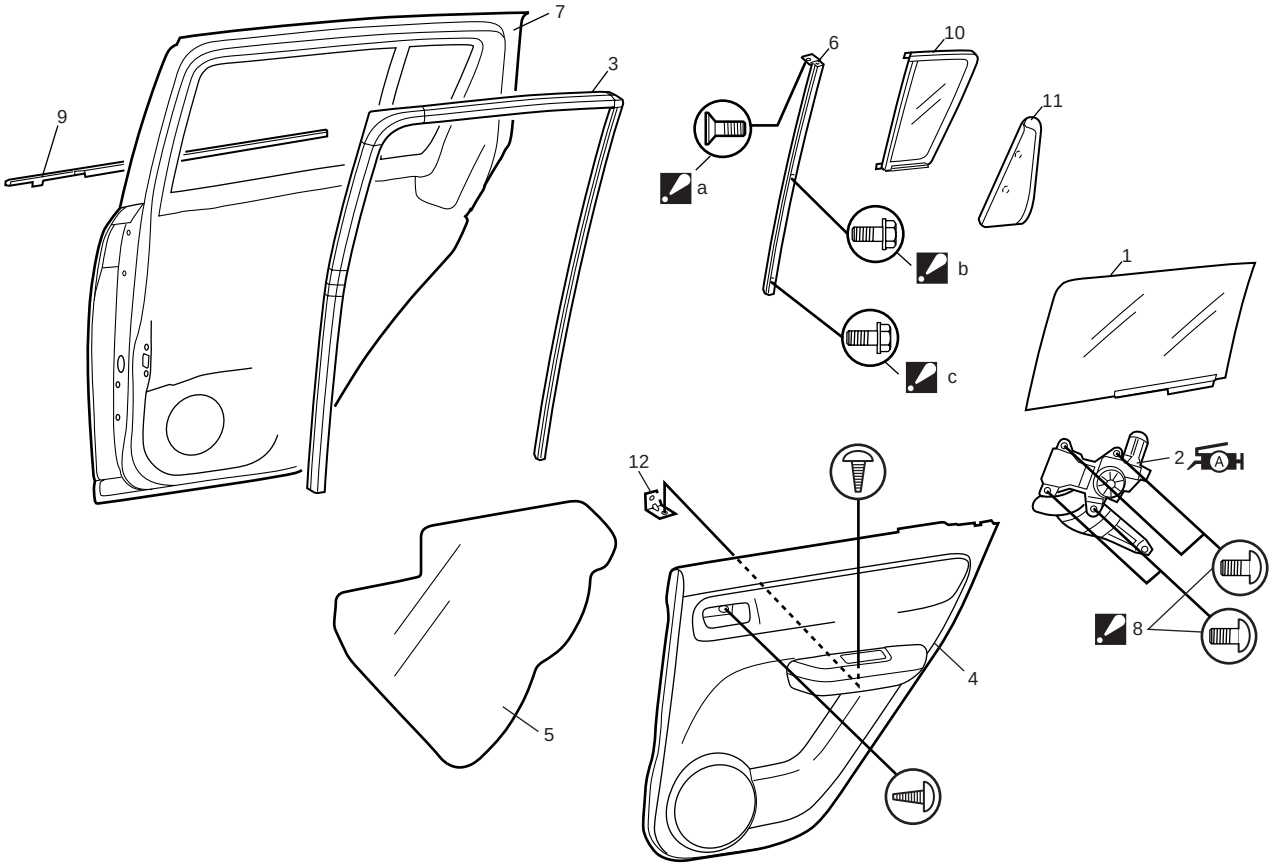
S4RS0A9506006

Check the following parts for wear, damage, smooth operation and lubrication:

- Check regulator sliding and rotating parts.
- Check rollers.

Rear Door Window Components

S4RS0A9506007



I4RS0A950015-

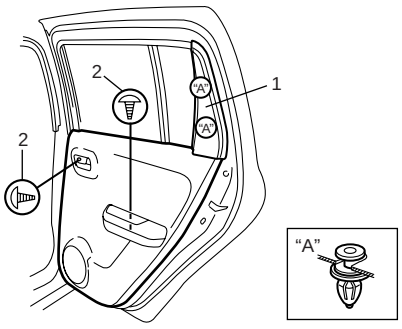
1. Door glass	6. Door sash	11. Rear door inner garnish
A H 2. Window regulator assembly : Apply lithium grease 99000-25010 to sliding part.	7. Door panel	12. Door trim bracket
3. Glass run	8. Rear door window regulator mounting screw : Tighten lower screw first, and then tighten upper screw.	a: Sash upper mounting screw : Tightening order: a → b → c
4. Door trim	9. Rear door outer weather-strip	b, c: Sash lower mounting bolt : Tightening order: a → b → c
5. Door sealing cover	10. Rear door partition glass.	

Rear Door Glass Removal and Installation

S4RS0A9506008

Removal

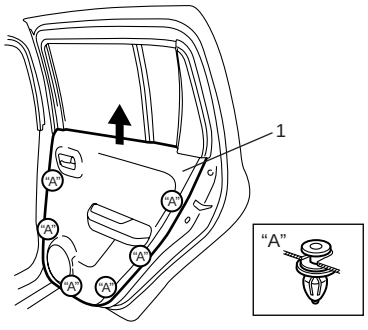
1) Remove rear door inner garnish (1).
2) Remove door trim mounting screws (2).



I4RS0A950016-

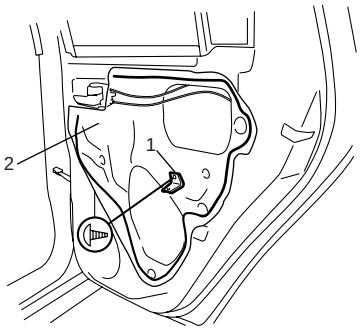
3) Remove door trim (1) as shown.

And disconnect power window switch lead wire at coupler.



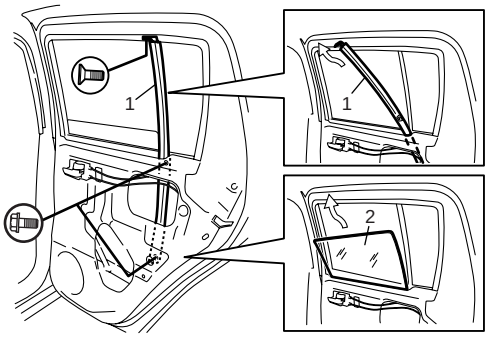
I4RS0A950017-

4) Remove door trim bracket (1).
5) Remove door sealing cover (2).



I4RS0A950018-

6) Detach rear part of glass run from door sash (1), and remove door sash (1).
7) Remove door glass (2) as shown.



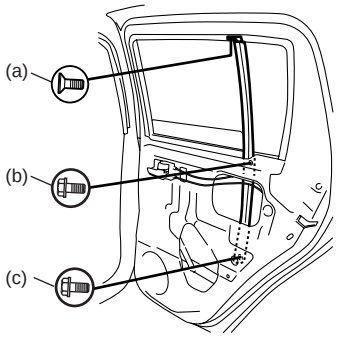
I4RS0A950019-

Installation

Reverse removal procedure noting the following instructions.

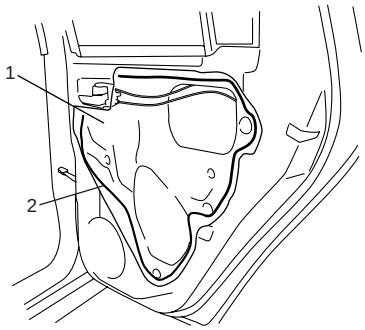
- If there is deformity for glass run, replace it with a new one.
- Tighten door sash mounting screw and bolts.

Door sash mounting screw and bolt tightening order
(a) → (b) → (c)



I4RS0A950020-

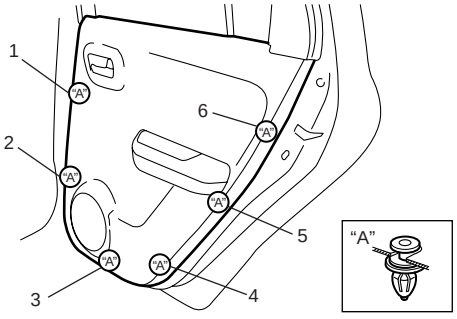
- Secure door sealing cover (1) with adhesive (2).



I4RS0A950021-

- Install rear door trim.

Rear door trim attaching order
(1) → (2) → (3) → (4) → (5) → (6)



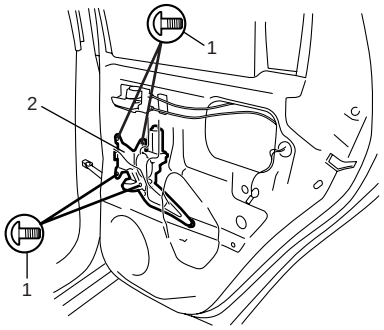
I4RS0A950022-

Rear Door Window Regulator Removal and Installation

S4RS0A9506009

Removal

1) Remove door glass referring to “Rear Door Glass Removal and Installation: ”.
2) Disconnect power window motor lead wire at coupler and loosen clamp.
3) Loosen regulator mounting screws (1), and then remove rear window regulator (2).



I4RS0A950023-

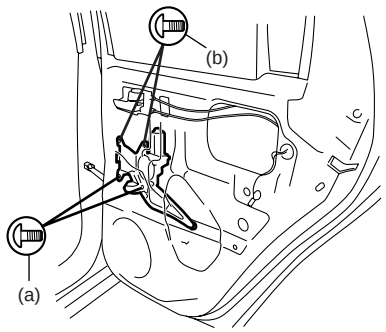
Installation
Reverse removal procedure noting the following.

- Apply grease to sliding and rotating portions of window regulator.

  : Grease 99000–25010

- Tighten rear door window regulator attaching screws.

  Rear door window regulator screw tightening order
  (a) → (b)



I4RS0A950024-

Rear Door Window Regulator Inspection

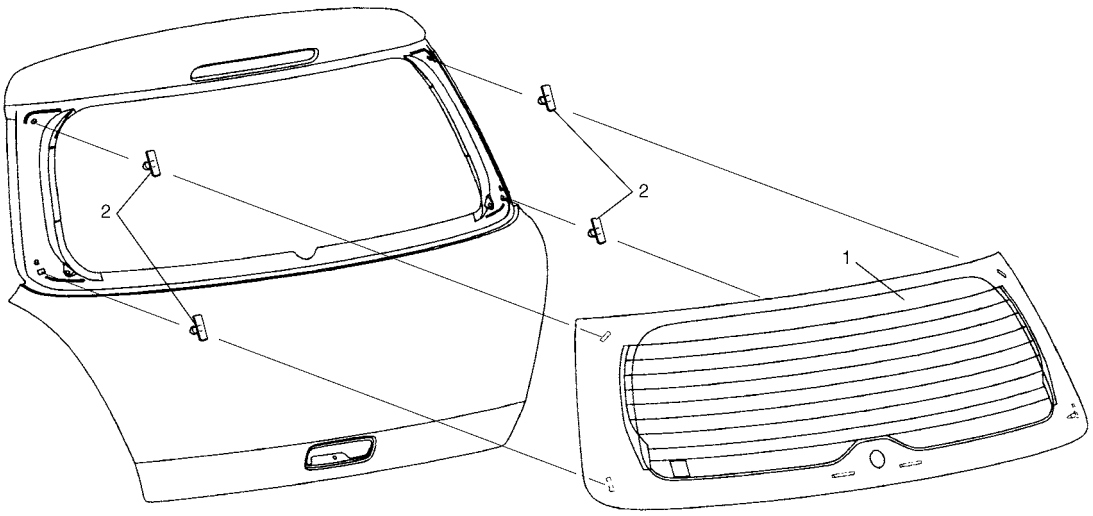
S4RS0A9506010

Check the following point:

- Check regulator sliding and rotating parts.
- Check rollers for wear and damage.

Rear End Door Window Components

S4RS0A9506012



I4RS0A950025-

1. Rear end door glass	2. Fastener

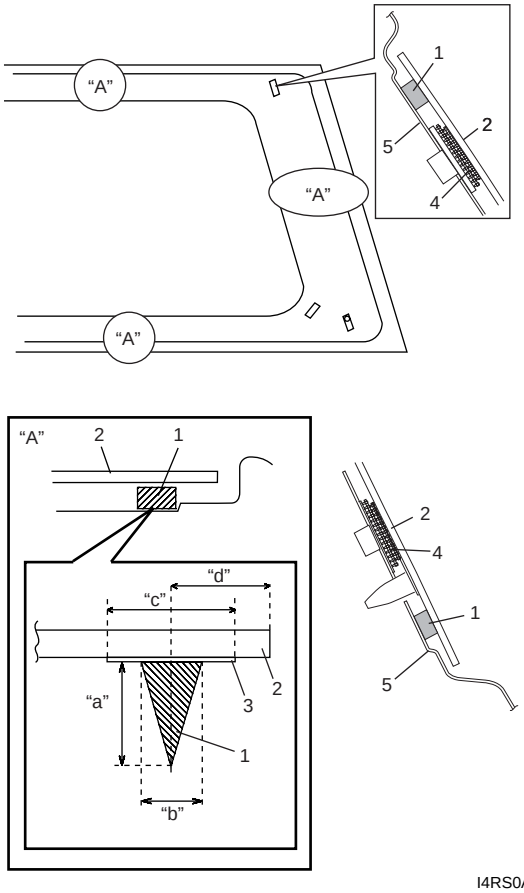
Rear End Door Glass Removal and Installation

S4RS0A9506013

Refer to “Windshield Removal and Installation: ” as removal and installation procedures are basically the same. However, note the following.

- Observe the following precautions when applying adhesive (1) along glass (2) edge.
- Adhesive (1) should be applied evenly especially in height.
- Be careful not to damage primer (3).
- With the position of fastener (4) properly aligned, install glass (2) on rear end door panel (5).
- Press glass against body quickly after adhesive (1) is applied.

Adhesive amount specifications and position for rear end door glass
Height “a”: 13 mm (0.51 in.)
Width “b”: 6 mm (0.24 in.)
Width “c”: 14 mm (0.55 in.)
Position “d”: 12 mm (0.47 in.) for glass upper section
Position “d”: 16 mm (0.63 in.) for glass bottom section
Position “d”: 32.5 mm (1.28 in.) for glass side sections



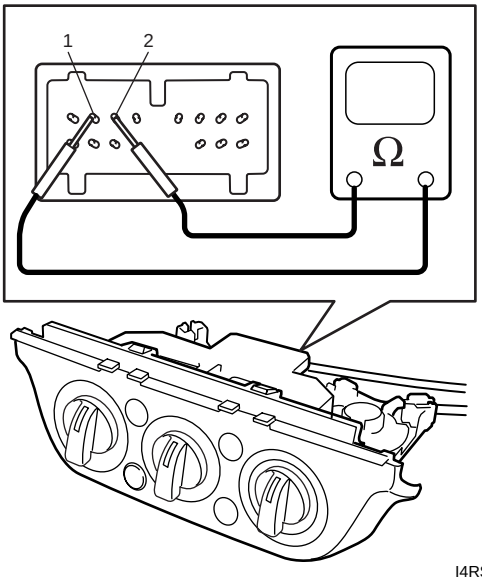
I4RS0A950026-

Rear End Door Window Defogger Switch Inspection

S4RS0A9506016

1) Check rear end door window defogger switch for operation as follows.
   a) Rear end door window defogger switch is built in HVAC control unit.
      Remove HVAC control unit referring to "HVAC Control Unit Removal and Installation: in Section 7A".
   b) Check that there is continuity between terminal (1) and terminal (2) of HVAC control unit when rear end door window defogger switch is at ON position. (Rear end door window defogger switch is kept in push.)
   c) Check that there is no continuity between terminal (1) and terminal (2) of HVAC control unit when rear end door window defogger switch is at OFF position.

If check result does not meet the above conditions, replace HVAC control unit.

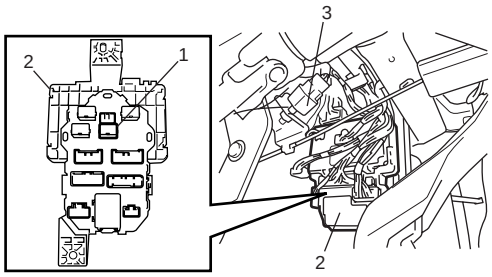


I4RS0A950037-

Rear End Door Window Defogger Relay Inspection

S4RS0A9506027

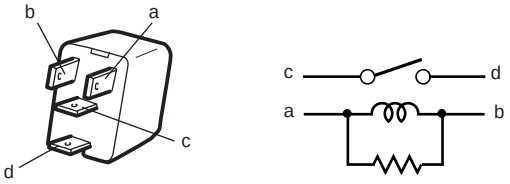
1) Disconnect negative (–) cable from battery.
2) Remove junction block assembly for inspection of rear end door window defogger relay.
   For removal, refer to "BCM (Included in Junction Block Assembly) Removal and Installation: in Section 10B".
3) Remove rear end door window defogger relay (1) from junction block assembly (2).



I4RS0A950027-

3. Brake (stop) lamp switch

4) Check that there is no continuity between terminal "c" and "d". If there is continuity, replace relay.
5) Check that there is continuity between terminals "c" and "d" when a 12 V battery is connected to terminals "a" and "b".
   If malfunction is found, replace it with a new one.



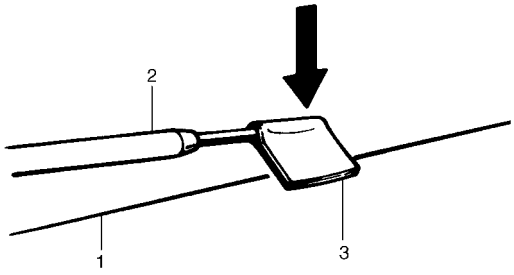
I4RS0A950028-

Rear End Door Window Defogger Wire Inspection

S4RS0A9506017

NOTE:

- **When cleaning rear end door window glass, use a dry cloth to wipe it along heat wire (1) direction.**
- **When cleaning glass, do not use detergent or abrasive-containing glass cleaner.**
- **When measuring wire voltage, use a tester with positive probe (2) wrapped with a tin foil (3) which should be held down on wire by finger pressure.**



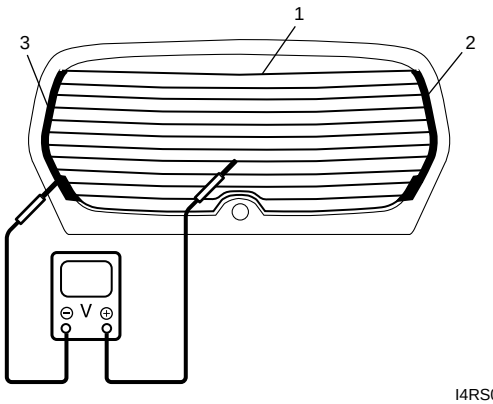
I2RH01950002-

Wire Damage Inspection

1) Turn ignition switch to ON position.
2) Turn on defogger switch.
3) Measure voltage at the center of each defogger wire (1), and check defogger wire condition according to the following table.
   If defogger wire open is found, go to next step.

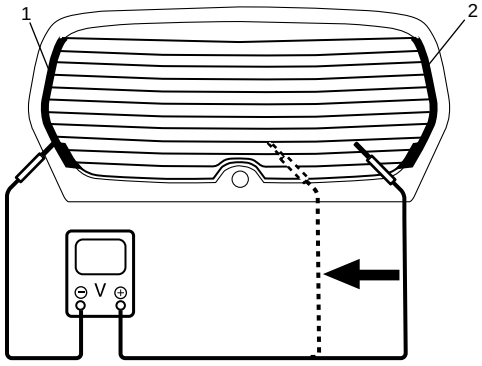
Defogger wire voltage

Voltage	Circuit
0 – 1 V	Defogger wire open between its center and defogger wire power source terminal end (2)
4 – 6 V	Normal condition
10 – 12 V	Defogger wire open between its center and defogger wire ground terminal end (3)



I4RS0A950029-

4) Touch voltmeter negative (–) lead to defogger wire ground terminal end (1).
5) Touch voltmeter positive (+) lead with a foil strip to defogger wire power source terminal end (2), then move it along wire to defogger wire ground terminal end (1).
   The place where voltmeter fluctuates from 10 – 12 V to 0 – 1 V is where there is open.
   If found defective, repair defogger wire referring to "Rear End Door Window Defogger Wire Repair: ".

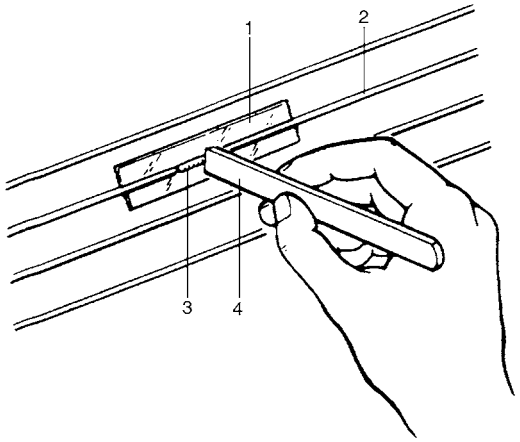


I4RS0A950030-

Rear End Door Window Defogger Wire Repair

S4RS0A9506018

1) Use white gasoline for cleaning.
2) Apply masking tape (1) at both upper and lower sides of heat wire (2) to be repaired.
3) Apply commercially-available repair agent (3) with a fine-tip brush (4).
4) 2 to 3 minutes later, remove masking tapes (1).



I2RH01950005-

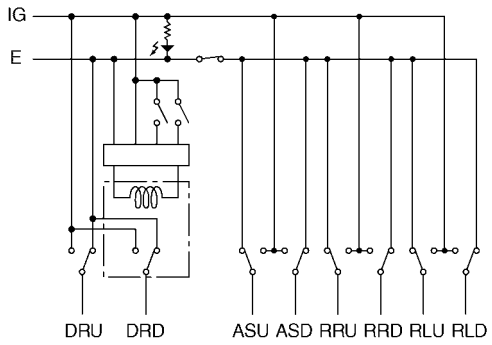
5) Leave repaired heat wire as it is for at least 24 hours before operating the defogger again.

Power Window Main Switch Inspection

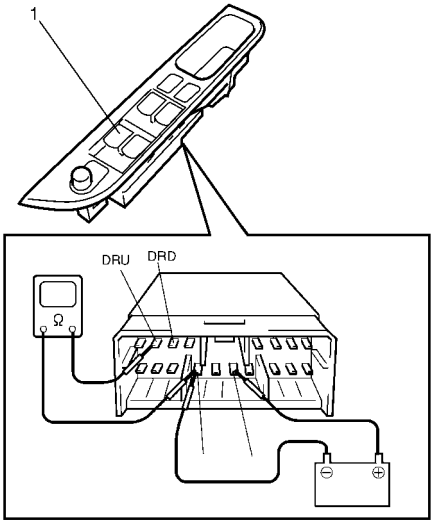
S4RS0A9506019

Switch for driver side window

1) Remove driver side door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation: ”.
2) Remove power window main switch from door trim.
3) Connect 12 V battery positive (+) terminal to terminal “IG” of power window main switch and its negative (–) terminal to terminal “E” of power window main switch.
4) Check for continuity between terminals as shown below.
   If check result is not as specified, replace power window main switch.



	IG	DRU	DRD	E
UP	○	○		
			○	○
OFF		○	○	○
DOWN	○		○	
		○		○



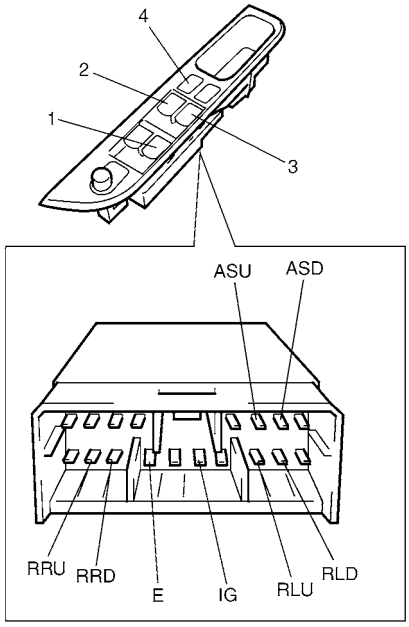
I4RS0A950031-

Switch for other window than driver side

1) Remove driver side door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation: ”.
2) Remove power window main switch from door trim.
3) Check for continuity between terminals as shown below.

If check result is not as specified, replace power window main switch.

		IG	ASU	ASD	E
Passenger side window switch (1)		IG	ASU	ASD	E
Rear right side window switch (2)		IG	RRU	RRD	E
Rear left side window switch (3)		IG	RLU	RLD	E
UNLOCK	UP	○	○		
				○	○
	OFF		○	○	○
	DOWN	○		○	
			○		○
LOCK	UP	○	○		
	OFF		○	○	
	DOWN	○		○	



I4RS0A950032-

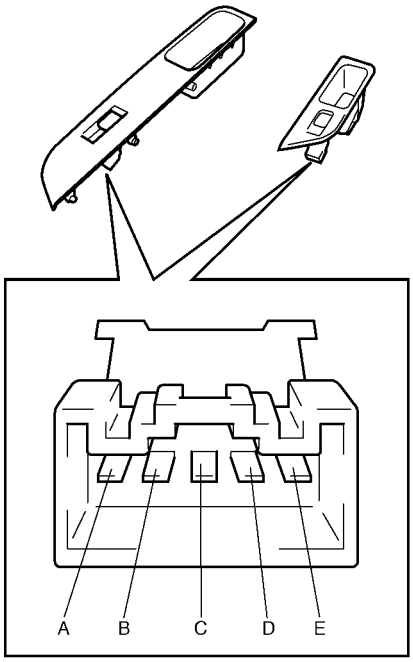
Power Window Sub Switch Inspection

S4RS0A9506020

1) Remove door trim from door panel.
   For front door trim, refer to Step 1) to 3) of “Front Door Glass Removal and Installation: ”
   For rear door trim, refer to Step 1) to 3) of “Rear Door Glass Removal and Installation: ”
2) Remove power window sub switch from door trim.
3) Check for continuity between terminals at each switch condition.

If check result is not as specified, replace switch.

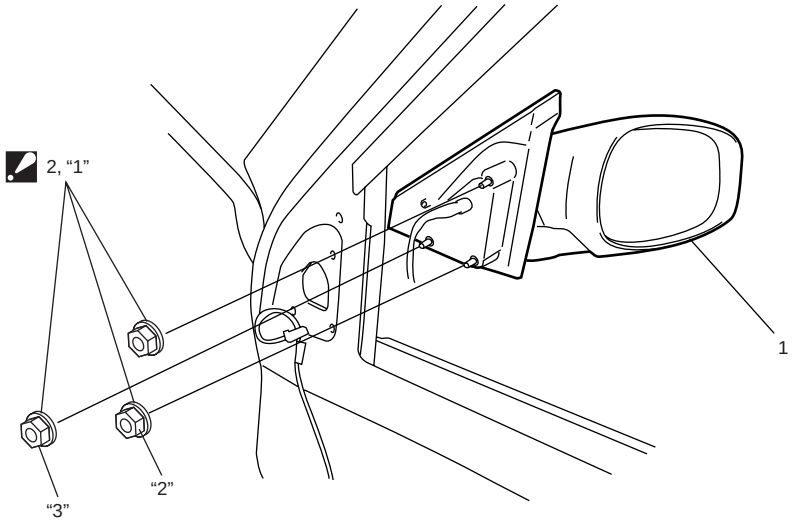
Switch Position \ Terminal	A	B	C	D	E
UP	○	○		○	○
OFF	○	○			
DOWN			○	○	○



I4RS0A950033-

Door Mirror Components

S4RS0A9506021



I4RS0A950034-

	1. Door mirror
✎	2. Door mirror mounting nut :Tighten nuts in such order as indicated in the figure.

Door Mirror Removal and Installation

S4RS0A9506022

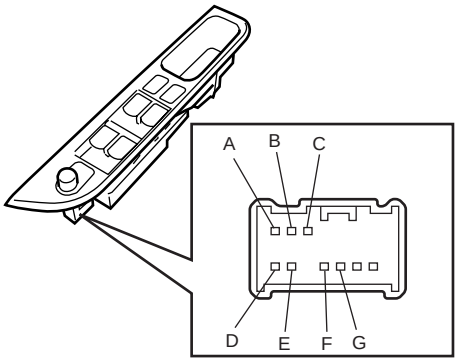
When removing or installing door mirror, refer to the figure in “Door Mirror Components: ”.

Power Door Mirror Switch Inspection

S4RS0A9506023

1) Remove driver side door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation: ”.
2) Remove power window main switch from door trim.
3) Check for continuity between terminals at each switch position.
   If check result is not as specified, replace door mirror switch.

L / R	A / B	C	D	E / F	G
Up		○	○	○	○
Down		○	○	○	○
Left	○	○	○	○	
Right	○	○	○	○	



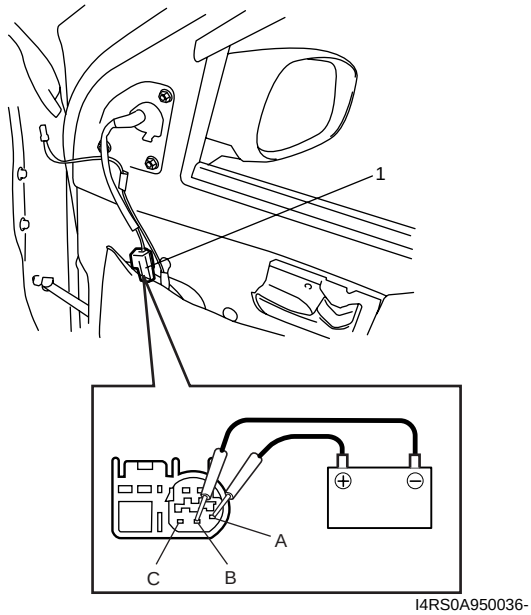
I4RS0A950035-

Power Door Mirror Actuator Inspection

S4RS0A9506024

1) Remove door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation: ”.
2) Disconnect door mirror coupler (1).
3) Check that door mirror operates properly when battery voltage is applied to connector terminals.
4) Connect battery positive (+) and negative (–) terminal to the door mirror terminals as shown.
   If it does not follow the table’s operation, replace door mirror assembly.

Terminal / Operation	A	B	C
Up	⊕	⊖	
Down	⊖	⊕	
Left		⊖	⊕
Right		⊕	⊖



I4RS0A950036-

Special Tools and Equipment

Recommended Service Material

S4RS0A9508001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞

NOTE:

Required service material is also described in the following.
“Front Door Window Components: ”
“Rear Door Window Components: ”

Security and Locks

General Description

Key Coding Construction

S4RS0A9601001

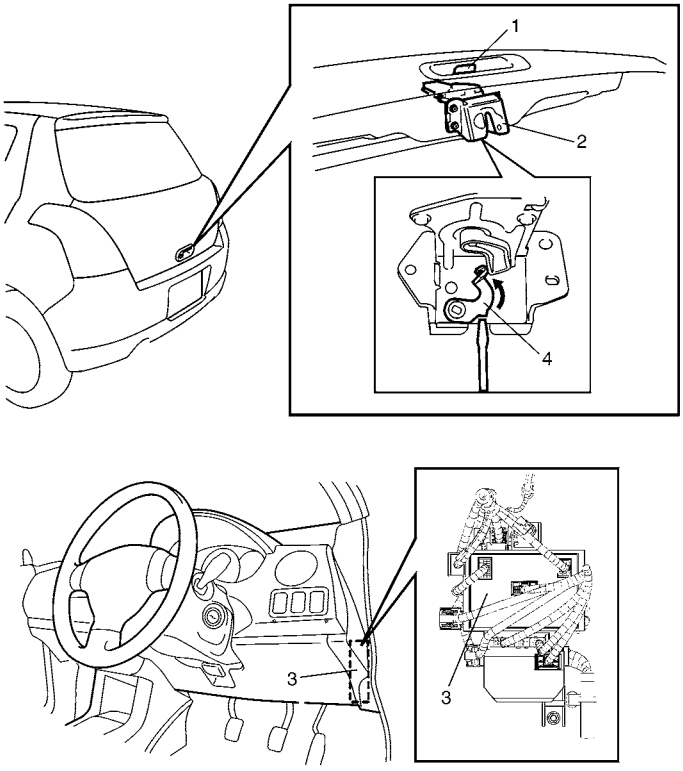
Key Usage and Identification

Key is used for ignition and door lock cylinder. Keys are cut on both edges to make them reversible.
Key identification is obtained from five character key code stamped on key code tag. Using this key code, key code cutting combination can be determined from a code list (available to owners of key cutting equipment from suppliers).
If key codes are not available from records or tags, key code can be obtained from the right hand door lock cylinder (if lock has not been replaced). Lock cylinders supplied by the factory as service parts are unmarked.
If original key is available, key code cutting combination can be determined by laying key.

Rear End Door Opener System Description

S4RS0A9601002

Rear end door opener system consists of rear end door opener switch (1), rear end door opener relay (in BCM), rear end door lock assembly (2) and BCM (3) (in junction block assembly).
Rear end door opener system is activated by pushing rear end door opener switch after all doors are unlocked by manual door switch, key cylinder switch or keyless entry transmitter.
When rear end door opener switch pushed rear end door opener relay is ON. Then, BCM releases latch of rear end door lock assembly from striker and rear end door can be opened.
In addition, in case that rear end door cannot be opened by rear end door opener switch, rear end door can be opened by emergency lever (4) in rear end door lock assembly.

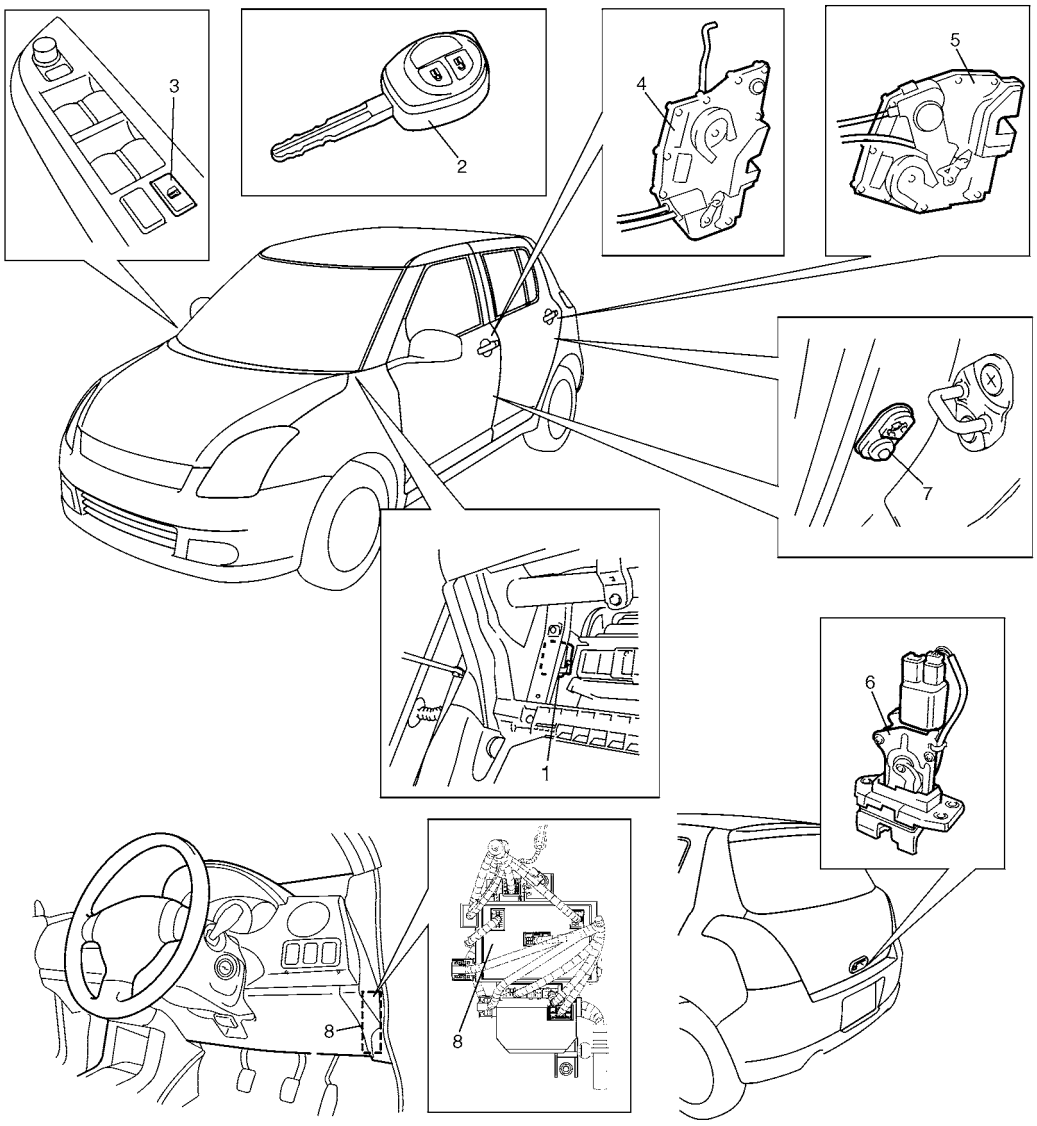


I4RS0A960025-

Component Location

Power Door Lock and Keyless Entry System Component Location

S4RS0A9603001



I4RS0A960001-

1. Keyless entry receiver	3. Power door lock switch	5. Rear door actuator	7. Door switch
2. Transmitter	4. Front door actuator	6. Rear end door actuator	8. BCM (included in junction block assembly)

Diagnostic Information and Procedures

Power Door Lock System Symptom Diagnosis

S4RS0A9604001

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
All door can not be locked / unlocked by all of switches	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
All door can not be locked / unlocked by only power door lock switch	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Power door lock switch faulty	*Check power door lock switch referring to "Power Door Lock Switch Inspection: ".*
	Wiring harness connected to power door lock switch faulty	*Repair.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
All door can not be locked / unlocked by only key cylinder switch	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Key cylinder switch faulty	*Check key cylinder switch referring to "Door Key Cylinder Switch Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Only one door can not be locked / unlocked	Power door lock actuator faulty	*Check actuator referring to "Power Door Lock Actuator Inspection: ".*
	Wiring harness connected to applicable door lock actuator faulty	*Repair.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Power Door Lock System Operation Inspection

S4RS0A9604002

1) Check the following operation:

a) Turn the driver side key cylinder to LOCK position with door key once, check all doors lock.

b) Turn the driver side door key cylinder to UNLOCK position with door key twice, check all doors unlock.

If malfunction is found, go to "Power Door Lock System Symptom Diagnosis: ".

Keyless Entry System Symptom Diagnosis

S4RS0A9604004

NOTE:

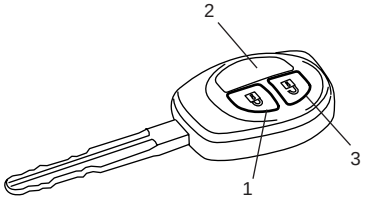
- **Confirm that power door lock system is in good condition before referring to the following possible causes.**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
All door can not be locked / unlocked by only keyless entry transmitter	Transmitter battery dead	*Replace battery referring to "Replacement of Transmitter Battery: ".*
	Door switch faulty	*Check door switch referring to "Door Switch (Front / Rear Door) Inspection: in Section 9C" and/or "Rear End Door Switch Inspection: in Section 9C".*
	Key remainder switch in ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection: in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*
	Transmitter faulty	*Replace transmitter.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Turn signal lights can not be flashed when doors are locked / unlocked by keyless entry transmitter	Turn signal and hazard warning relay faulty	*Check turn signal and hazard warning relay referring to "Turn Signal and Hazard Warning Relay Inspection: in Section 9B".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Interior light does not light when doors are unlocked by keyless entry transmitter	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Transmitter code can not be programmed to BCM	Wiring or grounding faulty	*Repair circuit.*
	Door switch faulty	*Check door switch referring to "Door Switch (Front / Rear Door) Inspection: in Section 9C" and/or "Rear End Door Switch Inspection: in Section 9C".*
	Keyless entry receiver faulty	*Check keyless entry receiver referring to "Keyless Entry Receiver and Its Circuit Inspection: ".*
	Key reminder switch in ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection: in Section 9C".*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Keyless Entry System Operation Inspection

S4RS0A9604005

1) Confirm that power door lock system operates normally, refer to "Power Door Lock System Operation Inspection: ".
2) All doors are closed and unlocked.
3) Check the following operation:
   a) Push "lock" button (1) on transmitter (2) once, and check all doors lock and hazard waning lights flash once.
   b) Push "unlock" button (3) on transmitter (2) twice, and check all doors unlock and hazard waning lights flash twice and interior light turns on several seconds with the interior light switch in the middle position.



I3RH0A960005-

If malfunction is found, go to "Keyless Entry System Symptom Diagnosis: ".

Rear End Door Opener System Symptom Diagnosis

S4RS0A9604007

NOTE:

- **Use SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data: in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Rear end door can not be opened	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Rear end door opener switch faulty	*Check rear end door opener switch referring to "Rear End Door Opener Switch Inspection: ".*
	Rear end door actuator faulty	*Check rear end door actuator referring to "Power Door Lock Actuator Inspection: ".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Rear End Door Opener System Operation Inspection

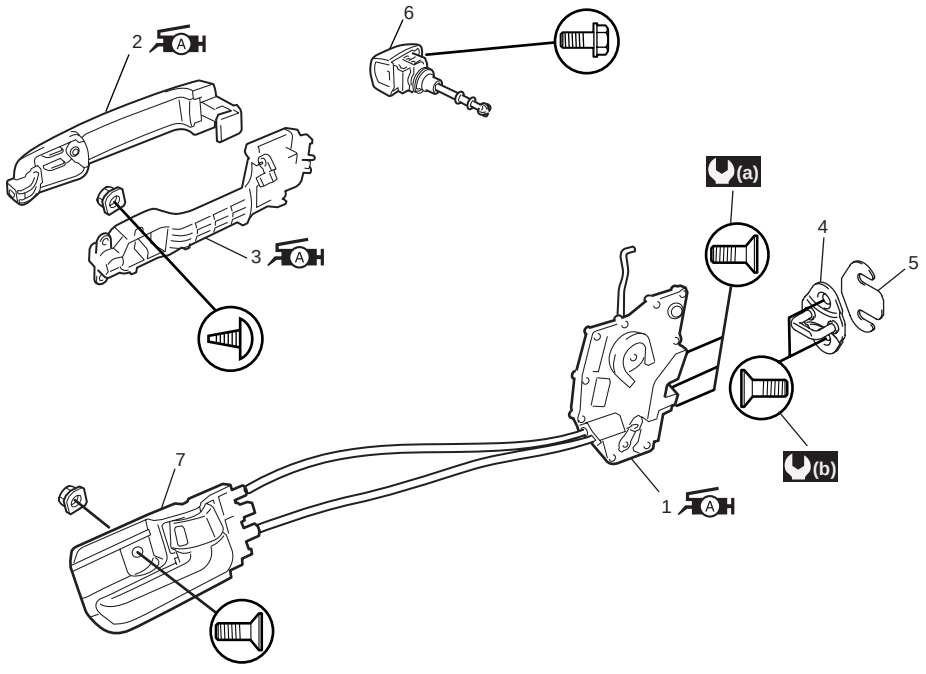
S4RS0A9604008

1) Unlock all doors by using manual lock switch, keyless entry transmitter, or key cylinder switch.
2) Make sure that latch of rear end door is released from striker when rear end door opener switch is pushed. If malfunction is found, go to "Rear End Door Opener System Symptom Diagnosis: ".

Repair Instructions

Front Door Lock Assembly Components

S4RS0A9606001



I4RS0A960002-

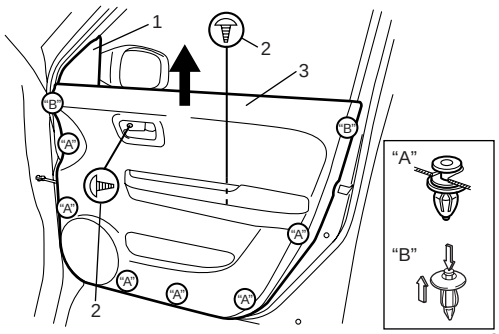
(A) 1. Front door latch assembly : Apply lithium grease 99000-25010 to sliding and rotating parts and spring if any.	4. Latch striker	7. Inside handle bezel
(A) 2. Outside handle : Apply lithium grease 99000-25010 to sliding part.	5. Shim	(a) : 5.0 N·m (0.5 kg-m, 4.0 lb-ft)
(A) 3. Outside handle frame : Apply lithium grease 99000-25010 to sliding part and spring.	6. Key cylinder	(b) : 10 N·m (1.0 kg-m, 7.5 lb-ft)

Front Door Lock Assembly Removal and Installation

S4RS0A9606018

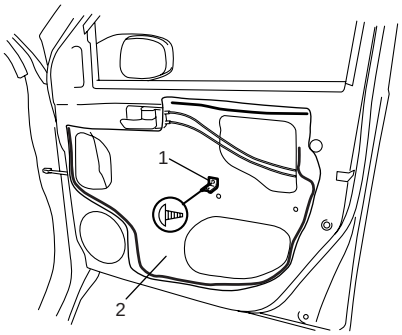
Removal

1) Remove door mirror trim (1).
2) Remove door trim (3) after removing screws (2) and clips “A” and “B”.



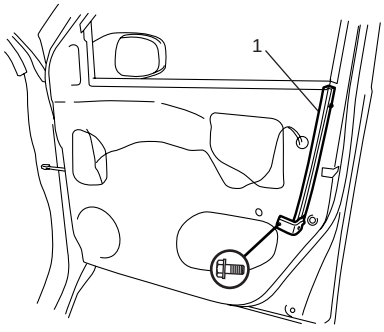
I4RS0A960003-

3) Disconnect power window switch and mirror switch lead wire at coupler.
4) Remove door trim bracket (1).
5) Remove door sealing cover (2).



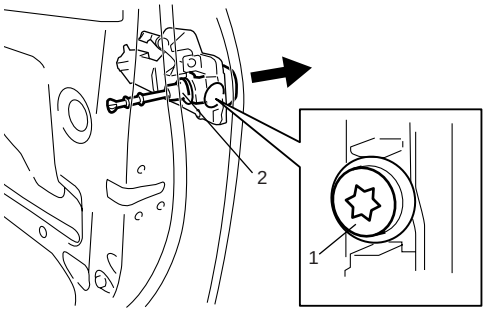
I4RS0A960004-

6) Raise window all the way up.
7) Remove door sash (1).



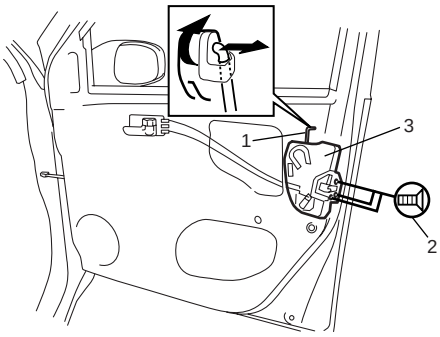
I4RS0A960007-

8) Remove key cylinder mounting bolt (1), and then remove key cylinder (2).



I4RS0A960005-

9) Disconnect door opening control rod (1) from outside handle.
10) Disconnect door lock motor lead wire at coupler.
11) Remove door latch screws (2) and remove door lock assembly (3).



I4RS0A960006-

Installation

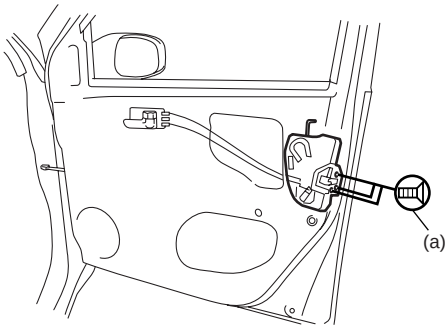
Reverse removal procedure to install front door lock assembly noting the following instructions.

- Apply grease to sliding parts of door latch assembly.

  : Grease 99000–25010

- Tighten door latch screws to specified torque.

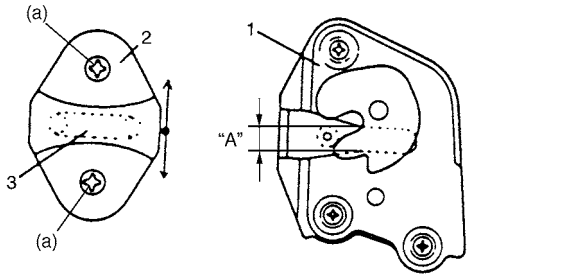
Tightening torque
Door latch screw (a): 5.0 N·m (0.5 kg-m, 4.0 lb-ft)



I4RS0A960008-

- Move door latch striker (2) up or down so its center aligns with the center of groove “A” on the door lock assembly (1) as shown.
  Striker should be moved vertically and placed level.
  Do not adjust door lock.

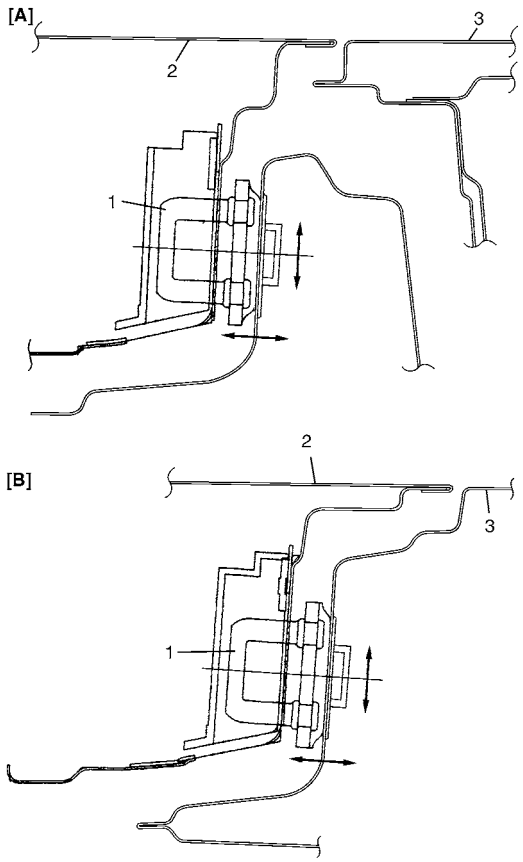
Tightening torque
Door latch striker screw (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A960029-

3. Shaft

- Move door latch striker (1) sideways to adjust door outer panel surface (2) flush with rear door outer panel or body outer panel surface (3) as shown.
  In order to correctly obtain door lock operation increase or decrease number of shims inserted between body and striker (1) to adjust it.



I3RM0A960013-

[A]: Front door
[B]: Rear door

Front Door Lock Assembly Inspection

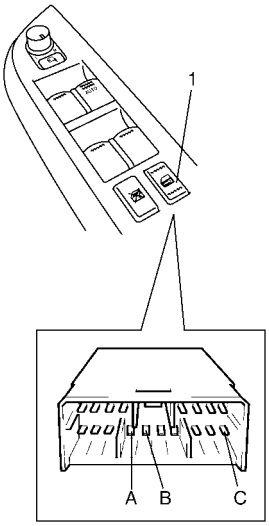
S4RS0A9606019

- Check that door open and closes smoothly and properly.
- Check that door stops in the secondary latched position properly (preventing door from opening freely) and that door closed completely in the fully latched position.
- Adjust door latch striker position, if necessary.

Power Door Lock Switch Inspection

S4RS0A9606003

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Switch \ Terminal	A	B	C
LOCK	○		○
OFF			
UNLOCK	○	○	

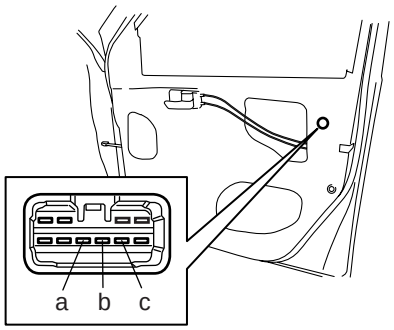
I4RS0A960009-

1. Power door lock switch

Door Key Cylinder Switch Inspection

S4RS0A9606004

1) Remove front door trim referring to Step 1) to 3) of “Front Door Glass Removal and Installation: in Section 9E”
2) Check for continuity between terminals at each switch position. If check result is not as specified, replace door lock assembly.



Terminal / Key Position	a	b	c
LOCK	○		○
OFF			
UNLOCK	○	○	

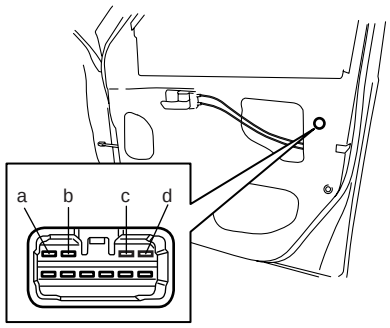
I4RS0A960010-

Power Door Lock Actuator Inspection

S4RS0A9606005

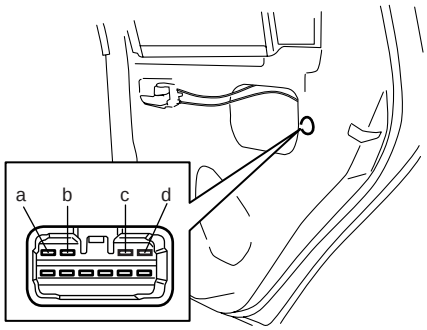
1) Remove door trim from door panel.
   For front door, refer to Step 1) to 3) of “Front Door Glass Removal and Installation: in Section 9E”.
   For rear door, refer to Step 1) to 3) of “Rear Door Glass Removal and Installation: in Section 9E”.
   For rear end door, refer to Step 1) of “Rear End Door Assembly Removal and Installation: in Section 9J”.
2) Disconnect power door lock actuator coupler.
3) Connect battery positive (+) and negative (–) terminals to the door lock actuator terminals (a, b, c, d) as shown in figure.
   If it does not operate as specified in the following table, replace door lock assembly.

[A]



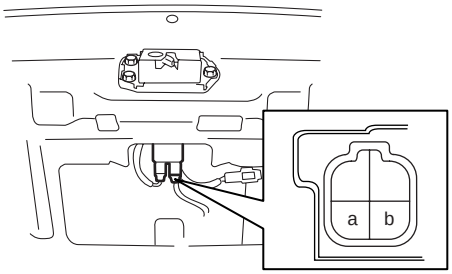
			d	b
Right side switch terminals			d	b
Left side switch terminals			a	c
Unlock	→	Lock	⊖	⊕
Lock	→	Unlock	⊕	⊖

[B]



			a	c
Right side switch terminals			a	c
Left side switch terminals			d	b
Unlock	→	Lock	⊖	⊕
Lock	→	Unlock	⊕	⊖

[C]



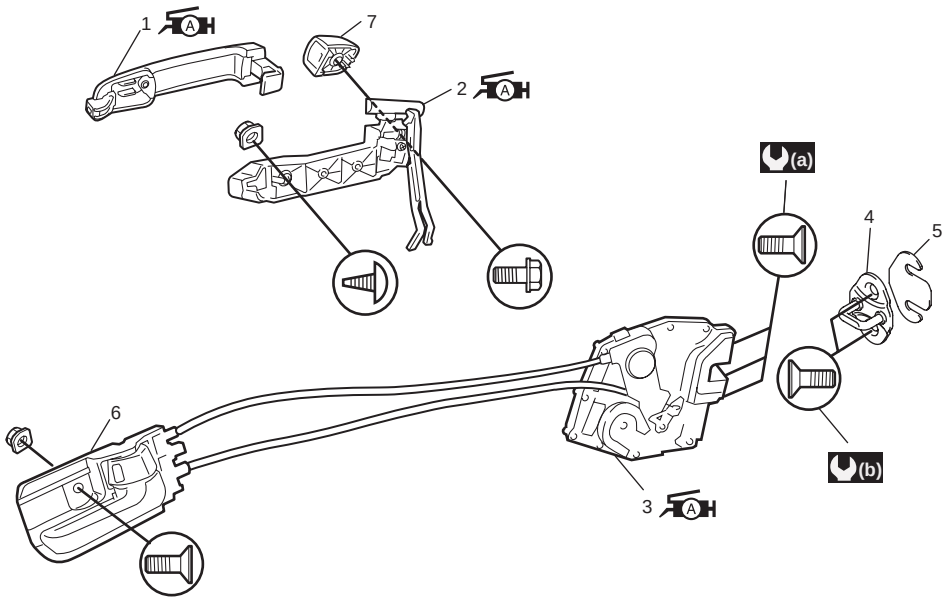
			a	b
Lock	→	Unlock	⊕	⊖

I4RS0A960011-

[A]: Front door
[B]: Rear door
[C]: Rear end door

Rear Door Lock Assembly Components

S4RS0A9606007



I4RS0A960012-

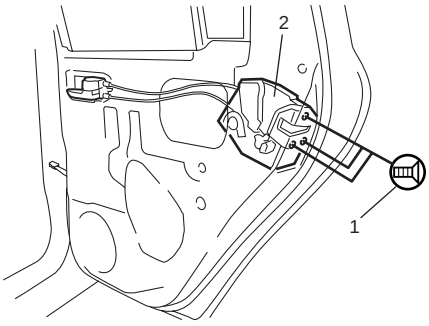
1. Outside handle : Apply lithium grease 99000-25010 to sliding part.	4. Latch striker	7. Out side handle cap
2. Outside handle frame : Apply lithium grease 99000-25010 to sliding part and spring.	5. Shim	(a) : 5.0 N·m (0.5 kg-m, 4.0 lb-ft)
3. Rear door latch assembly : Apply lithium grease 99000-25010 to sliding part.	6. Inside handle bezel	(b) : 10 N·m (1.0 kg-m, 7.5 lb-ft)

Rear Door Lock Assembly Removal and Installation

S4RS0A9606008

Removal

1) Remove rear door glass referring to “Rear Door Glass Removal and Installation: in Section 9E”.
2) Disconnect door lock motor lead wire.
3) Remove door latch mounting screws (1) and remove door latch assembly (2).



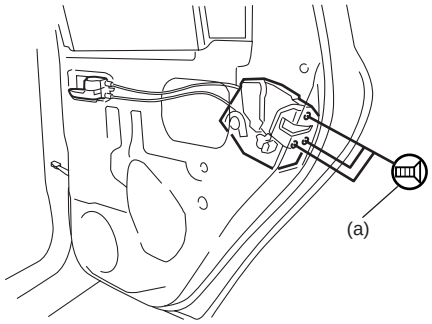
I4RS0A960013-

Installation

Reverse removal procedure to install rear door lock assembly referring to the following instruction and “Front Door Lock Assembly Removal and Installation: ”.

- Tighten door latch screw to specified torque.

Tightening torque
Door latch screw (a): 5.0 N·m (0.5 kg-m, 4.0 lb-ft)



I4RS0A960014-

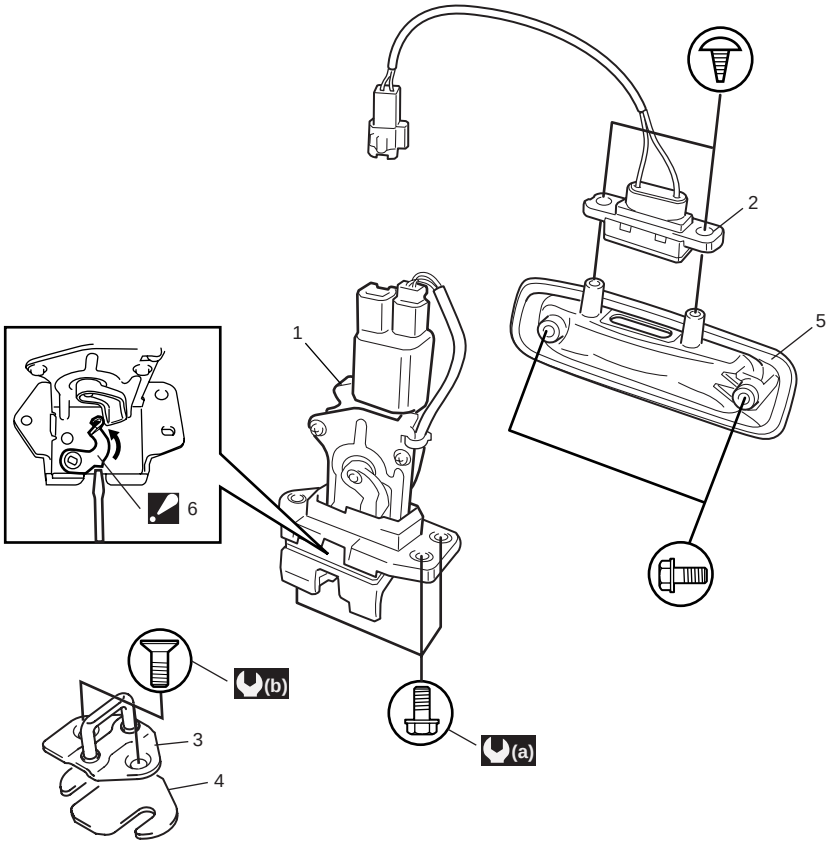
Rear Door Lock Assembly Inspection

S4RS0A9606009

- Check that door opens and closes smoothly and properly.
- Check that door stops in the secondary latched position properly (preventing door from opening freely) and that door closes completely in the fully latched position.
- Adjust door latch striker position, if necessary.

Rear End Door Lock Assembly Components

S4RS0A9606010



I4RS0A960015-

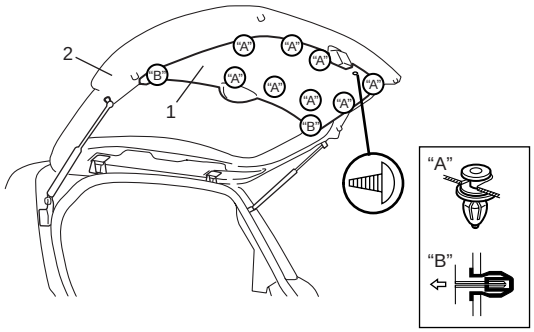
1. Rear end door latch assembly (including in rear end door switch)	3. Latch striker	5. Door handle	(a) : 10 N·m (1.0 kg-m, 7.5 lb-ft)
2. Rear end door opener switch	4. Shim	6. Emergency lever : Rear end door is unlocked by pushing emergency lever with flat head driver if rear end door lock can not be released by door opener switch.	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

Rear End Door Lock Assembly Removal and Installation

S4RS0A9606011

Removal

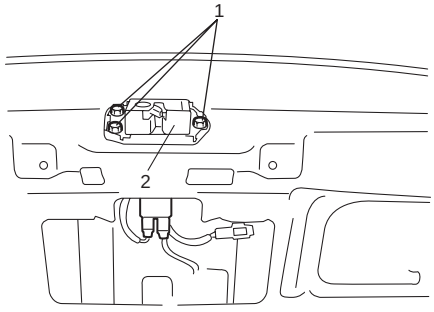
1) Remove door trim (1) from rear end door panel (2).



I4RS0A960016-

2) Disconnect door lock motor lead wire.

3) Loosen door latch bolts (1) and remove door latch assembly (2).



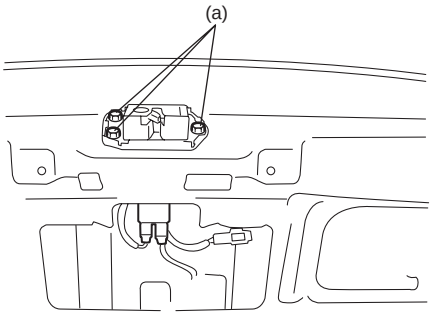
I4RS0A960017-

Installation

Reverse removal procedure to install rear end door lock assembly noting the following instruction.

- Tighten rear end door latch bolt to specified torque.

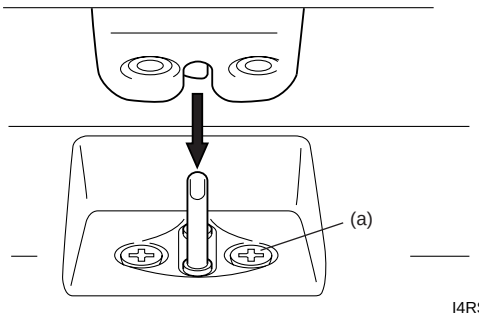
  Tightening torque
  Rear end door latch bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



I4RS0A960018-

- Adjust door latch striker so that its center aligns with the center of groove in door latch base.

  Tightening torque
  Rear end door striker screw (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A960019-

Rear End Door Lock Assembly Inspection

S4RS0A9606012

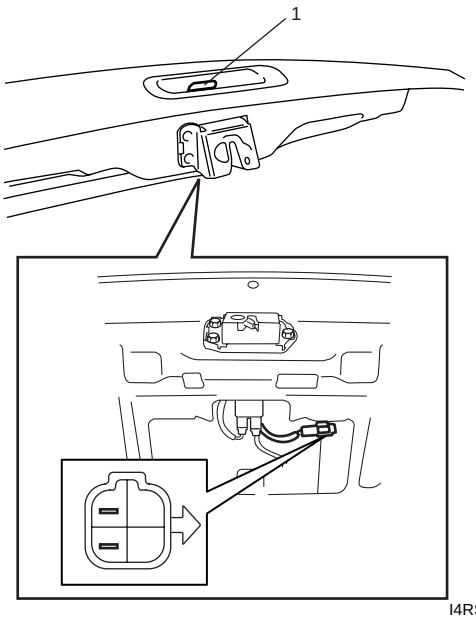
- Check that door opens and closes smoothly and properly.
- Check that door stops in the secondary latched position properly (preventing door from opening freely) and that door closes completely in the fully latched position.
- Adjust door latch striker position, if necessary.

Rear End Door Opener Switch Inspection

S4RS0A9606020

1) Remove rear end door trim.
2) Disconnect rear end door switch coupler.
3) Check that there is continuity between terminals when rear end door opener switch (1) is pushed.
4) Check that there is no continuity between terminals when rear end door opener switch (1) is not pushed.

If check result is not as specified, replace switch.



I4RS0A960020-

Replacement of Transmitter Battery

S4RS0A9606016

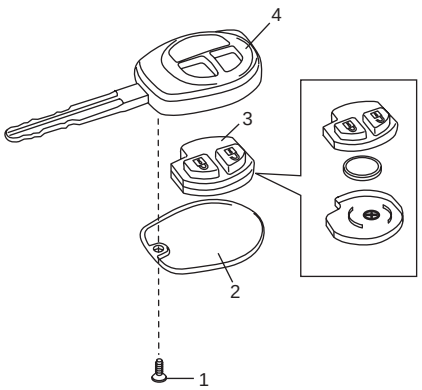
If transmitter becomes unreliable, replace transmitter battery as follows.

1) Remove screw (1) and transmitter cover (2).
2) Remove transmitter (3) from transmitter holder (4).

CAUTION:

Use care not to allow grease or dirt to be attached on the printed circuit board and the battery.

3) With tip of flat blade screwdriver put in slot of transmitter, pry it open.
4) Replace the battery (lithium disc-type CR 1620 or equivalent battery) so its (+) terminal faces “+” mark on transmitter.
5) Fit together transmitter (3) and install it into transmitter holder (4).
6) Install transmitter cover (2) and screw (1).
7) Make sure that door locks can be operated with transmitter.



I4RS0B960014-

NOTE:

- **To prevent theft, be sure to break the transmitter before discarding it.**
- **Dispose of the used battery properly according to applicable rules or regulations. Do not dispose of lithium batteries with ordinary household trash.**

Programming Transmitter Code

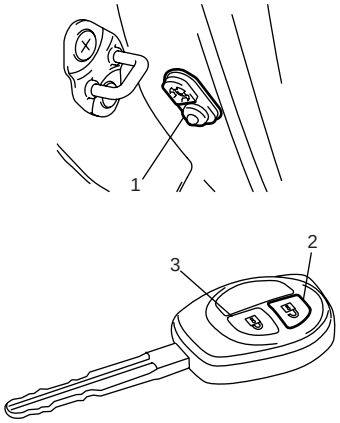
S4RS0A9606017

NOTE:

- **Three transmitter codes can be registered.**
- **When a new transmitter code is registered, the oldest one will be cleared.**

If transmitter or BCM (included in junction block assembly) is replaced with a new one or additional transmitter(s) is necessary, program transmitter code(s).

1) Confirm that all doors are closed and ignition key is out of ignition key cylinder
2) Open driver side door.
3) Turn ignition switch to ON position, and then drawn ignition key from ignition key cylinder within 10 seconds after that.
4) Push and release driver side door switch (1) at 3 times by hand within 20 seconds after removing ignition key from ignition key cylinder.
5) Turn ignition switch to ON position, and then drawn ignition key from ignition key cylinder within 10 seconds after that. All doors automatically lock and unlock once.
   With this, registration mode.
6) Push “UNLOCK” button (2) on transmitter (3) within 20 seconds after Step 5). All doors automatically lock and unlock once.
   With this, code registration is completed.
7) If an additional transmitter, needs to be programed repeat the procedure of Step 1).



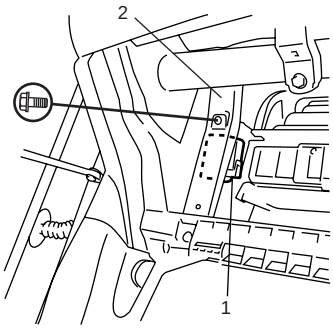
I4RS0A960021-

Keyless Entry Receiver Removal and Installation

S4RS0A9606021

Removal

1) Disconnect negative cable at battery.
2) Remove grove box referring to Step 6) of “Instrument Panel Removal and Installation: in Section 9C”.
3) Disconnect keyless entry receiver coupler.
4) Remove keyless entry receiver (1) from steering support member (2).



I4RS0A960022-

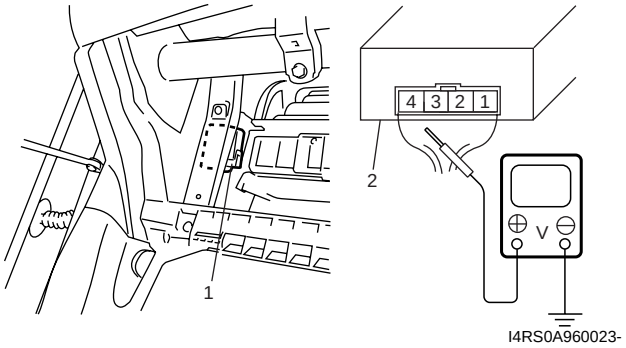
Installation

Reverse removal procedure.

Keyless Entry Receiver and Its Circuit Inspection

S4RS0A9606022

1) Check that the voltage between the following terminals and body ground are specifications under each conditions. If check result is not as specified, check applicable circuit for open or short. If circuit is normal, proceed to next step.



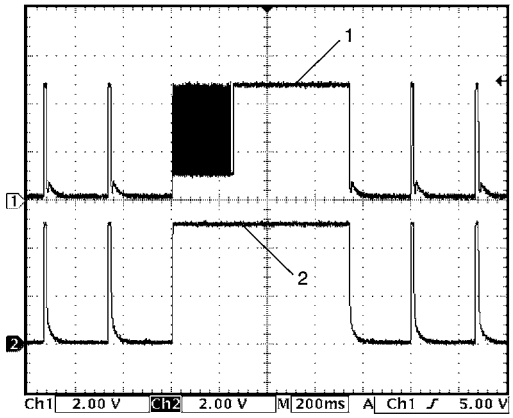
I4RS0A960023-

1. Keyless entry receiver
2. Keyless entry receiver connector (view from harness side)

Terminal	Wire color	Circuit	Specification	Condition
G02-1	LT GRN	Power source	Figure [A]	Push “Lock” or “Unlock” button on transmitter.
			0-1 V	Except the above-mentioned condition.
G02-3	PNK	Lock/Unlock output signal circuit	Figure [A]	Push “Lock” or “Unlock” button on transmitter.
			0-1 V	Except the above-mentioned condition.
G02-4	BRN/WHT	Ground	0-1 V	—

Oscilloscope setting
CH1: 2V/DIV
CH2: 2V/DIV
TIME: 200 ms/DIV

[A]



I4RS0A960024-

1. Lock/Unlock out put signal
2. Power source

1) Recheck keyless entry receiver as follows.
   a) Substitute a known-good keyless entry receiver.
   b) Record key code referring to “Programming Transmitter Code: ”.
   c) Recheck keyless entry receiver system.

Specifications

Tightening Torque Specifications

S4RS0A9607001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Door latch screw	5.0	0.5	4.0	☞ / ☞
Door latch striker screw	10	1.0	7.5	☞
Rear end door latch bolt	10	1.0	7.5	☞
Rear end door striker screw	23	2.3	17.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Door Lock Assembly Components: ”
“Rear Door Lock Assembly Components: ”
“Rear End Door Lock Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A9608001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞

NOTE:

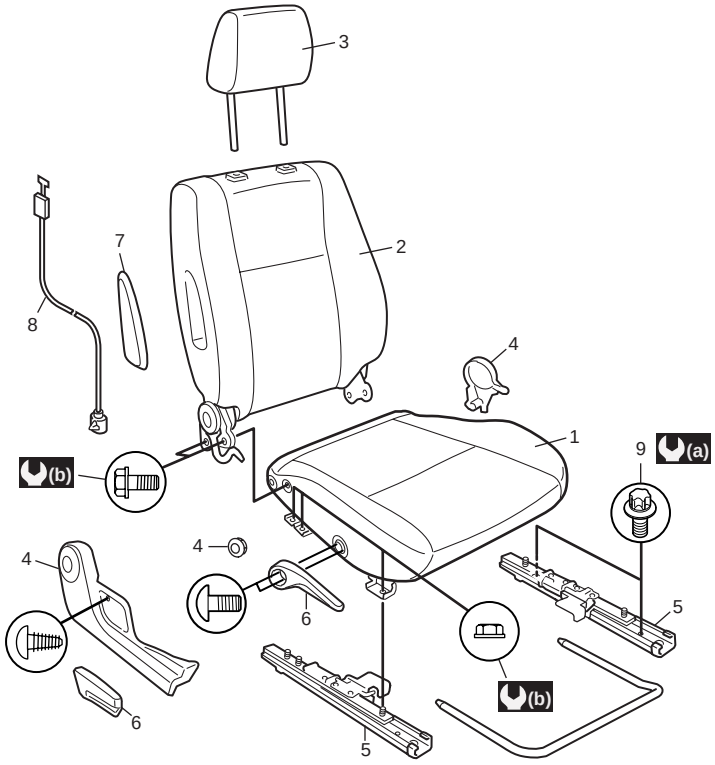
Required service material is also described in the following.
“Front Door Lock Assembly Components: ”
“Rear Door Lock Assembly Components: ”

Seats

Repair Instructions

Front Seat Components

S4RS0A9706001



I4RS0A970001-

1. Seat cushion	4. Cover	7. Side air bag module (if equipped)	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
2. Seat back	5. Seat adjuster	8. Side air bag harness (if equipped)	(b) : 35 N·m (3.5 kg-m, 25.5 lb-ft)
3. Headrest	6. Knob	9. Seat mounting bolt	

Front Seat Removal and Installation

S4RS0A9706002

Removal

1) Disable air bag system referring to“Disabling Air Bag System: in Section 8B”
2) Disconnect seat harness coupler and side air bag coupler, if equipped.
3) Remove 4 mounting bolts to remove seat assembly.
4) Disassemble and repair seat as necessary.

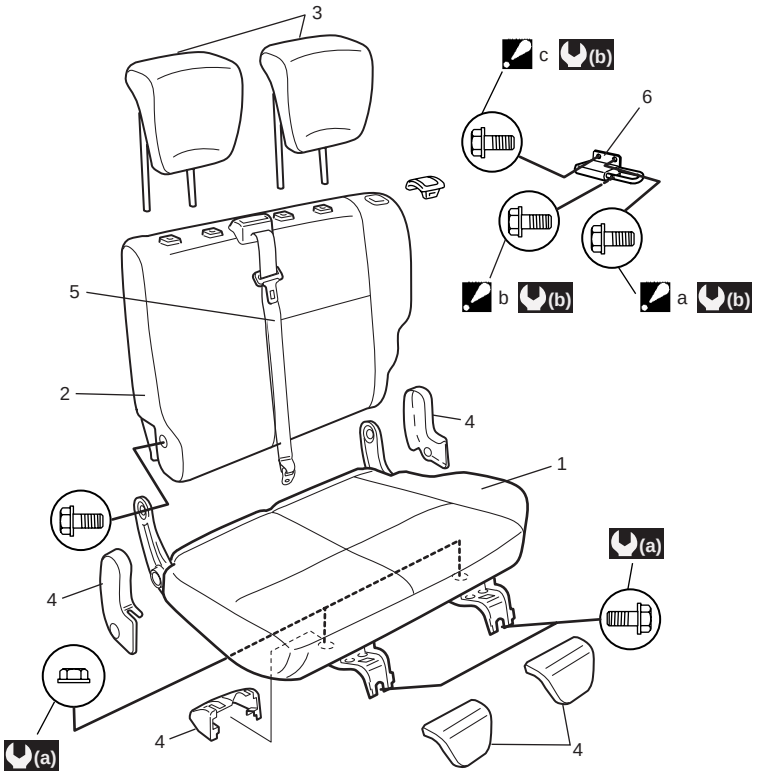
Installation

Reverse removal procedure to install front seat.

- Torque to specifications as shown in “Front Seat Components: ”.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Rear Seat Components

S4RS0A9706003



I4RS0A970002-

1. Seat cushion	4. Cover	(a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)	a, b, c: Seat back striker mounting bolt
2. Seat back	5. Rear center seat belt	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)	: Tightening order (Left side): a→b→c
3. Head rest	6. Seat back striker		: Tightening order (Right side): b→a→c

Rear Seat Removal and Installation

S4RS0A9706004

Removal

1) Fold rear seat back forward.
2) Remove seat mounting bolts and nuts to remove seat assembly.
3) Disassemble and repair seat as necessary.

Installation

Reverse removal procedure to install rear seat.

- Torque to specifications in “Rear Seat Components: ”.

Specifications

Tightening Torque Specifications

S4RS0A9707001

NOTE:

The specified tightening torque is also described in the following.
“Front Seat Components: ”
“Rear Seat Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Interior Trim

Repair Instructions

Floor Carpet Removal and Installation

S4RS0A9806001

Removal

1) Remove front seats and rear seats.
2) Remove seat belt lower anchor bolt.
3) Remove dash side trims, front side sill scuffs, center pillar inner lower trims, rear side lower trims and rear side sill scuffs.
4) Remove console box.
5) Remove floor carpet.

Installation

Reverse removal sequence to install front floor carpet, noting the following instruction.

- For tightening torque of rear seat mounting bolt, refer to “Rear Seat Components: in Section 9G”.
- For tightening torque of front seat mounting bolt, refer to “Front Seat Components: in Section 9G”.

Head Lining Removal and Installation

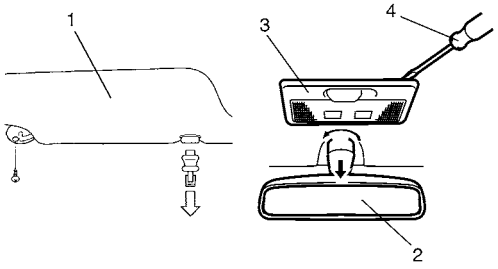
S4RS0A9806002

WARNING:

Refer to “Air Bag Warning: in Section 00” before starting service work.

Removal

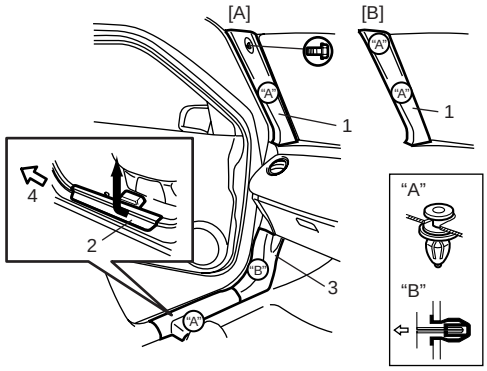
1) Remove sun visor (1).
2) Remove room mirror (2).
3) Remove dome light (3).



I4RS0A980011-

4. Flat head driver

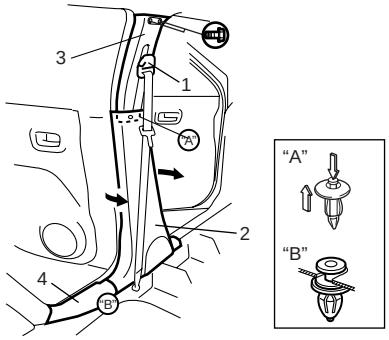
4) Remove front pillar trim (1), front side sill scuff (2) and dash side trim (3).



I4RS0A980001-

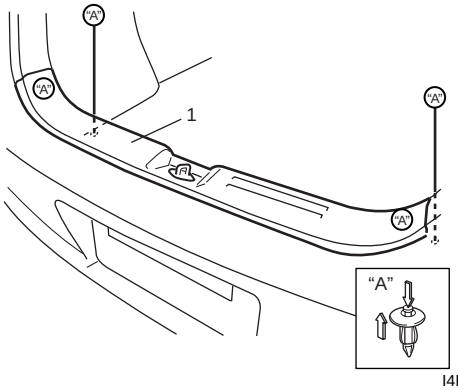
[A]: With curtain air bag
[B]: Without curtain air bag
4. Forward

5) Remove front seat belt upper anchor (1), center pillar inner trim (2), center pillar inner upper trim (3) and rear side sill scuff (4).



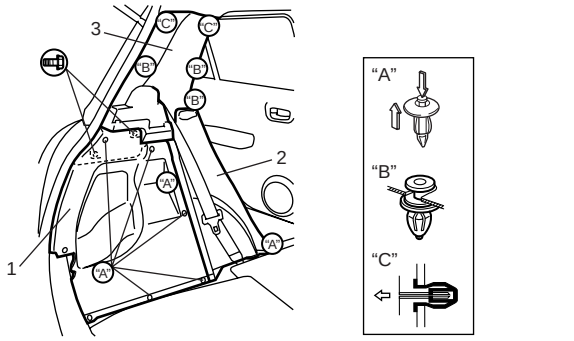
I4RS0A980002-

6) Remove tail end member trim (1).



I4RS0A980003-

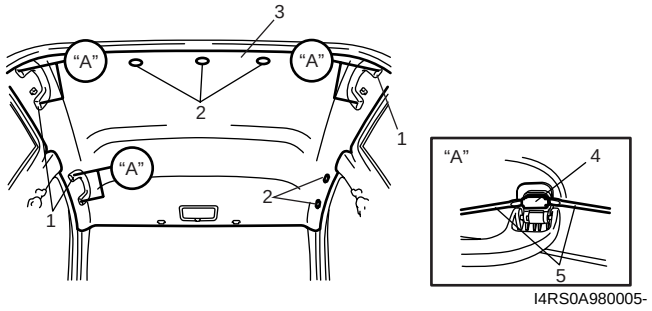
7) Remove rear inner trim (1), rear side lower trim (2) and rear pillar trim (3).



I4RS0A980004-

8) Remove assistant grip (1).

9) Remove head lining clips (2) and remove head lining (3).



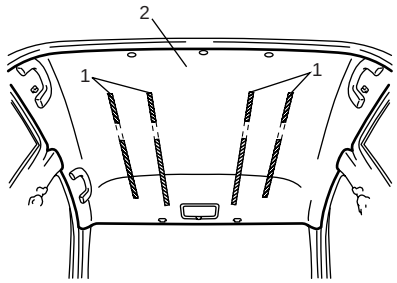
I4RS0A980005-

4.	Clip
5.	Flat head driver

Installation

Reverse removal procedure noting the following.

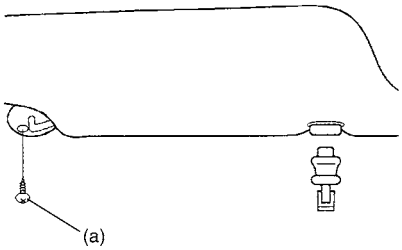
- Apply adhesive (1) to head lining (2) as shown in the figure, and then install head lining (2).



I4RS0A980006-

- Tighten sun visor screw to specified torque.

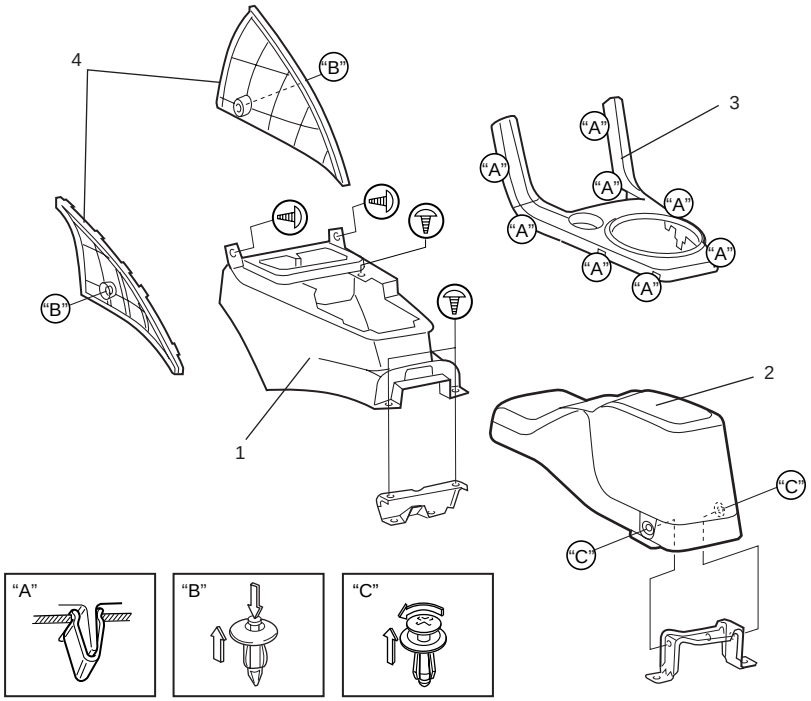
Tightening torque
Sun visor screw (a): 4 N·m (0.4 kg-m, 3.0 lb-ft)



I4RS0A980007-

Console Box Components

S4RS0A9806003

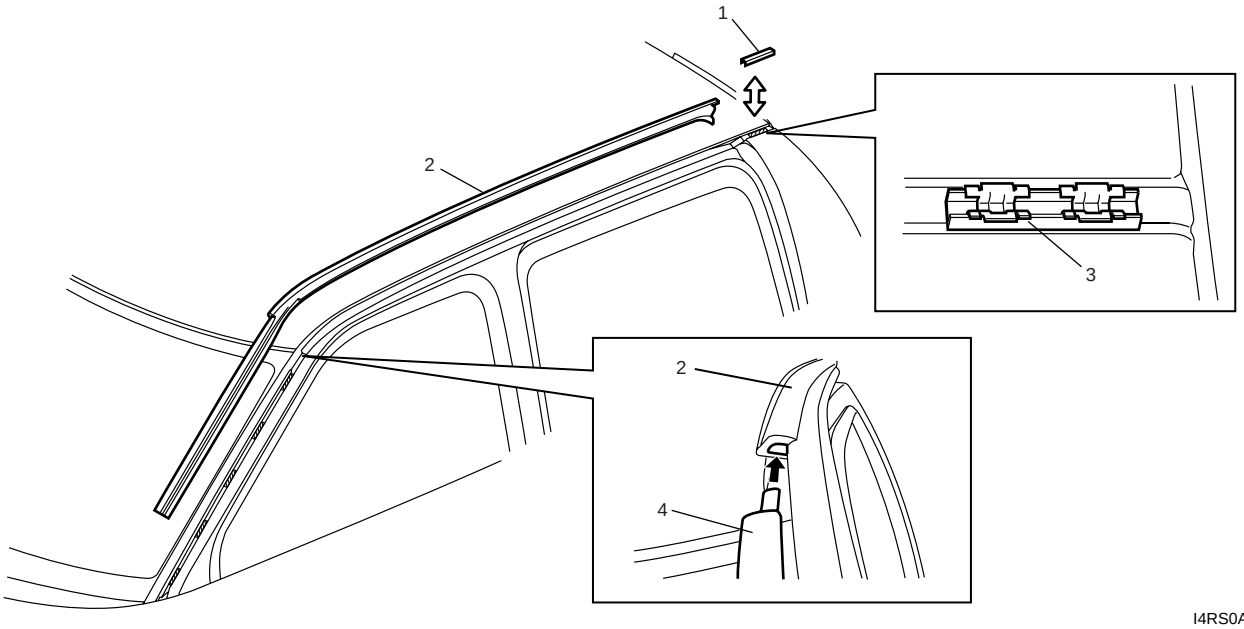


I4RS0A980008-

1.	Front console box	3.	Front console box garnish
2.	Rear console box	4.	Console side cover

Roof Molding Components

S4RS0A9806004

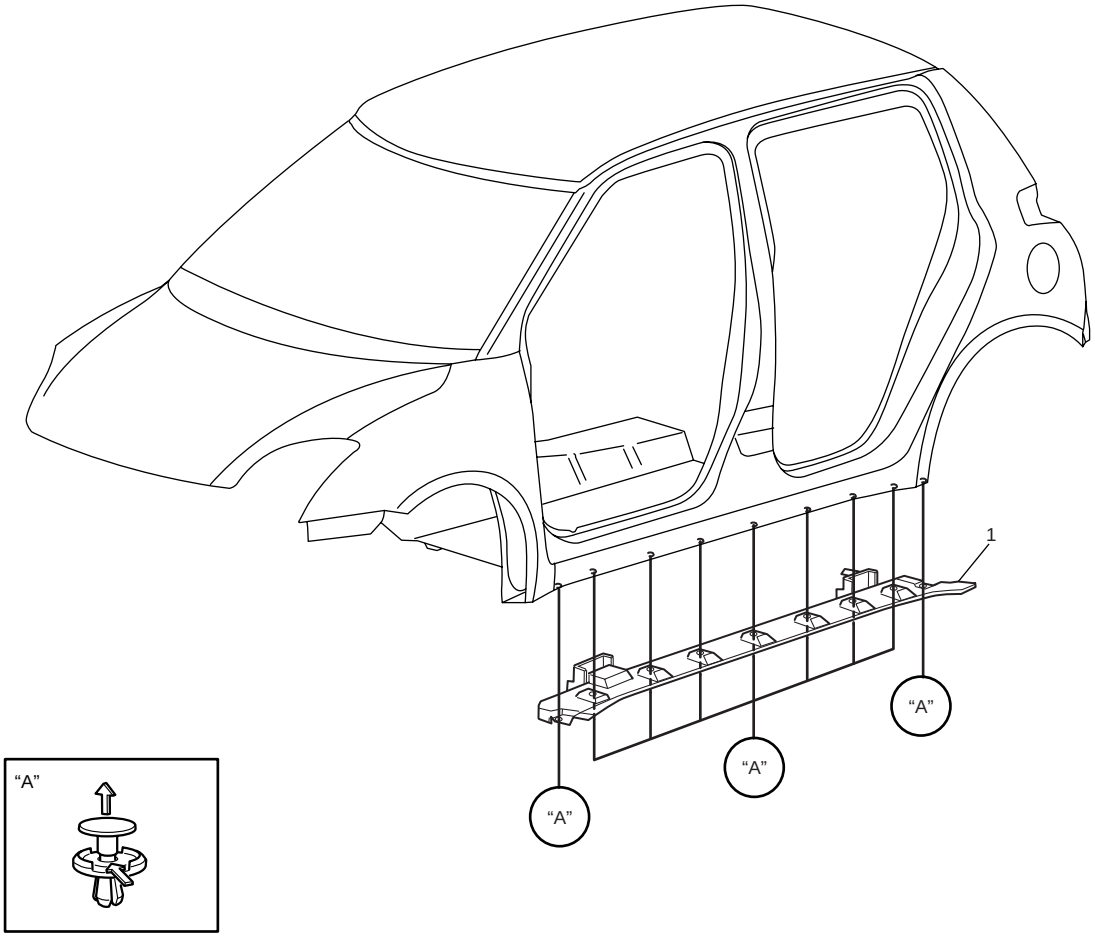


I4RS0A980009-

1. Roof molding	3. Roof molding clip (Push-in type)
2. Roof side weather-strip	4. Windshield side garnish

Splash Guard (If Equipped) Components

S4RS0A9806005



I4RS0A980010-

1. Side sill splash guard

Specifications

Tightening Torque Specifications

S4RS0A9807001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Sun visor screw	4	0.4	3.0	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Hood / Fenders / Doors

Repair Instructions

Hood Removal and Installation

S4RS0A9A06001

Removal

CAUTION:

Place cloth to prevent body from any damage.

1) Remove hood silencer (4).
2) Disconnect window washer hose (1) from hood.
3) Remove 4 mounting bolts (3) to detach hood (2).

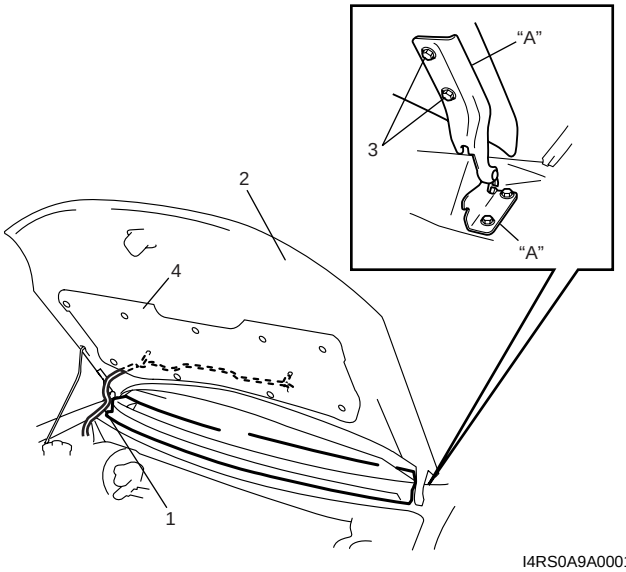
Installation

Reverse removal procedure noting the following.

- Apply sealant to contact face “A” of hood hinge.
  Specified sealant.

  “A”: Sealant 99000–31110

- Adjust hood lock position if necessary referring to “Hood Inspection and Adjustment”.



I4RS0A9A0001-

Hood Inspection and Adjustment

S4RS0A9A06002

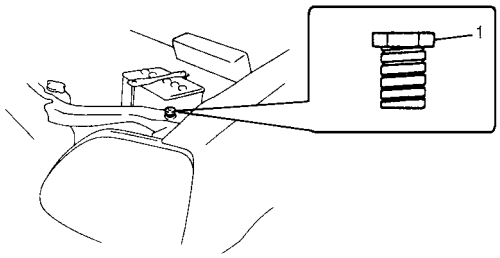
Inspection

- Check that hood opens and closes smoothly and properly. Lubricate if necessary.
- Check that hood stops in the secondary latched position properly (preventing hood from opening freely) and that hood closes completely in the fully latched position.
- Adjust hood locks position, if necessary.

Adjustment

Adjust the following point:

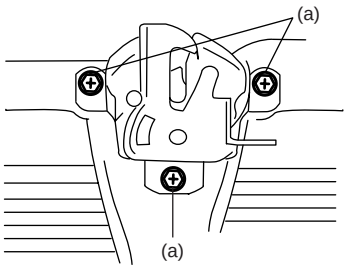
- Hood position adjustment.
  Fore-and-aft and right-and-left adjustment.
  Adjust hood clearance by loosening hood mounting bolts. Refer to “Panel Clearance: in Section 9K”.
- Vertical adjustment
  If only one side (right or left) of hood is not level with front fender, make it level by tightening or loosening hood cushion (1).



I2RH019A0022-

- Hood lock position adjustment
  a. Loosen hood lock bolts.
  b. Adjust hood lock height position so the hood is locked without looseness.
  c. Tighten hood latch bolts to specified torque.

     Tightening torque
     Hood latch bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

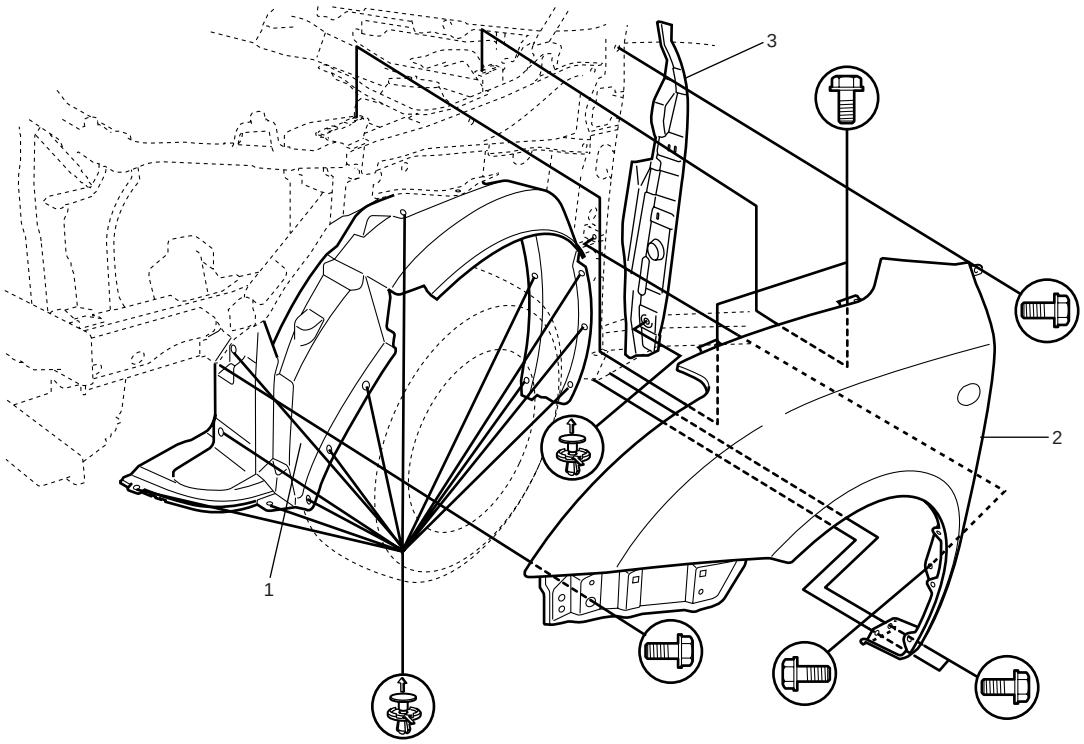


I4RS0A9A0002-

  d. Make sure the hood is locked smoothly and securely.

Front Fender Components

S4RS0A9A06003



I4RS0A9A0003-

1. Front fender lining	2. Front fender	3. Front fender cover

Front Fender Removal and Installation

S4RS0A9A06004

Removal

1) Remove splash guard (if equipped) referring to “Splash Guard (If Equipped) Components: in Section 9H”.
2) Remove front fender lining.
3) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
4) Remove headlight assembly referring to “Headlight Housing Removal and Installation: in Section 9B”.
5) Disconnect connector from side turn signal lamp.
6) Remove front fender cover.
7) Remove front fender.

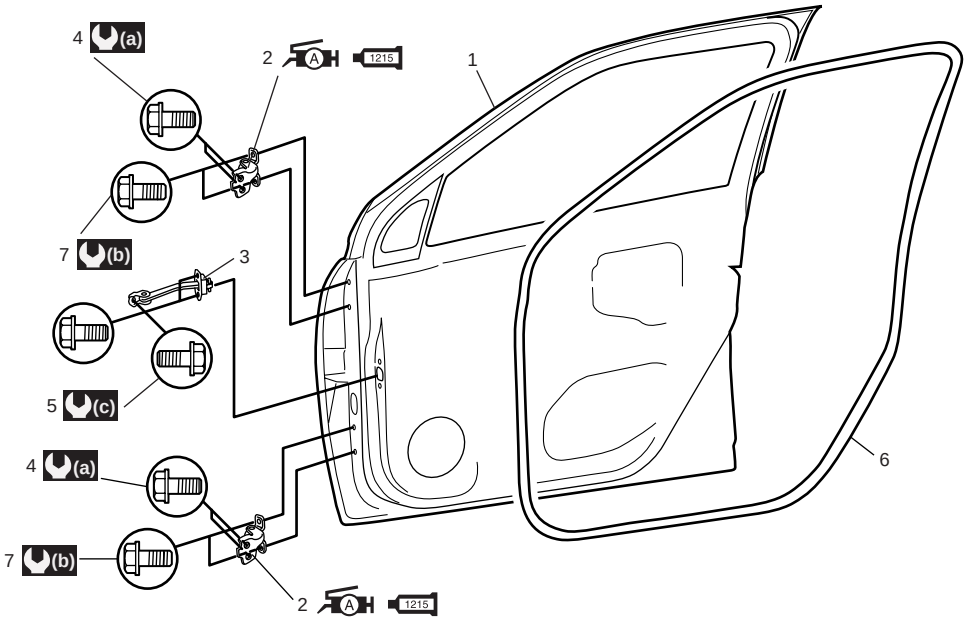
Installation

Reverse removal procedure to install front fender noting the following instruction.

- If paint on fender bolt is peeled off, be sure to apply paint again.
- Adjust panel clearance referring to “Panel Clearance: in Section 9K”.

Front Door Assembly Components

S4RS0A9A06005



I4RS0A9A0004-

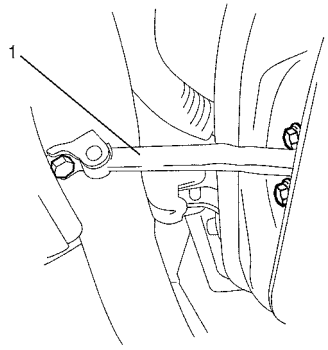
1. Door panel	5. Door open stopper bolt	(b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
A 1215 2. Door hinge : Apply lithium grease 99000-25010 to rotating part. : Apply sealant 99000-31110 to contact face.	6. Front door opening weather-strip	(c) : 21 N·m (2.1 kg-m, 15.5 lb-ft)
3. Door open stopper	7. Front door hinge bolt (door side)	
4. Front door hinge bolt (body side)	(a) : 27 N·m (2.7 kg-m, 19.5 lb-ft)	

Front Door Assembly Removal and Installation

S4RS0A9A06006

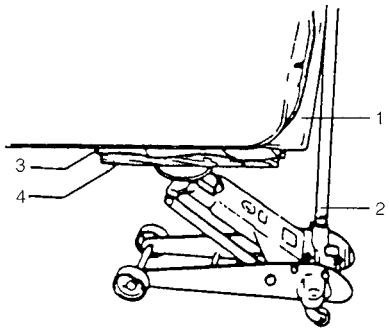
Removal

1) Remove front fender referring to “Front Fender Components: ”.
2) Disconnect door harness lead wires at each coupler.
3) Remove door open stopper (1).



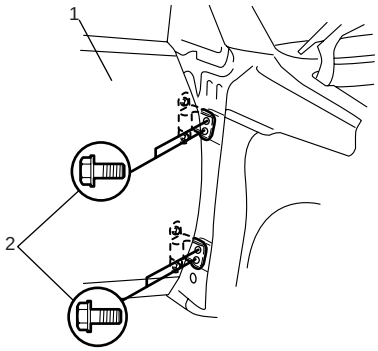
I4RS0A9A0005-

4) Support door panel (1) using a jack (2) with rags (3) and a piece of wood (4) placed between jack (2) and panel (1) as shown.



I2RH019A0003-

5) Remove door assembly (1) by loosening hinge mounting bolts (2).



I4RS0A9A0006-

Installation

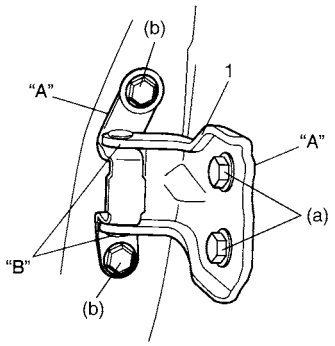
Reverse removal procedure to install door assembly noting the following instructions.

- When replacing door, coat replacement door inside with wax for proper anti-corrosion treatment. Refer to “Sealant Application Areas: in Section 9L”.
- Apply sealant to contact face “A” of hinge (1) and apply grease to rotating part “B” of hinge (1). Specified sealant and grease.

  “A”: Sealant 99000–31110
  “B”: Grease 99000–25010

- Tighten hinge bolt to specified torque.

  Tightening torque
  Door hinge mounting bolt (body side) (a): 27 N·m (2.7 kg-m, 19.5 lb-ft)
  Door hinge mounting bolt (door side) (b): 23 N·m (2.3 kg-m, 17.0 lb-ft)



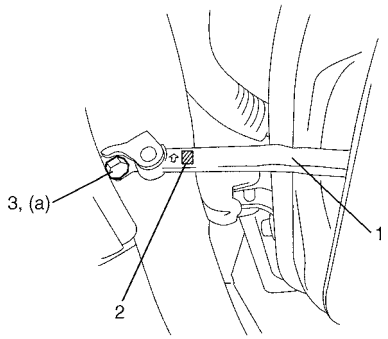
I4RS0A9A0007-

- When door open stopper (1) is installed, be careful make sure punch mark (2) comes to the top.

  Door open stopper installing direction
  Left side door: L punch mark is upward
  Right side door: R punch mark is upward

- Tighten door open stopper bolt (3) to specified torque.

  Tightening torque
  Door open stopper bolt (a): 21 N·m (2.1 kg-m, 15.5 lb-ft)

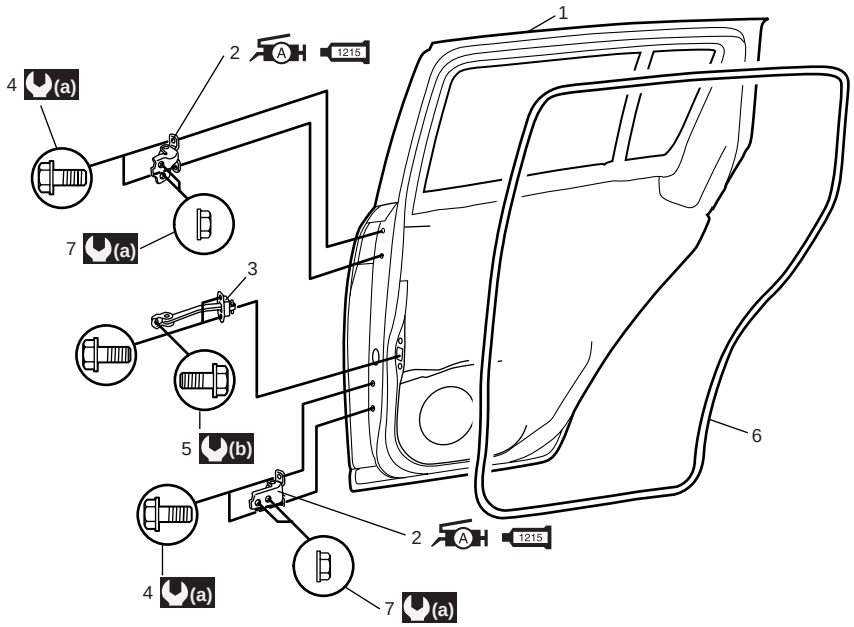


I4RS0A9A0008-

- Adjust door latch striker position referring to “Front Door Lock Assembly Removal and Installation: in Section 9F”.
- Adjust front door cushion so that door becomes flush with side body.
- After installation, open and close the door to check looseness.

Rear Door Assembly Components

S4RS0A9A06007



I4RS0A9A0009-

1. Door panel	4. Rear door hinge bolt	7. Rear door hinge nut
A H 1215 2. Door hinge : Apply lithium grease 99000-25010 to rotating part. : Apply sealant 99000-31110 to contact face.	5. Door open stopper bolt	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
3. Door open stopper	6. Rear door opening weather-strip	(b) : 21 N·m (2.1 kg-m, 15.5 lb-ft)

Rear Door Assembly Removal and Installation

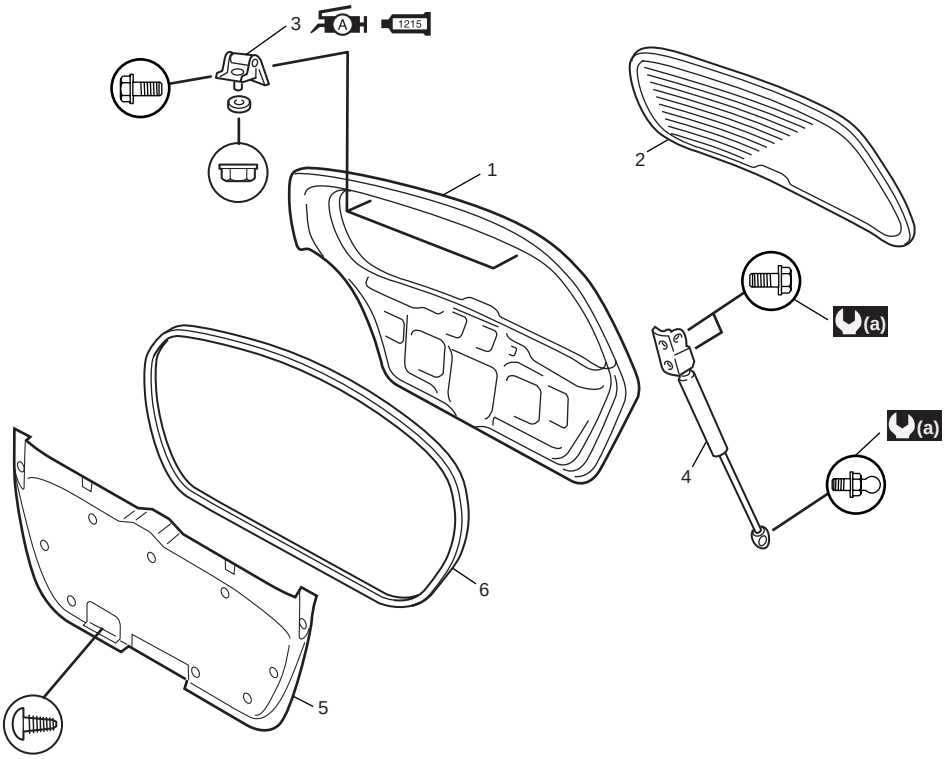
S4RS0A9A06008

Refer to “Front Door Assembly Removal and Installation: ” as removal and installation procedures are basically the same. However, note the following.

- Tighten rear door hinge bolts and nuts to specified torque referring to “Rear Door Assembly Components”.

Rear End Door Assembly Components

S4RS0A9A06009



I4RS0A9A0010-

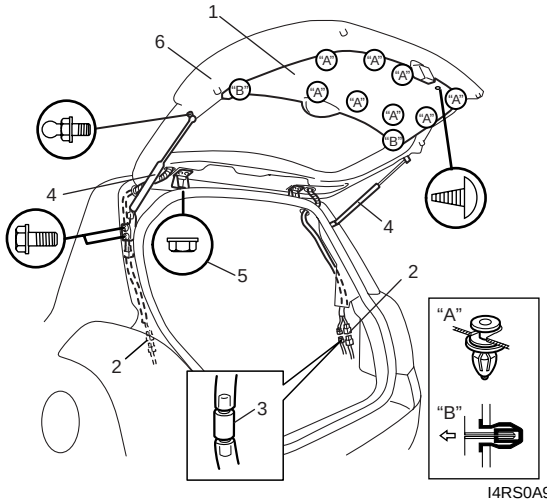
1. Rear end door panel assembly	4. Rear end door balancer	(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
2. Rear end door window glass	5. Rear end door trim	
A 1215 3. Rear end door hinge : Apply lithium grease 99000-25010 to door hinge moving section. : Apply sealant 99000-31110 to contact face.	6. Rear end door opening wether-strip	

Rear End Door Assembly Removal and Installation

S4RS0A9A06010

Removal

1) Remove rear end door trim (1).
2) Remove related section of head lining and rear trim.
3) Disconnect rear end door harness couplers (2) and washer hose (3).
4) Remove rear end door balancers (4).
5) Remove door hinge nuts (5) and remove rear end door assembly (6).



I4RS0A9A0011-

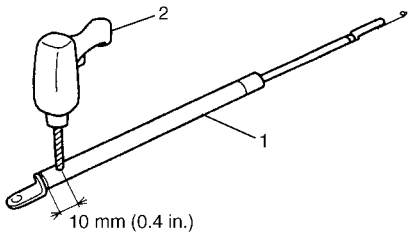
WARNING:

Handling of Rear End Door Balancer (Damper)

- **Handle balancer carefully. Do not scar or scratch exposed surface of its piston rod, and never allow any paint or oil to stick to its surface.**
- **Do not turn piston rod with balancer fully extended.**
- **Do not disassemble balancer (1) because its cylinder is filled with gas.**

Discarding of Rear End Door Balancer (Damper)

- **The gas itself in balancer is harmless but it may issue out of the hole together with chips generated by the drill (2). Therefore, be sure to wear goggle when drilling.**
- **Using a 2 to 3 mm (0.08 to 0.12 in.) drill (2), make a hole to remove gas inside as shown before discarding.**



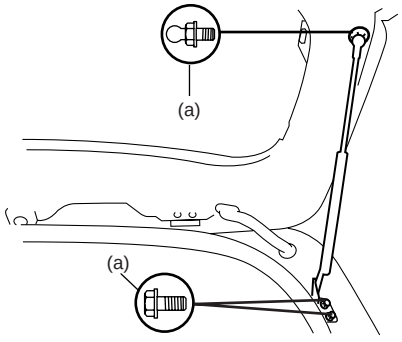
I2RH019A0010-

Installation

Reverse removal procedure noting the following.

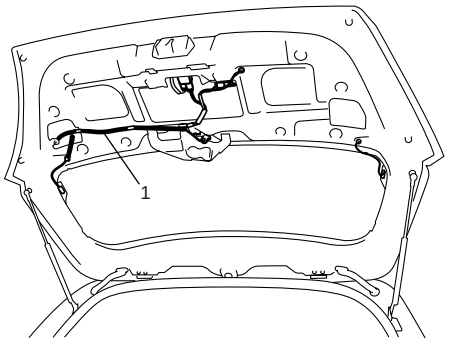
- Tighten rear end door balancer bolt to specified torque.

Tightening torque
Rear end door balancer bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



I4RS0A9A0013-

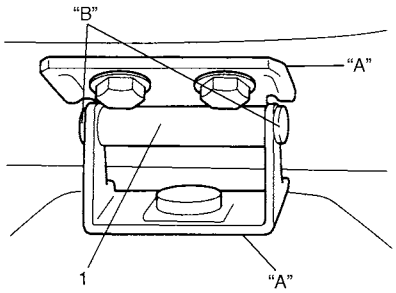
- Secure wiring harness (1).



I4RS0A9A0012-

- Adjust door latch striker position by referring to “Rear End Door Lock Assembly Removal and Installation: in Section 9F”.
- Adjust door cushion so that door contacts body when closed.
- Apply sealant to contact face “A” of door hinge (1) and apply grease to rotating part “B” of hinge (1). Specified sealant and grease.

“A”: Sealant 99000–31110
“B”: Grease 99000–25010



I2RH019A1012-

Specifications

Tightening Torque Specifications

S4RS0A9A07001

Fastening part	Tightening torque			Note
	N·m	kg-m	lb-ft	
Hood latch bolt	10	1.0	7.5	☞
Door hinge mounting bolt (body side)	27	2.7	19.5	☞
Door hinge mounting bolt (door side)	23	2.3	17.0	☞
Door open stopper bolt	21	2.1	15.5	☞
Rear end door balancer bolt	23	2.3	17.0	☞

NOTE:

The specified tightening torque is also described in the following.
“Front Door Assembly Components: ”
“Rear Door Assembly Components: ”
“Rear End Door Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S4RS0A9A08001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞
Sealant	SUZUKI Bond No.1215	P/No.: 99000–31110	☞ / ☞ / ☞

NOTE:

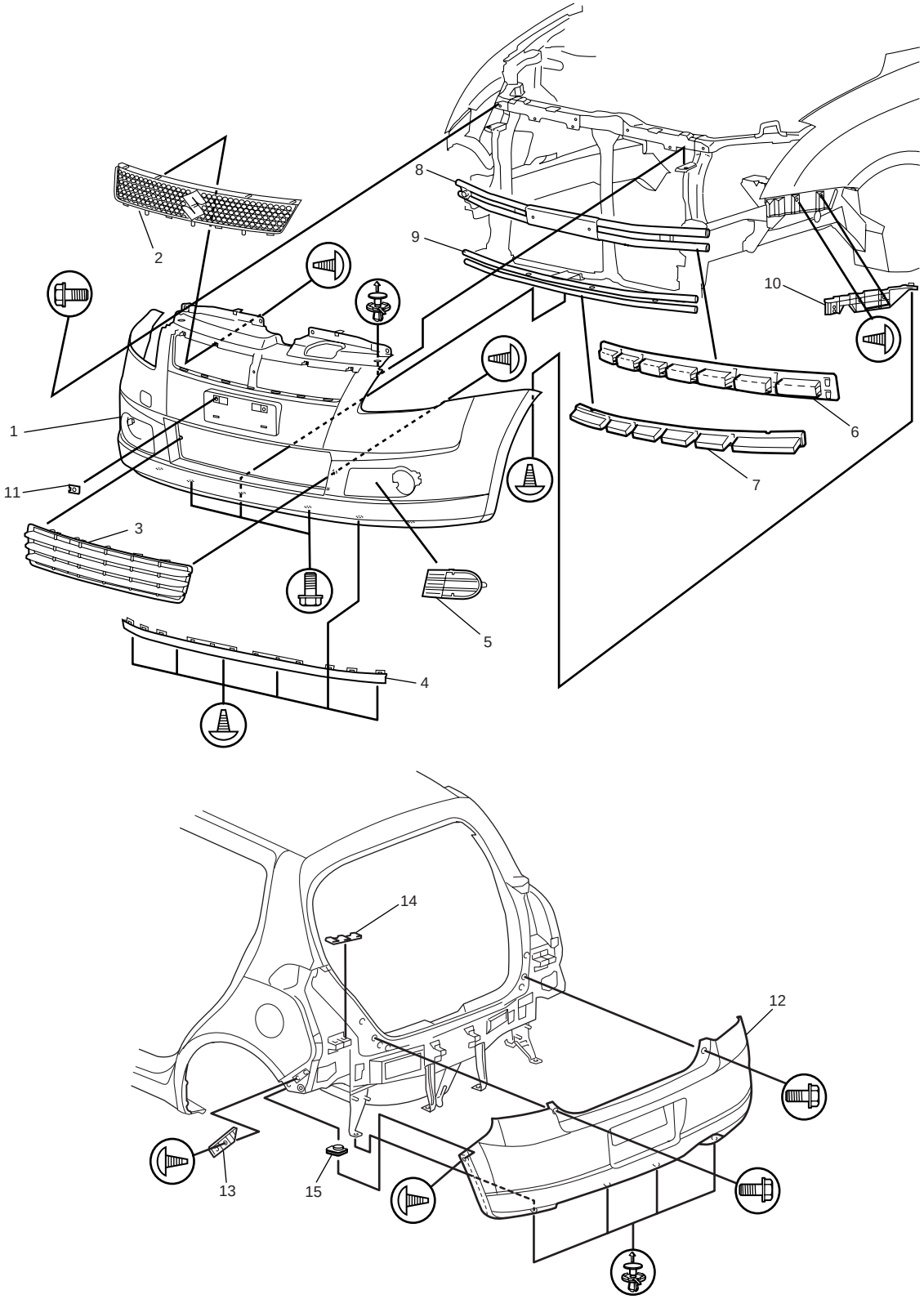
Required service material is also described in the following.
“Front Door Assembly Components: ”
“Rear Door Assembly Components: ”
“Rear End Door Assembly Components: ”

Body Structure

Repair Instructions

Front Bumper and Rear Bumper Components

S4RS0A9B06001



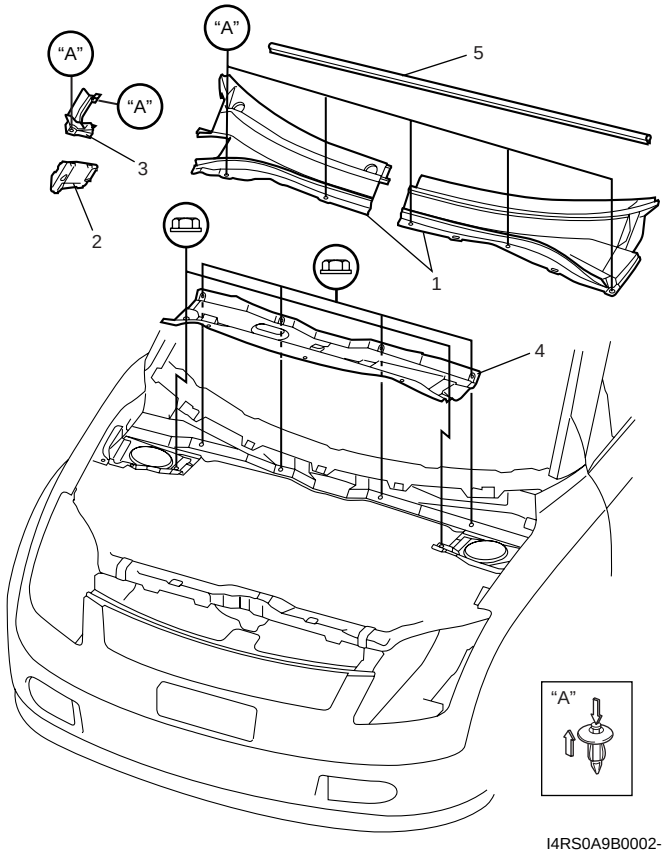
I4RS0A9B0001-

1. Front bumper	5. Front fog lamp cap	9. Front bumper lower member	13. Rear bumper holder
2. Radiator upper grill	6. Front bumper upper absorber	10. Front bumper holder	14. Rear lamp holder

3. Radiator lower grill	7. Front bumper lower absorber	11. License plate nut	15. Plastic nut
4. Front air dam skirt	8. Front bumper upper member	12. Rear bumper	

Cowl Top Components

S4RS0A9B06003



I4RS0A9B0002-

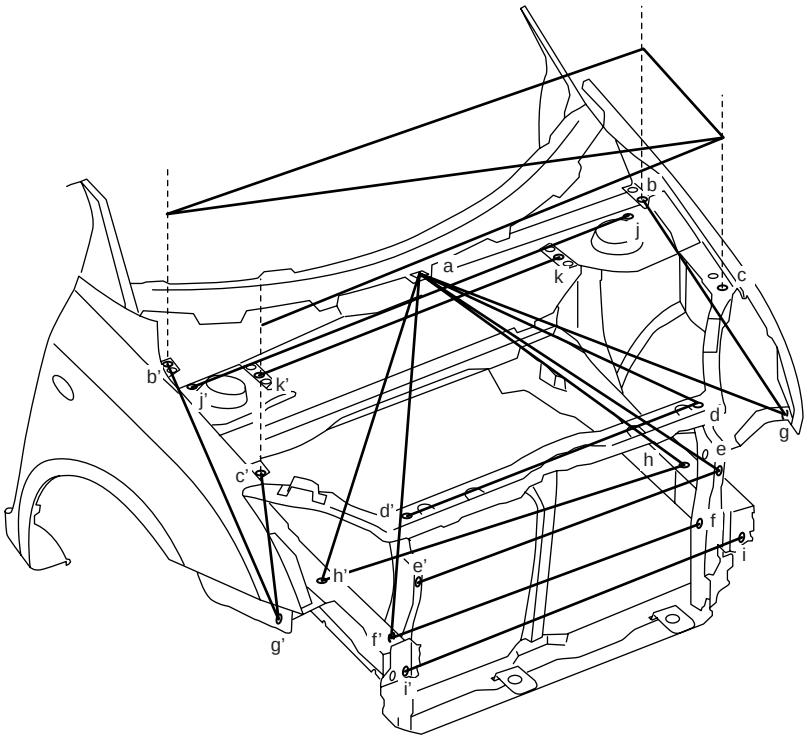
1. Cowl top cover	3. Cowl top side garnish	5. Hood rear seal
2. Cowl the cover lid	4. Cowl top panel	

Specifications

Body Dimensions

S4RS0A9B07001

Engine Room



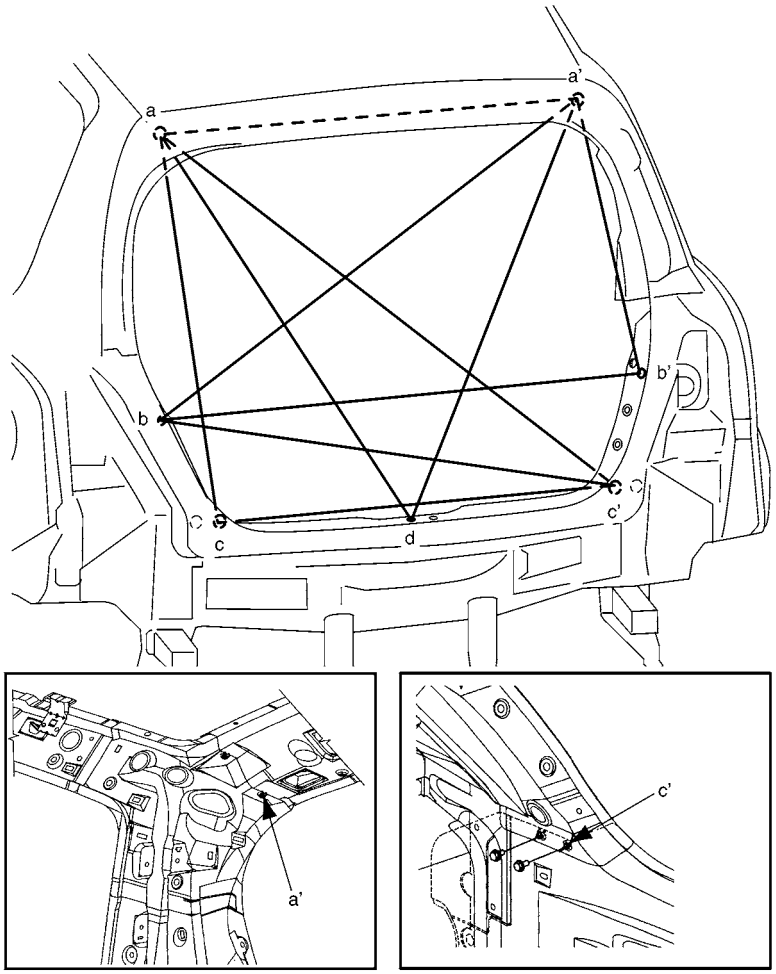
I4RS0A9B0003-

a. Cowl top installation center hole	e (e'). Headlight installation hole	i (i'). Front bumper upper member installation hole
b (b'). Front fender installation hole	f (f'). Jig hole (ϕ 8 mm)	j (j'). Jig hole (ϕ 8 mm)
c (c'). Headlight installation hole	g (g'). Front fender installation hole	k (k'). Jig hole (ϕ 7 mm)
d (d'). Hood lock member installation hole (when hood lock member removed)	h (h'). Engine mounting installation front hole	

Hole to hole distance

a-d: 675 mm (26.57 in.)	**b-c: 343 mm (13.50 in.)**	**e-e': 851 mm (33.50 in.)**
a-e: 816 mm (32.13 in.)	**b-g: 625 mm (24.61 in.)**	**f-f': 817 mm (32.17 in.)**
a-g: 943 mm (37.13 in.)	**b'-c: 1364 mm (53.70 in.)**	**h-h': 950 mm (37.40 in.)**
a-h: 784 mm (30.87 in.)	**b'-g': 647 mm (25.47 in.)**	**i-i': 937 mm (36.89 in.)**
a-f': 864 mm (34.02 in.)	**c-c': 1310 mm (51.57 in.)**	**j-j': 1249 mm (49.17 in.)**
a-h': 743 mm (29.25 in.)	**c'-g': 324 mm (12.76 in.)**	**k-k': 886 mm (34.88 in.)**
b-b': 1317 mm (51.85 in.)	**d-d': 800 mm (31.50 in.)**	

Rear End Door



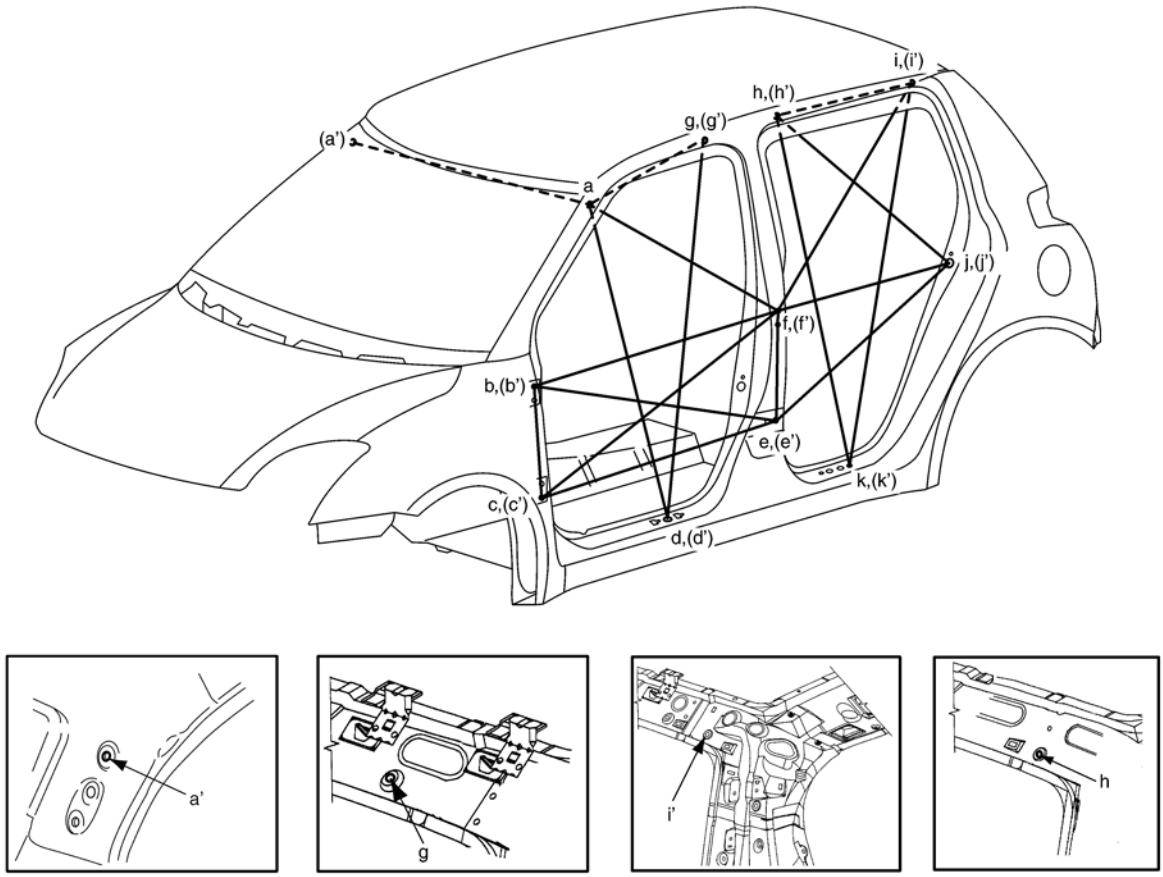
I4RS0A9B0004-

a (a'). Roof back member bolt installation hole	c (c'). Back panel bolt installation hole
b (b'). Jig hole	d. Rear end door striker installation left side hole

Hole to hole distance

a-a': 759 mm (29.88 in.)	**a'-b: 1037 mm (40.83 in.)**	**b-c': 985 mm (38.78 in.)**
a-c: 762 mm (30.00 in.)	**a'-d: 904 mm (35.59 in.)**	**c-c': 850 mm (33.46 in.)**
a-d: 887 mm (34.92 in.)	**a'-b': 528 mm (20.79 in.)**	
a-c': 1107 mm (43.58 in.)	**b-b': 1051 mm (41.38 in.)**	

Side Body



I4RS0A9B0005-

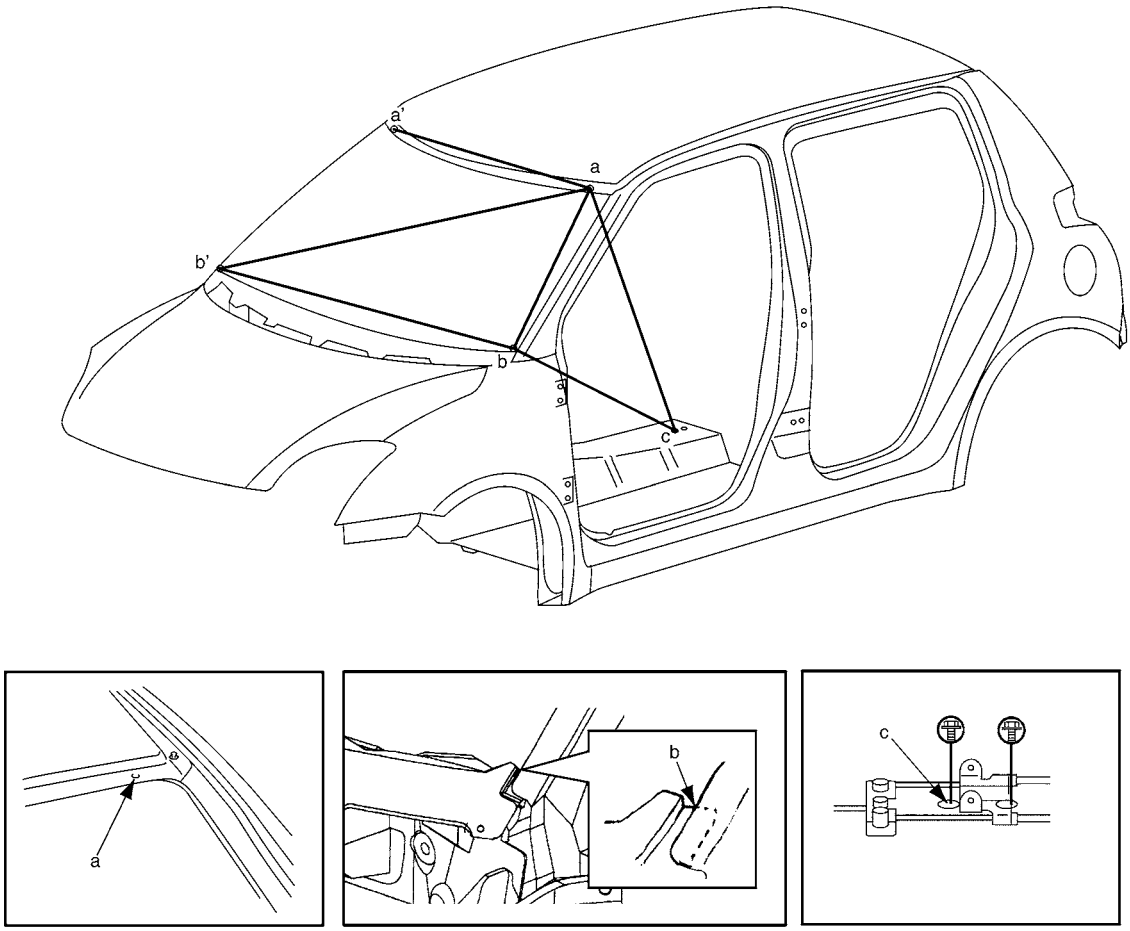
a (a'). Jig hole (ϕ 8 mm)	e (e'). Rear door lower hinge installation rear hole	i (i'). Jig hole (ϕ 10 mm)
b (b'). Front door upper hinge installation upper hole	f (f'). Rear door upper hinge installation upper hole	j (j'). Rear door switch installation hole (large hole)
c (c'). Front door lower hinge installation lower hole	g (g'). Jig hole (ϕ 10 mm)	k (k'). Rear side sill scuff installation hole
d (d'). Bleeding hole	h (h'). Curtain air bag clip installation hole	( ). Body right side

Hole to hole distance

a-d: 1055 mm (41.54 in.)	**c-e: 1021 mm (40.20 in.)**	**f-j: 835 mm (32.87 in.)**
a-f: 747 mm (29.41 in.)	**c-f: 1123 mm (44.21 in.)**	**h-i: 601 mm (23.66 in.)**
a-g: 378 mm (14.88 in.)	**d-g: 1129 mm (44.45 in.)**	**h-j: 817 mm (32.17 in.)**
b-c: 383 mm (15.08 in.)	**e-f: 354 mm (13.94 in.)**	**h-k: 1097 mm (43.19 in.)**
b-e: 1085 mm (42.72 in.)	**e-j: 946 mm (37.24 in.)**	**i-k: 1153 mm (45.39 in.)**
b-f: 1061 mm (41.77 in.)	**f-i: 926 mm (36.46 in.)**	

Hole to hole distance

a-a': 1039 mm (40.91 in.)	**e-e': 1474 mm (58.03 in.)**	**i-i': 1009 mm (39.72 in.)**
b-b': 1461 mm (57.52 in.)	**f-f': 1468 mm (57.80 in.)**	**j-j': 1327 mm (52.24 in.)**
c-c': 1489 mm (58.62 in.)	**g-g': 1018 mm (40.08 in.)**	**k-k': 1472 mm (57.95 in.)**
d-d': 1472 mm (57.95 in.)	**h-h': 1022 mm (40.24 in.)**	



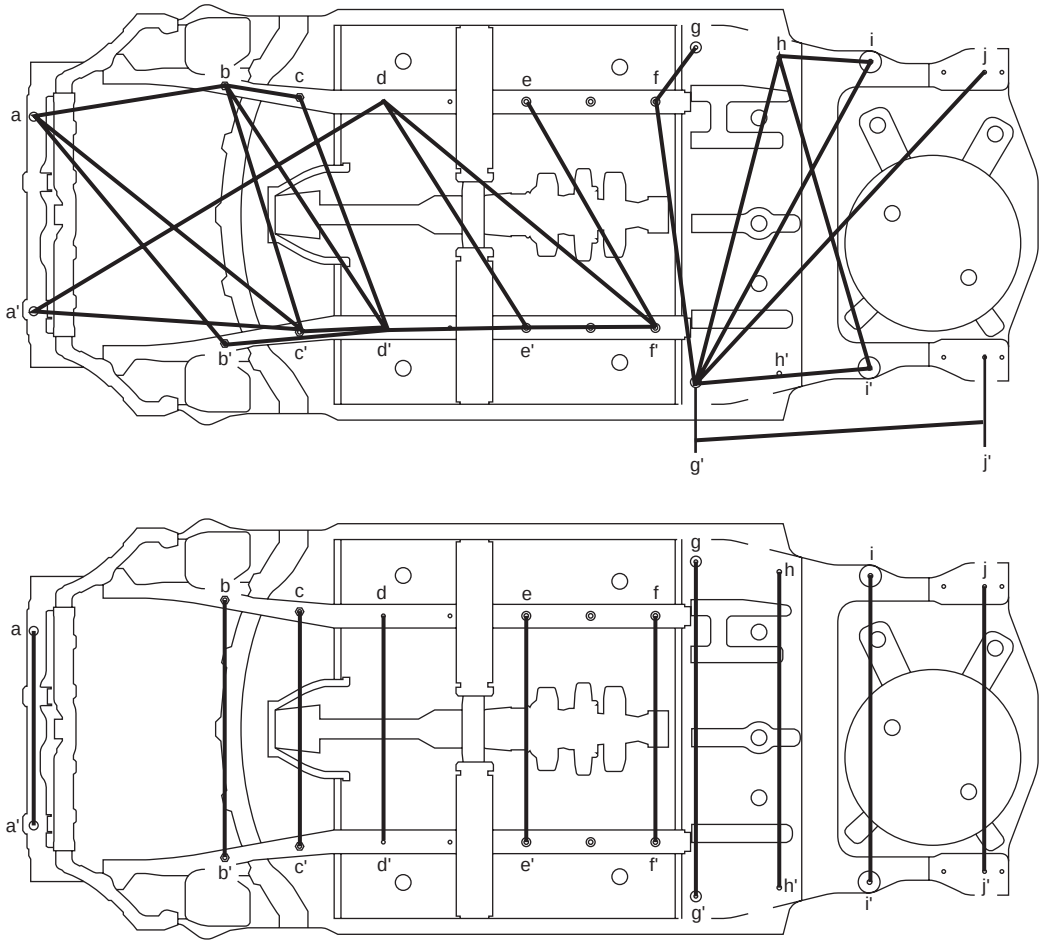
I4RS0A9B0006-

a (a'). Jig hole (ϕ 6.5 mm)	b (b'). Panel cross point	c. Parking brake cable bracket installation front hole

Hole to hole distance

a-b: 638 mm (25.12 in.)	**a-b': 1194 mm (47.01 in.)**
a-c: 1293 mm (50.91 in.)	**b-c: 1422 mm (55.98 in.)**
a-a': 800 mm (31.50 in.)	**b-b': 1272 mm (50.08 in.)**

Under Body



I4RS0A9B0007-

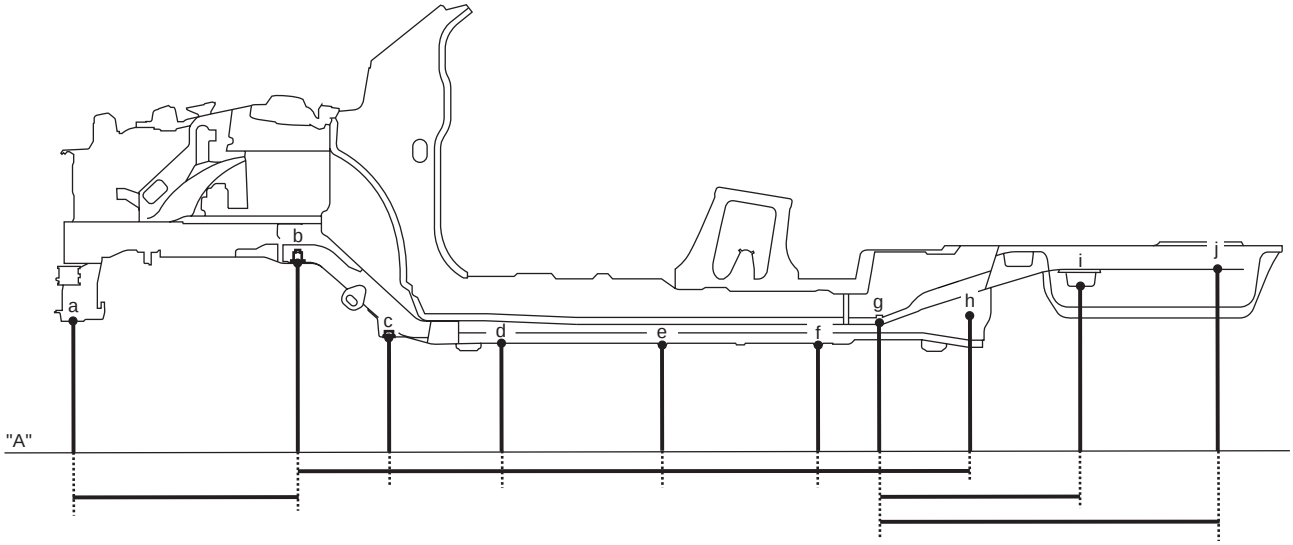
a (a'). Jig hole (ϕ 20 mm)	e (e'). Jig hole (ϕ 15 mm)	i (i'). Drain hole (ϕ 10 mm)
b (b'). Front suspension frame installation hole	f (f'). Jig hole (ϕ 15 mm)	j (j'). Jig hole (ϕ 16 mm)
c (c'). Front suspension frame installation hole	g (g'). Jig hole (ϕ 25 mm)	
d (d'). Jig hole (ϕ 10 mm)	h (h'). Rear axle housing installation inside hole	

Hole to hole distance

a-b: 674 mm (26.54 in.)	**c-d': 836 mm (32.91 in.)**	**g'-h: 1135 mm (44.69 in.)**
a-b': 1018 mm (40.08 in.)	**c'-d': 288 mm (11.34 in.)**	**g'-i: 1229 mm (48.39 in.)**
a-c': 1163 mm (45.79 in.)	**d-e': 911 mm (35.87 in.)**	**g'-i': 612 mm (24.09 in.)**
a'-d: 1391 mm (54.76 in.)	**d-f': 1205 mm (47.44 in.)**	**g'-j: 1433 mm (65.42 in.)**
a'-c': 908 mm (35.75 in.)	**d'-e': 488 mm (19.21 in.)**	**g'-j': 971 mm (38.23 in.)**
b-c: 335 mm (13.19 in.)	**e-f': 887 mm (34.92 in.)**	**h-i: 324 mm (12.76 in.)**
b-c': 904 mm (35.59 in.)	**e'-f': 440 mm (17.32 in.)**	**h-i': 1070 mm (42.13 in.)**
b-d': 1016 mm (40.00 in.)	**f-g: 240 mm (9.45 in.)**	
b'-d': 594 mm (23.39 in.)	**f-g': 969 mm (38.15 in.)**	

Hole to hole distance

a-a': 660 mm (25.98 in.)	**e-e': 770 mm (30.31 in.)**	**i-i': 992 mm (39.06 in.)**
b-b': 881 mm (34.69 in.)	**f-f': 770 mm (30.31 in.)**	**j-j': 970 mm (38.19 in.)**
c-c': 800 mm (31.50 in.)	**g-g': 1144 mm (45.04 in.)**	
d-d': 770 mm (30.31 in.)	**h-h': 1048 mm (41.26 in.)**	



I4RS0A9B0008-

a. Jig hole (ϕ 20 mm)	e. Jig hole (ϕ 15 mm)	i. Drain hole (ϕ 10 mm)
b. Front suspension frame installation hole	f. Jig hole (ϕ 15 mm)	j. Jig hole (ϕ 16 mm)
c. Front suspension frame installation hole	g. Jig hole (ϕ 25 mm)	
d. Jig hole (ϕ 10 mm)	h. Rear axle housing installation inside hole	

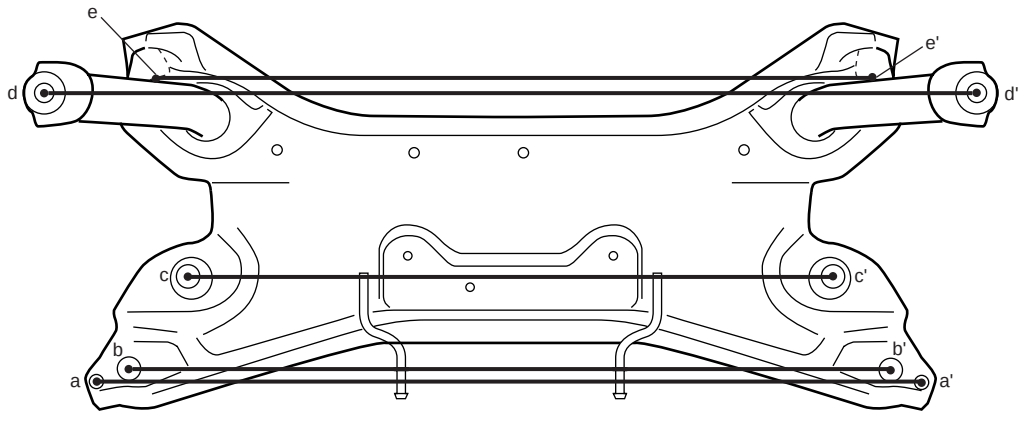
Hole to hole distance

a-b: 644 mm (25.35 in.)	**d-e: 488 mm (19.21 in.)**	**g-h: 293 mm (11.54 in.)**
b-c: 260 mm (10.24 in.)	**e-f: 440 mm (17.32 in.)**	**g-i: 597 mm (23.50 in.)**
c-d: 288 mm (11.34 in.)	**f-g: 138 mm (5.43 in.)**	**g-j: 956 mm (37.64 in.)**

Projection dimension from standard line “A”

a: 73 mm (2.87 in.)	**e: 10 mm (0.39 in.)**	**i: 181 mm (7.13 in.)**
b: 236 mm (9.29 in.)	**f: 10 mm (0.39 in.)**	**j: 221 mm (8.70 in.)**
c: 29 mm (1.14 in.)	**g: 68 mm (2.68 in.)**	
d: 12 mm (0.47 in.)	**h: 72 mm (2.83 in.)**	

Front Suspension Frame

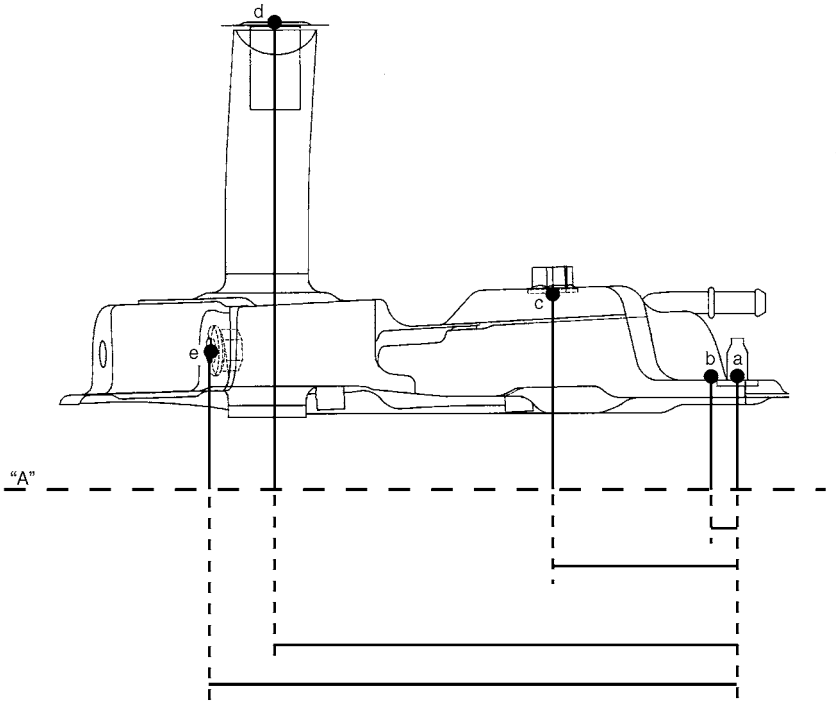


I4RS0A9B0009-

a (a’). Stud	d (d’). Front suspension frame installation hole
b (b’). Front suspension frame installation hole	e (e’). Front suspension control arm installation hole
c (c’). Front suspension control arm installation hole	

Hole to hole distance

a-a’: 896 mm (35.28 in.)	**d-d’: 881 mm (34.68 in.)**
b-b’: 800 mm (31.50 in.)	**e-e’: 765 mm (30.12 in.)**
c-c’: 666 mm (26.22 in.)	



I4RS0A9B0010-

a. Stud	d. Front suspension frame installation hole
b. Front suspension frame installation hole	e. Front suspension control arm installation hole
c. Front suspension control arm installation hole	

Hole to hole distance

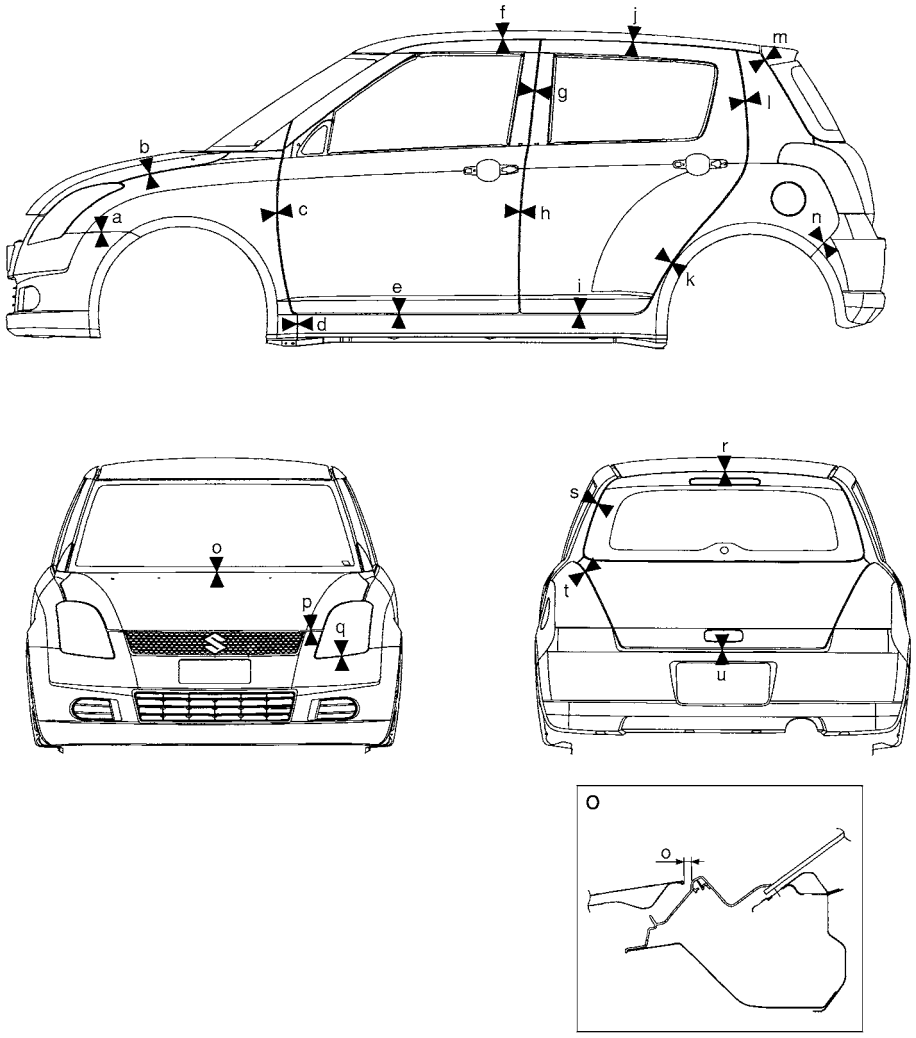
a-b: 10 mm (0.39 in.)	**a-d: 270 mm (10.63 in.)**
a-c: 108 mm (4.25 in.)	**a-e: 309 mm (12.17 in.)**

Projection dimension from standard line “A”

a: 50 mm (1.97 in.)	**d: 258 mm (10.16 in.)**
b: 50 mm (1.97 in.)	**e: 66 mm (2.60 in.)**
c: 97 mm (3.82 in.)	

Panel Clearance

S4RS0A9B07002



I4RS0A9B0011-

Panel to panel distance

a: 0-1 mm (0-0.039 in.)	h: 3.1-5.1 mm (0.122-0.201 in.)	o: 8.1 mm (0.319 in.)
b: 2.3-4.3 mm (0.091-0.169 in.)	i: 4.7-6.7 mm (0.185-0.263 in.)	p: 6.1-8.1 mm (0.240-0.319 in.)
c: 3.1-5.1 mm (0.122-0.201 in.)	j: 15.4-18.4 mm (0.606-0.724 in.)	q: 2.3 mm (0.091 in.)
d: 1.1-3.1 mm (0.043-0.122 in.)	k: 3.0-5.0 mm (0.118-0.197 in.)	r: 7.2-8.7 mm (0.283-0.343 in.)
e: 4.7-6.7 mm (0.185-0.263 in.)	l: 3.1-5.1 mm (0.122-0.201 in.)	s: 3.5-5.5 mm (0.138-0.217 in.)
f: 14.7-17.7 mm (0.579-0.697 in.)	m: 3.5-5.5 mm (0.138-0.217 in.)	t: 3.4-5.4 mm (0.134-0.213 in.)
g: 3.1-5.1 mm (0.122-0.201 in.)	n: 0.5-1.0 mm (0.020-0.039 in.)	u: 5.0-7.0 mm (0.197-0.276 in.)

Paint / Coatings

General Description

Anti-Corrosion Treatment Construction

S4RS0A9C01001

WARNING:

Standard shop practices, particularly eye protection, should be followed during the performance of the following operations to avoid personal injury.

As rust proof treatment, steel sheets are given corrosion resistance on the interior and/or exterior.
These corrosion resistance steel sheet materials are called one of two-side galvanized steel sheets.
It is for the sake of rust protection that these materials are selected and given a variety of treatments as described blow.

- Steel sheets are treated with cathodic electro primer which is excellent in corrosion resistance.
- Rust proof wax coatings are applied to door and side sill insides where moisture is liable to stay.
- Vinyl coating is applied to body underside and wheel housing inside.
- Sealer is applied to door hem, engine compartment steel sheet-to-steel sheet joint, and the like portions to prevent water penetration and resulting in rust occurrence.

In panel replacement or collision damage repair, leaving the relevant area untreated as it is in any operation which does disturb the rust proof treatment will cause corrosion to that area. Therefore, it is the essential function of any repair operation to correctly recoat the related surfaces of the relevant area.
All the metal panels are coated with metal conditioners and primer coating during vehicle production. Following the repair and/or replacement parts installation, every accessible bare metal surface should be cleaned and coated with rust proof primer. Perform this operation prior to the application of sealer and rust proof wax coating.
Sealer is applied to the specific joints of a vehicle during production. The sealer is intended to prevent dust from entering the vehicle and serves also as an anticorrosion barrier. The sealer is applied to the door and hood hem areas and between panels. Correct and reseal the originally sealed joints if damaged. Reseal the attaching joints of a new replacement panel and reseal the hem area of a replacement door or hood.
Use a quality sealer to seal the flanged joints, overlap joints and seams. The sealer must have flexible characteristics and paint ability after it's applied to repair areas.
For the sealer to fill open joints, use caulking material. Select a sealer in conformance with the place and purpose of a specific use. Observe the manufacturer's label-stand instructions when using the sealer.
In many cases, repaired places require color painting. When this is required, follow the ordinary techniques specified for the finish preparation, color painting and undercoating build-up.
Rust proof wax, a penetrative compound, is applied to the metal-to-metal surfaces (door and side sill insides) where it is difficult to use ordinary undercoating material for coating. Therefore, when selecting the rust proof wax, it may be the penetrative type.
During the undercoating (vinyl coating) application, care should be taken that sealer is not applied to the engine-related parts and shock absorber mounting or rotating parts. Following the under coating, make sure that body drain holes are kept open.
The sequence of the application steps of the anti-corrosion materials are as follows:

1) Clean and prepare the metal surface.
2) Apply primer.
3) Apply sealer (all joints sealed originally).
4) Apply color in areas where color is required such as hem flanges, exposed joints and under body components.
5) Apply anticorrosion compound (penetrative wax).
6) Apply undercoating (rust proof material).

Plastic Parts Finishing

S4RS0A9C01002

Paintable plastic parts are ABS plastic parts.

Painting

Rigid or hand ABS plastic needs no primer coating. General acrylic lacquers can be painted properly over hard ABS plastic in terms of adherence.

1) Use cleaning solvent for paint finish to wash each part.
2) Apply conventional acrylic color lacquer to part surface.
3) Follow lacquer directions for required drying time. (Proper drying temperature range is 60 – 70 °C (140 – 158 °F)).

Reference

Plastic parts employ not only ABS (Acrylonitrile Butadiene Styrene) plastic but also polypropylene, vinyl, or the like plastic. Burning test method to identify ABS plastic is described below.

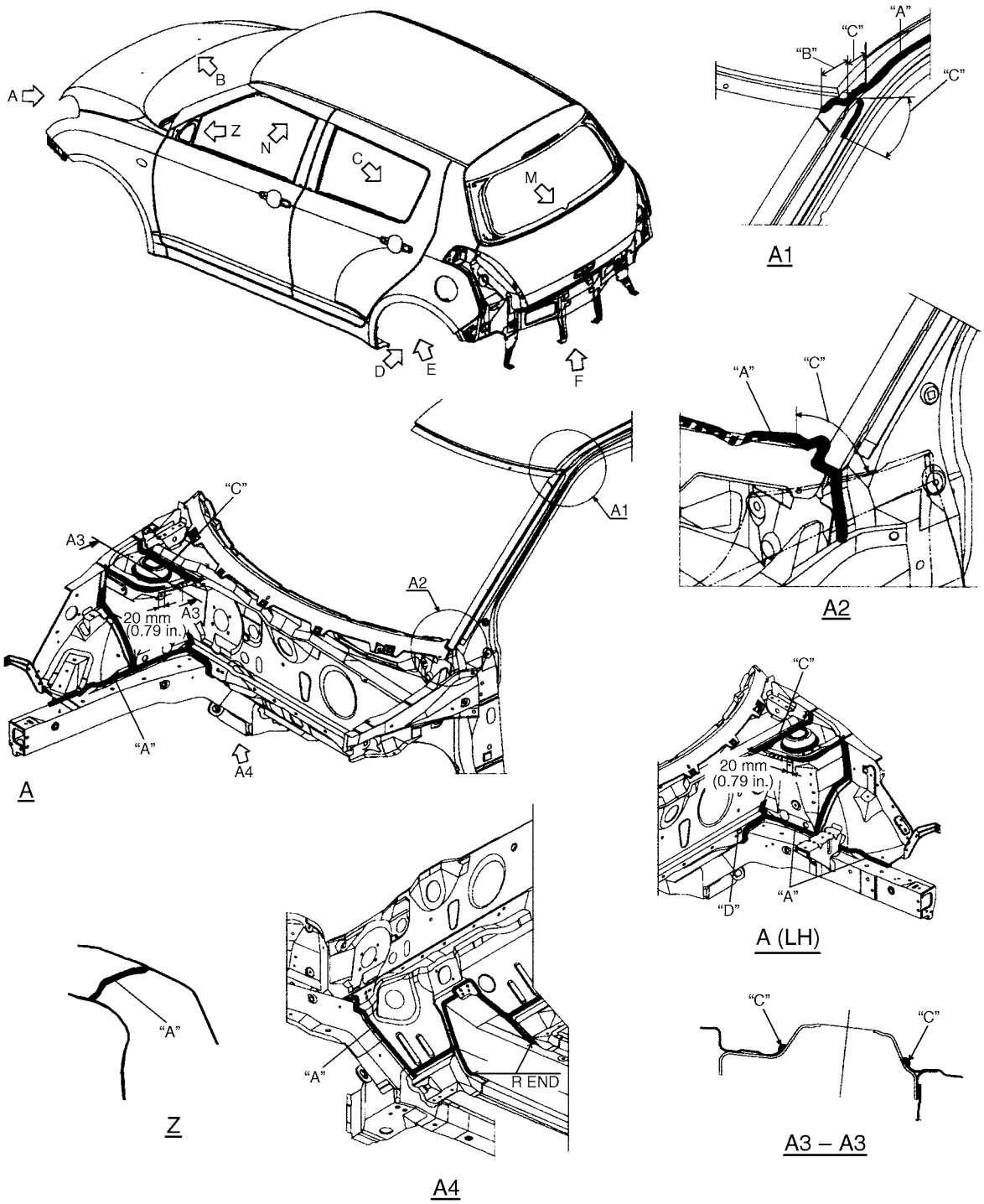
1) Use a sharp blade to cut off a plastic sliver from the part at its hidden backside.
2) Hold sliver with pincers and set it on fire.
3) Carefully observe condition of the burning plastic.
4) ABS plastic must raise readily distinguishable back smoke while burning with its residue suspended in air temporarily.

5) Polypropylene must raise no readily distinguishable smoke while burning.

Component Location

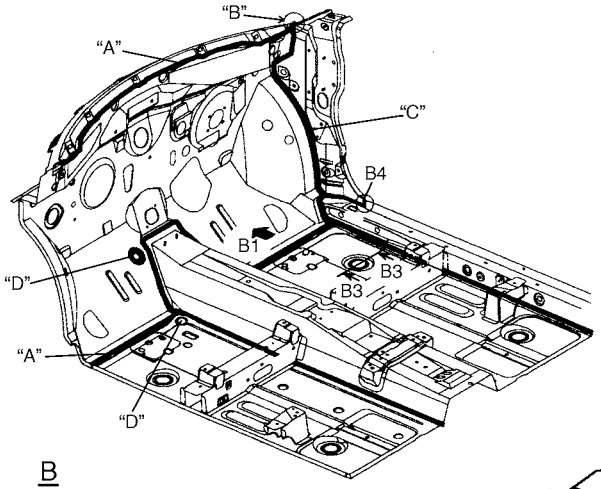
Sealant Application Areas

S4RS0A9C03001

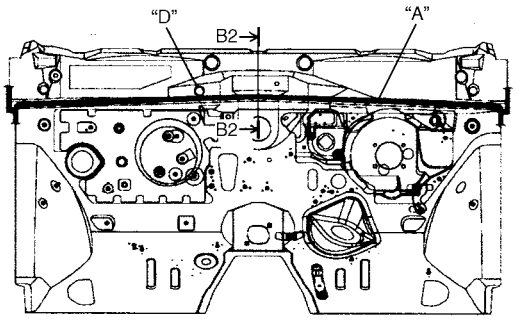


I4RS0A9C0001-

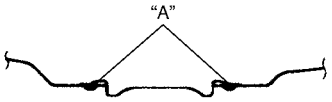
"A": Apply sealant.	"C": Smooth out sealant with a brush.
"B": Wipe off excess sealant after application.	"D": Do not apply sealant



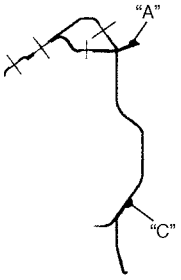
B



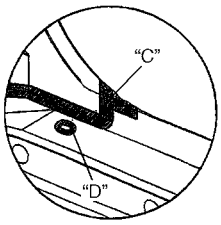
B1



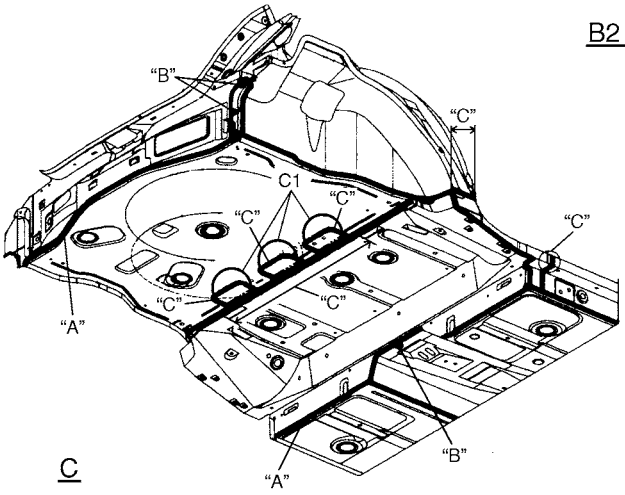
B3 – B3



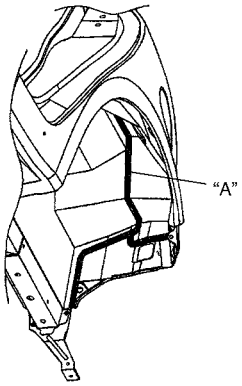
B2 – B2



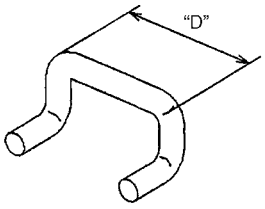
B4



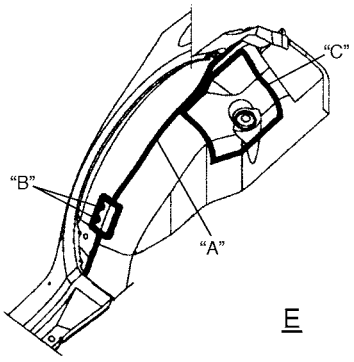
C



D



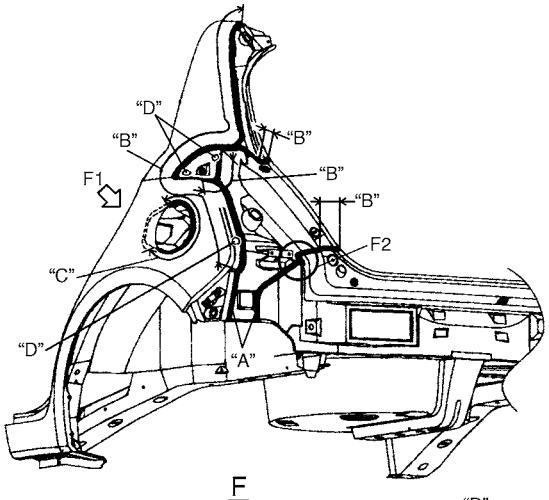
C1



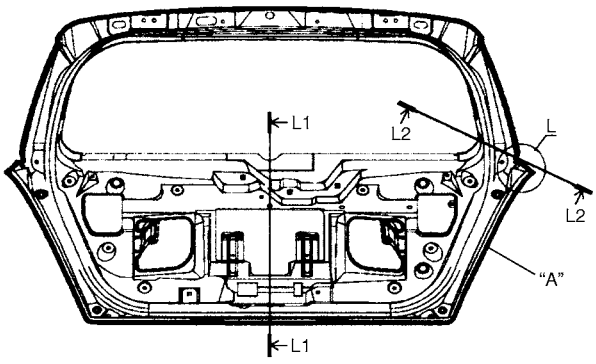
E

I4RS0A9C0002-

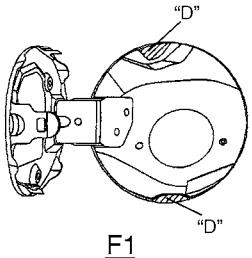
"A": Apply sealant.	"C": Smooth out sealant with a brush.
"B": Fill gap / hole with sealant.	"D": Do not apply sealant.



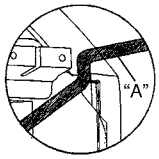
F



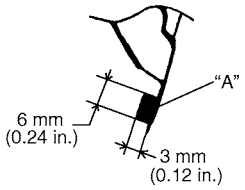
M



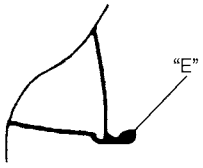
F1



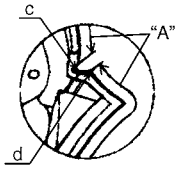
F2



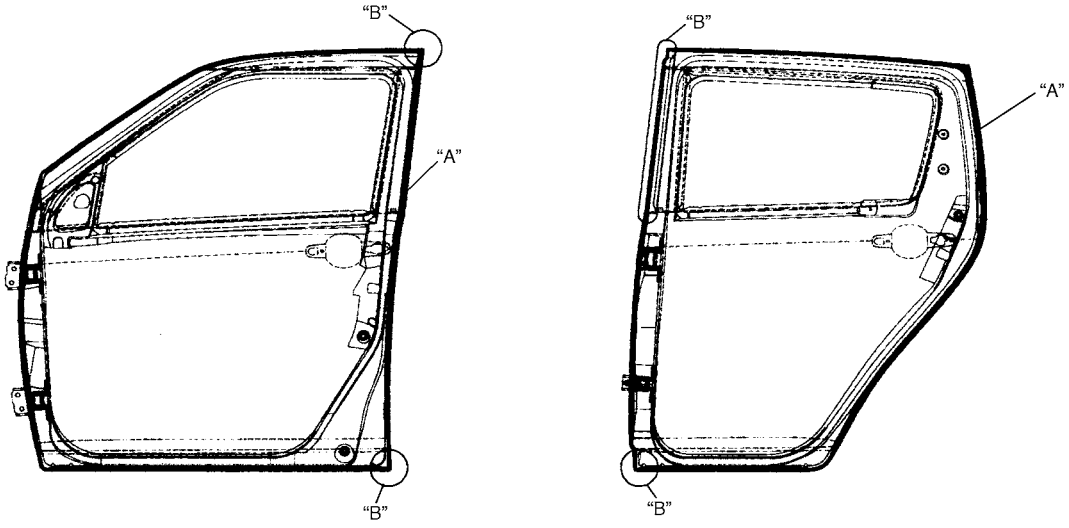
L1 – L1



L2 – L2



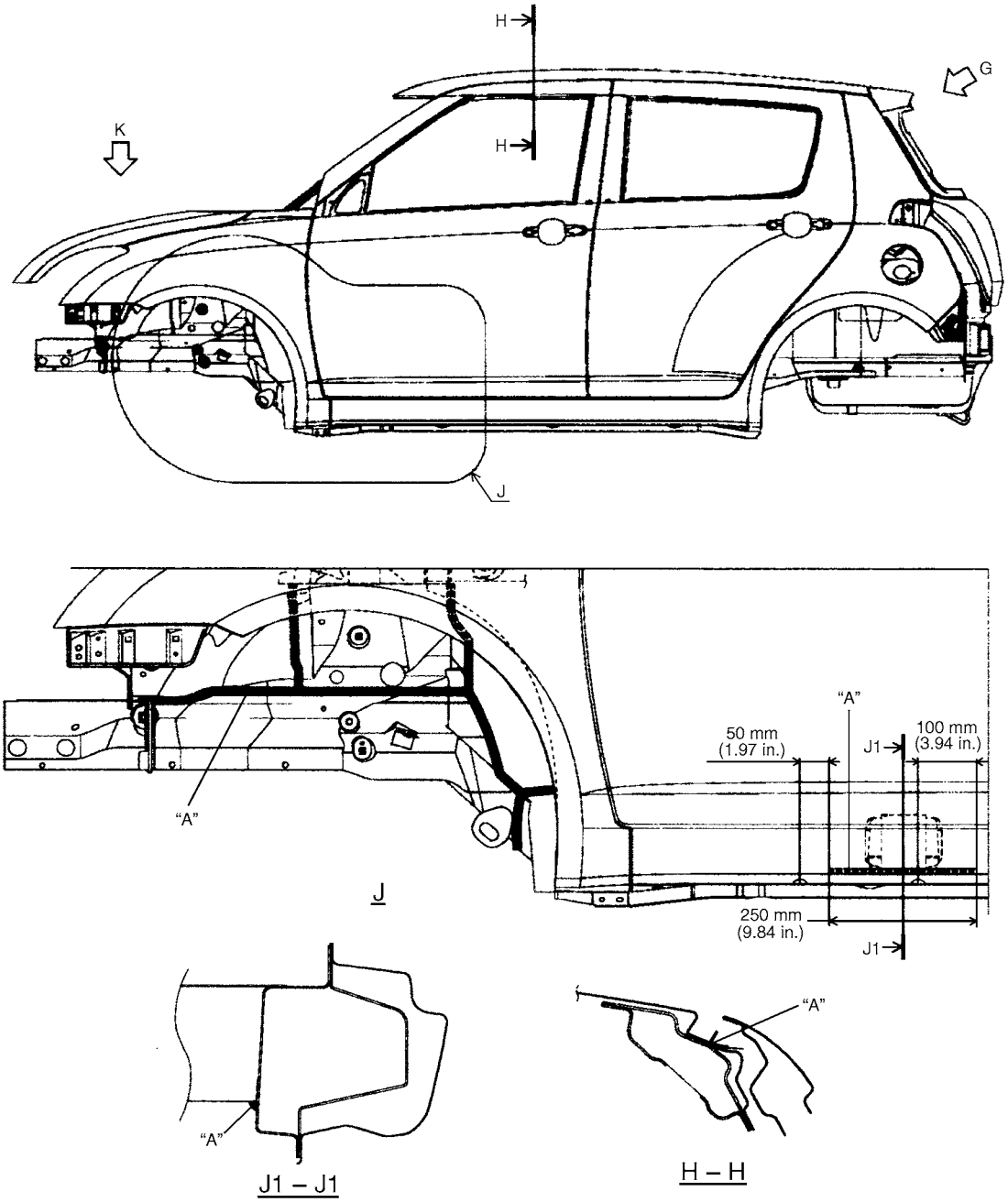
L



N

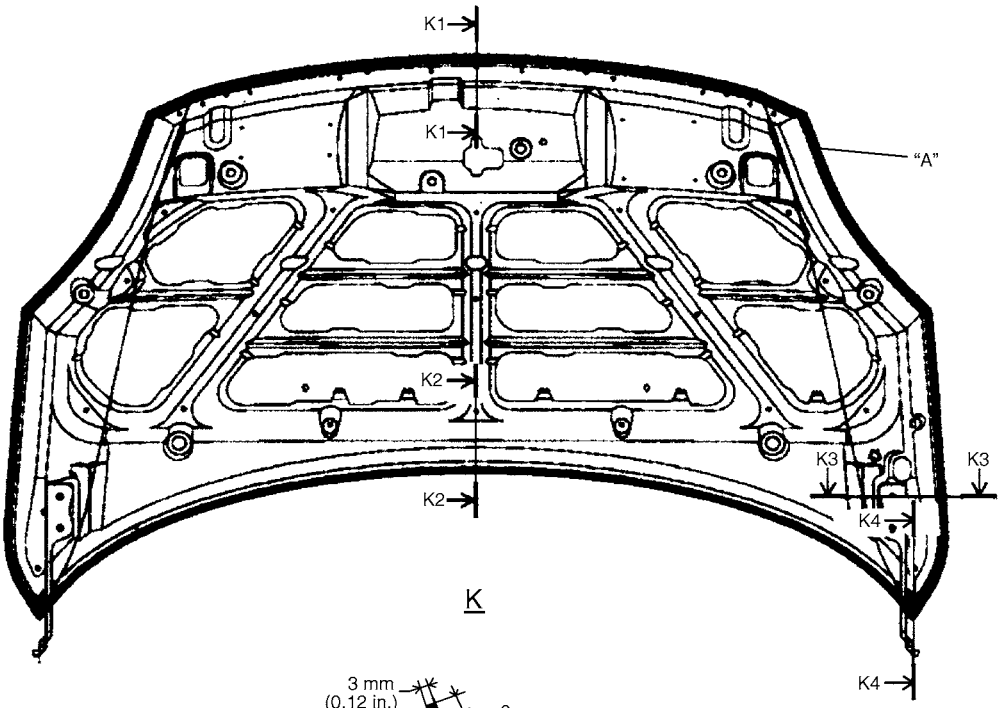
I4RS0A9C0003-

"A": Apply sealant.	"C": Smooth out sealant with a brush.	"E": Apply sealant covering flange end (between "c" and "d").
"B": Wipe off excess sealant after application.	"D": Do not apply sealant.	

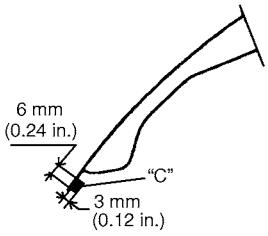


I4RS0A9C0004-

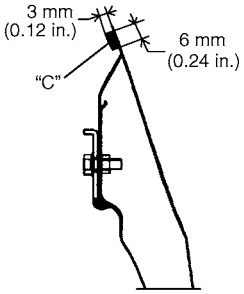
"A": Apply sealant



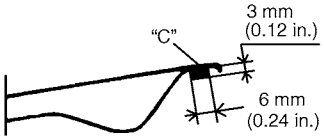
K



K1 – K1

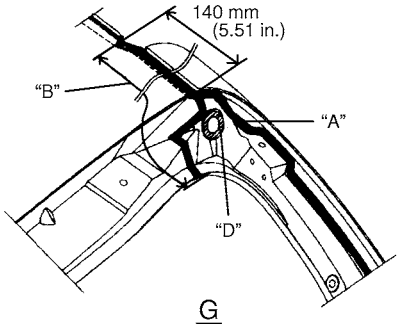


K3 – K3



K2 – K2

K4 – K4



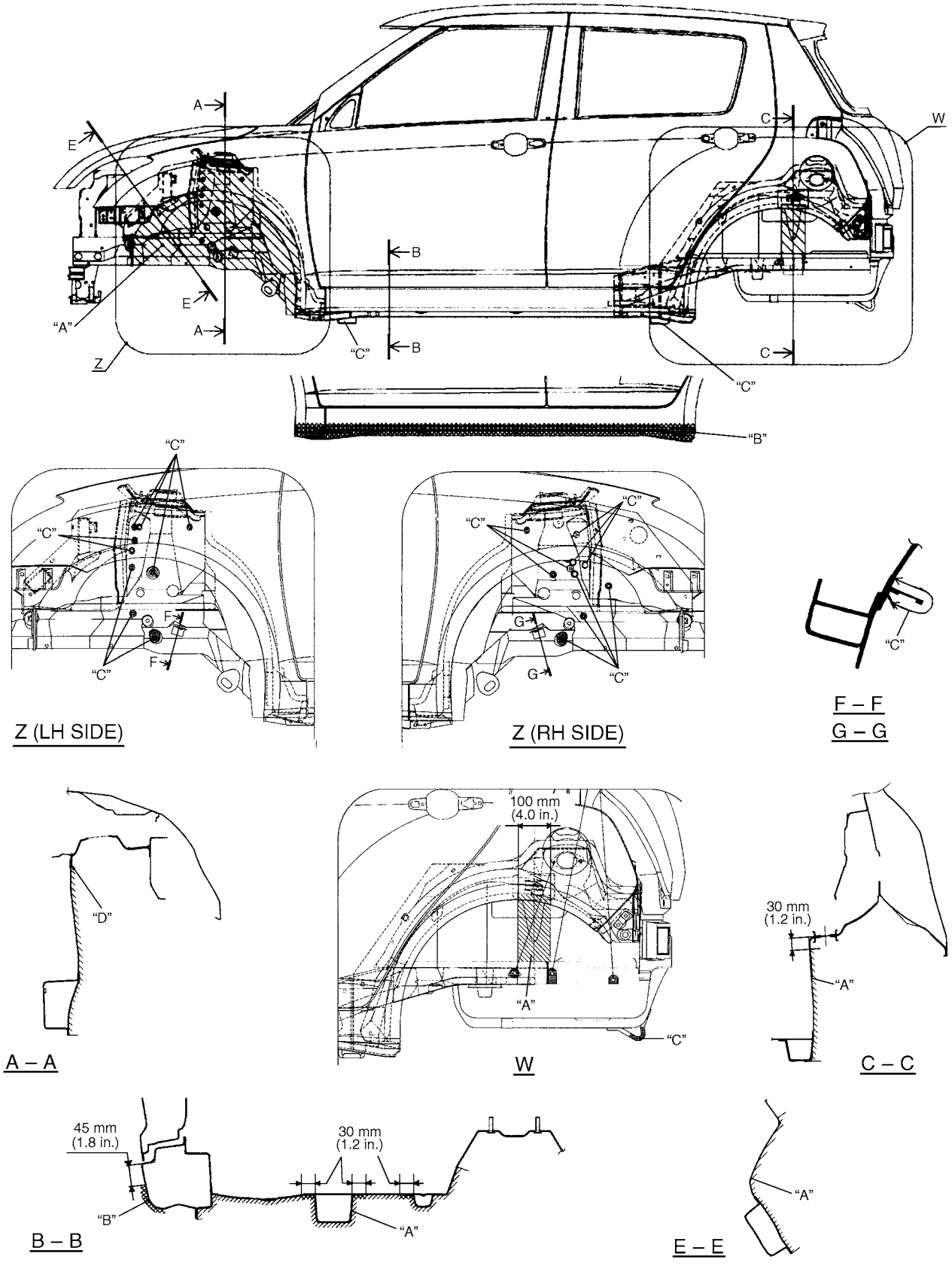
G

I4RS0A9C0005-

"A": Apply sealant.	"C": Apply sealant covering flange end.
"B": Wipe off excess sealant after application.	"D": Do not apply sealant.

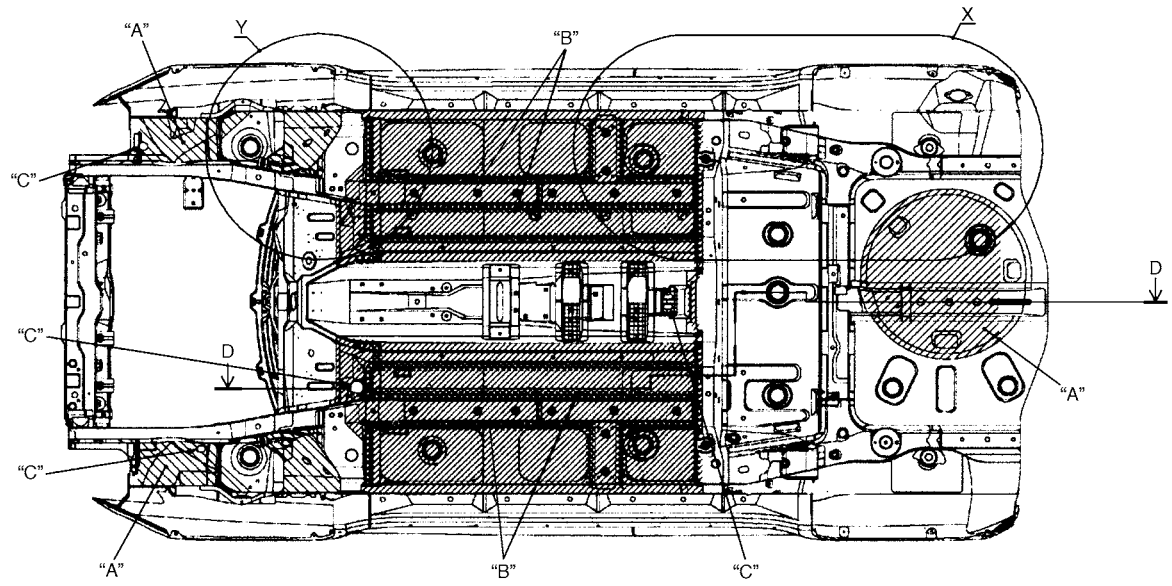
Under Coating Application Areas

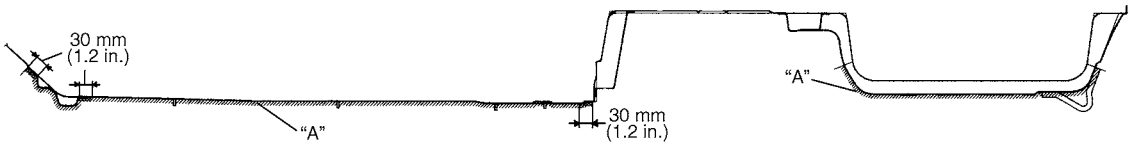
S4RS0A9C03002



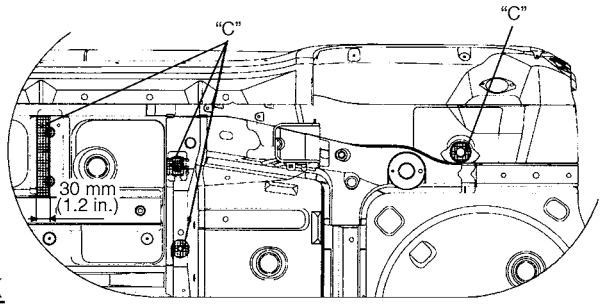
I4RS0A9C0006-

"A": Apply undercoating (PVC, 400 μm or more).	"C": Do not apply undercoating.
"B": Apply anti-chip coat (300 μm or more).	"D": Apply undercoating (PVC, 400 μm or more) covering flange end.

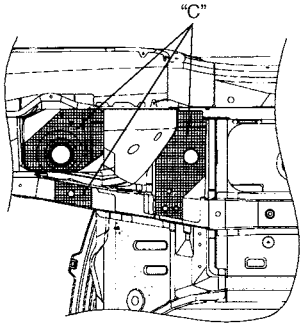




D-D



X



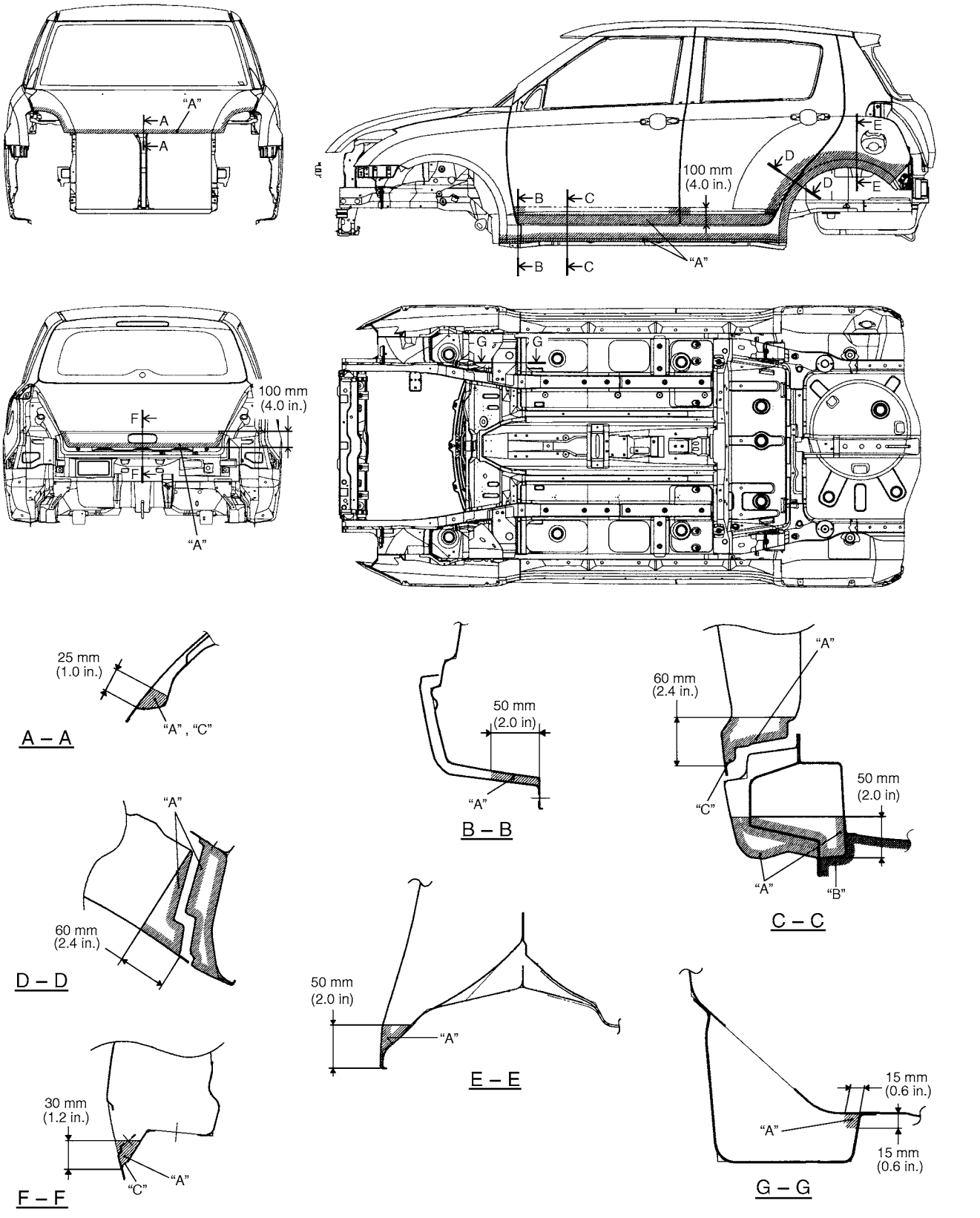
Y

I4RS0A9C0007-

"A": Apply undercoating (PVC, 400 μm or more).	"C": Do not apply undercoating.
"B": Apply undercoating (PVC, 600 μm or more).	

Anti-Corrosion Compound Application Area

S4RS0A9C03003



I4RS0A9C0008-

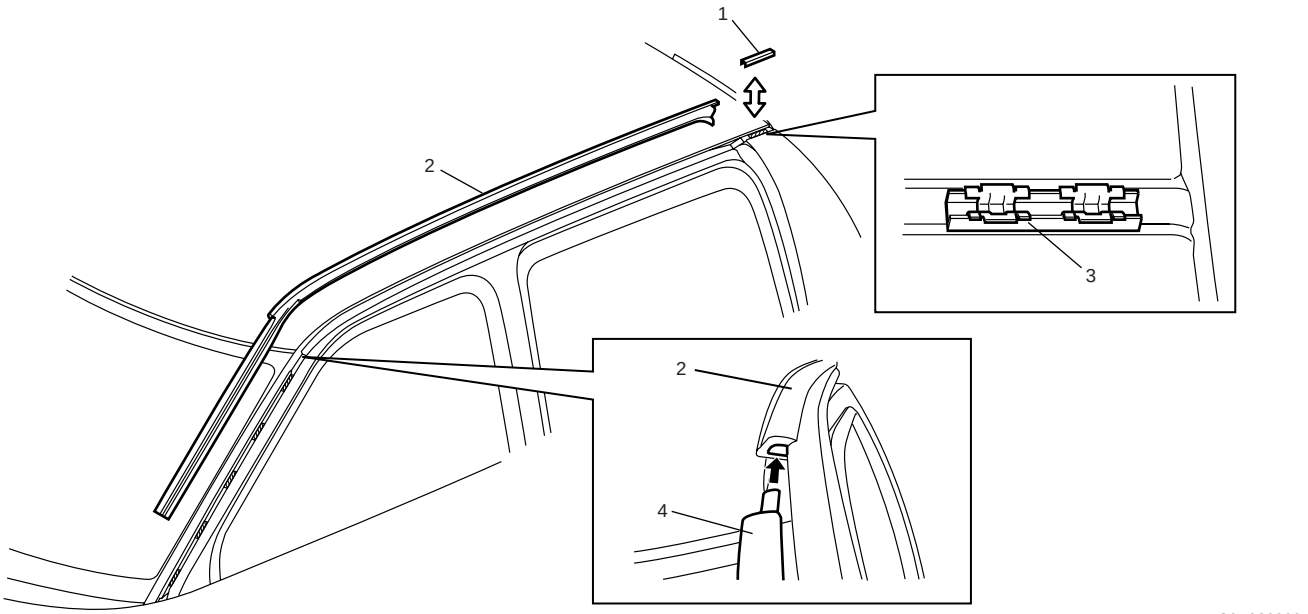
"A":	Apply rust proof wax (hot wax 50 μm or more).
"B":	Apply rust proof wax (high viscosity wax 50 μm or more).
"C":	Never fill up drain holes with rust proof wax.

Exterior Trim

Repair Instructions

Roof Molding Components

S4RS0A9D06005

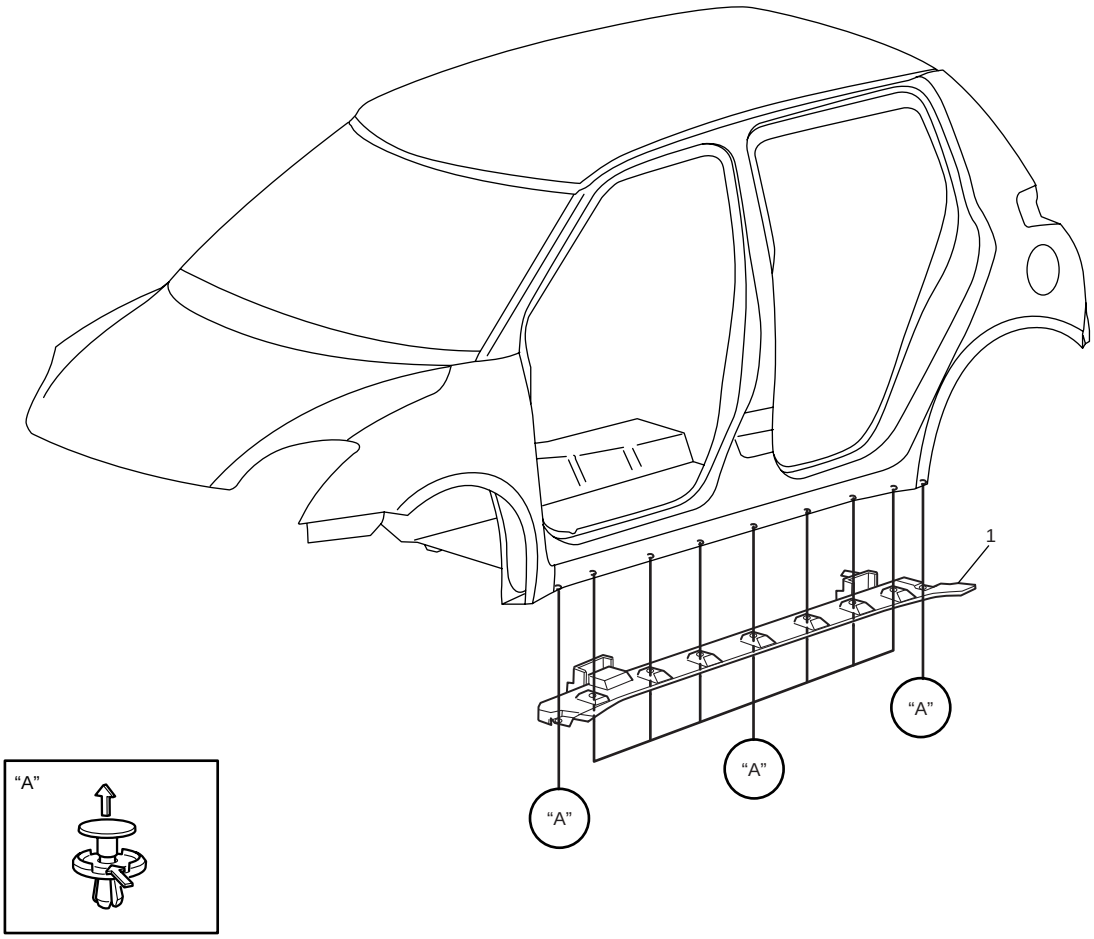


I4RS0A980009-

1. Roof molding	3. Roof molding clip (Push-in type)
2. Roof side weather-strip	4. Windshield side gamish

Splash Guard (If Equipped) Components

S4RS0A9D06006



I4RS0A980010-

1. Side sill splash guard

Section 10

Control systems

CONTENTS

Precautions 10-1
Precautions 10-1
Precautions for Control Systems 10-1

Body Electrical Control System 10B-1
Precautions 10B-1
Precautions in Diagnosing Trouble 10B-1
General Description 10B-1
BCM General Description 10B-1
CAN Communication System Description 10B-2
Schematic and Routing Diagram 10B-3
Body Electrical Control System Wiring Circuit Diagram 10B-3
Connector Layout Diagram of BCM and Junction Block Assembly 10B-6
Component Location 10B-7
BCM and Related System Component Location 10B-7
Diagnostic Information and Procedures 10B-8
BCM Self-Diagnosis Function 10B-8
Body Electrical Control System Check 10B-9
Scan Tool Data 10B-11
DTC Table 10B-13
DTC Check 10B-13
DTC Clearance 10B-15
BCM Power Circuit and Ground Circuit Check 10B-15
DTC B1133 (DTC No.1133): Battery Voltage Too High 10B-17
DTC B1141 / DTC B1142 / DTC B1143 (No.1141 / No. 1142/ No. 1143) Outside Air Temperature (Ambient Temp.) Sensor Circuit Malfunction 10B-18
DTC B1150 (No. 1150): Air Bag Communication Circuit Malfunction 10B-20
DTC B1157 (No.1157) Air Bag Deployment Signal Input 10B-22
DTC B1170 (No. 1170): EEPROM access error 10B-22
DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error) ... 10B-23
DTC U1073 (No. 1073): Control Module Communication Bus Off 10B-25
DTC U1100 (No.1100): Lost communication with ECM 10B-27
DTC U1101 (No.1101): Lost communication with TCM 10B-29
Inspection of BCM and its Circuits 10B-30
Repair Instructions 10B-39
BCM (Included in Junction Block Assembly) Removal and Installation 10B-39
Outside Air Temperature Sensor Removal and Installation 10B-39
Outside Air Temperature Sensor Inspection ... 10B-39
Special Tools and Equipment 10B-40
Special Tool 10B-40

Immobilizer Control System 10C-1
Precautions 10C-1
Precautions in Diagnosing Troubles 10C-1
Precaution in Replacing ECM 10C-1
Precautions in Handling Immobilizer Control System 10C-1
General Description 10C-2
Immobilizer Control System Introduction 10C-2
Immobilizer Control System Components Location 10C-2
On-Board Diagnostic System Description (Self-diagnosis Function) 10C-3
Schematic and Routing Diagram 10C-3
Immobilizer Control System Wiring Circuit Diagram 10C-3
Diagnostic Information and Procedures 10C-5
Immobilizer Control System Check 10C-5
Diagnostic Trouble Code (DTC) Check 10C-5
Diagnostic Trouble Code (DTC) Clearance 10C-5
Diagnostic Trouble Code (DTC) Table 10C-6
Scan Tool Data 10C-6
DTC P1614 Transponder Response Error 10C-7
DTC P1621 Immobilizer Communication Line Error 10C-8
DTC P1622 EEPROM Error 10C-10
DTC P1623 Unregistered Transponder 10C-10
DTC P1625 Immobilizer Antenna Error 10C-11
Inspection of Immobilizer Control Module and Its Circuit 10C-12
Repair Instructions 10C-14
Immobilizer Control Module Removal and Installation 10C-14
Registration of the Ignition Key 10C-14
Procedure after ECM Replacement 10C-14
Special Tools and Equipment 10C-14
Special Tool 10C-14

Precautions

Precautions

Precautions for Control Systems

S4RS0AA000001

Air Bag Warning
Refer to “Air Bag Warning: in Section 00”.

Body Electrical Control System

Precautions

Precautions in Diagnosing Trouble

S4RS0AA200001

- Diagnostic information stored in BCM memory can be cleared as well as checked by using SUZUKI scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00" before inspection and observe what is written there.
- Communication of ECM, TCM (if equipped), combination meter and BCM, is established by CAN (Controller Area Network). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System: in Section 00".

General Description

BCM General Description

S4RS0AA201001

The Body electrical Control Module (BCM) is incorporated in junction block assembly. Do not attempt removal of BCM from junction block assembly as it may cause contact failure.
The BCM incorporates relays and controllers which are used for the following systems and controls them.

- Power door lock
- Keyless entry
- Rear wiper
- Combination meter
- Interior light
- Warning buzzer
- Rear end door window defogger
- Rear end door opener
- Alarm indicator lamp

Also, the BCM has a function to cause the interior light and open door warning lamp in the combination meter to turn off when any door is left open for longer than 15 minutes to reduce wasteful battery consumption.
In addition, it is possible to check operation of actuator which is controlled by BCM by using the output test function of SUZUKI scan tool to operate actuator simulatively.

CAN Communication System Description

S4RS0AA201002

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a functionality to detect a communication error automatically.
Each module reads necessary data from the received data and transmits data. BCM communicates with each control module about the following information.

[A]: Data which BCM (1) transmits to ECM (2)

- Air conditioning switch signal
- Electric load (Rear end door window defogger switch signal)
- Ignition switch signal

[B]: Data which BCM receives from ECM

- Vehicle speed signal
- Engine coolant temperature signal
- Fuel consumption signal (Distance kilometers per liter of fuel)

[C]: Data which BCM transmits to TCM (A/T model) (3)

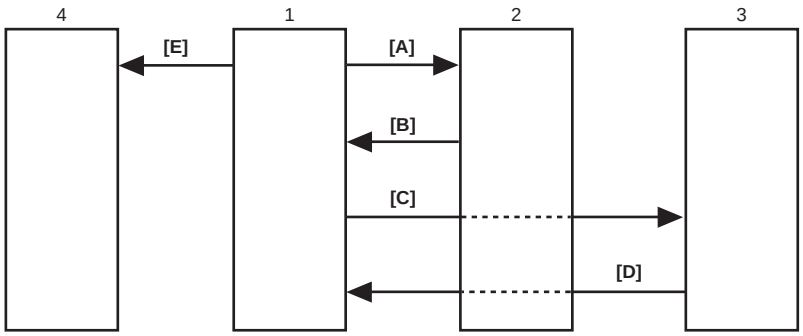
- “3” position switch signal (“2” or “3” range signal of A/T selector lever)

[D]: Data which BCM receives from TCM (A/T model)

- Transmission range sensor signal (A/T select lever position indicator)

[E]: Data which BCM transmits to combination meter (4)

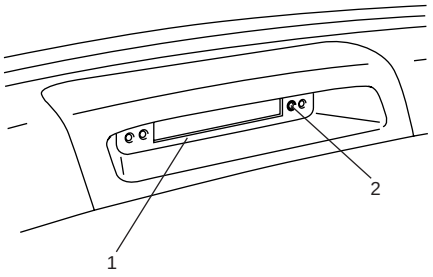
- Brake fluid level switch signal
- Parking brake switch signal
- Driver side seat belt buckle switch signal
- Charging system warning lamp signal
- Engine oil pressure switch signal
- Lighting switch signal
- Door switch signal



I4RS0AA20032-

Alarm Indicator Lamp

The information display (1) of this vehicle includes an alarm indicator lamp (2) for the theft preventive purpose. The BCM makes the alarm indicator lamp flash at certain intervals after the ignition switch is turned off until it is turned on again. Also, to check DTCs stored in BCM without using a SUZUKI scan tool when diagnosing troubles, it is possible to identify them by flashing patters of the alarm indicator lamp.



I4RS0AA20031-

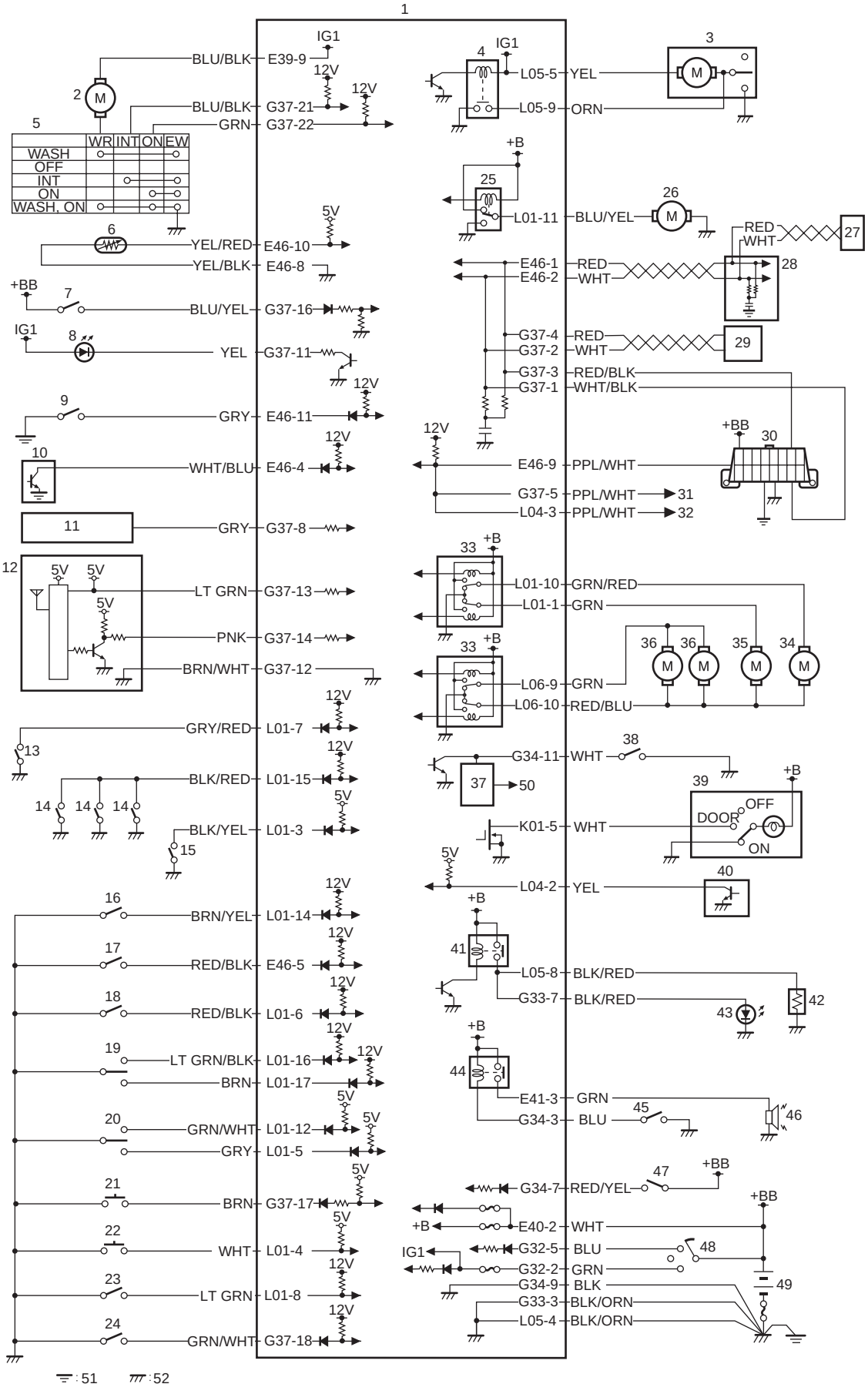
Schematic and Routing Diagram

Body Electrical Control System Wiring Circuit Diagram

S4RS0AA202001

NOTE:

This wiring diagram shows circuits related to only BCM, not the entire circuits of BCM and junction block. Refer to “Power Supply Diagram: in Section 9A” for wiring circuits other than the figure below.



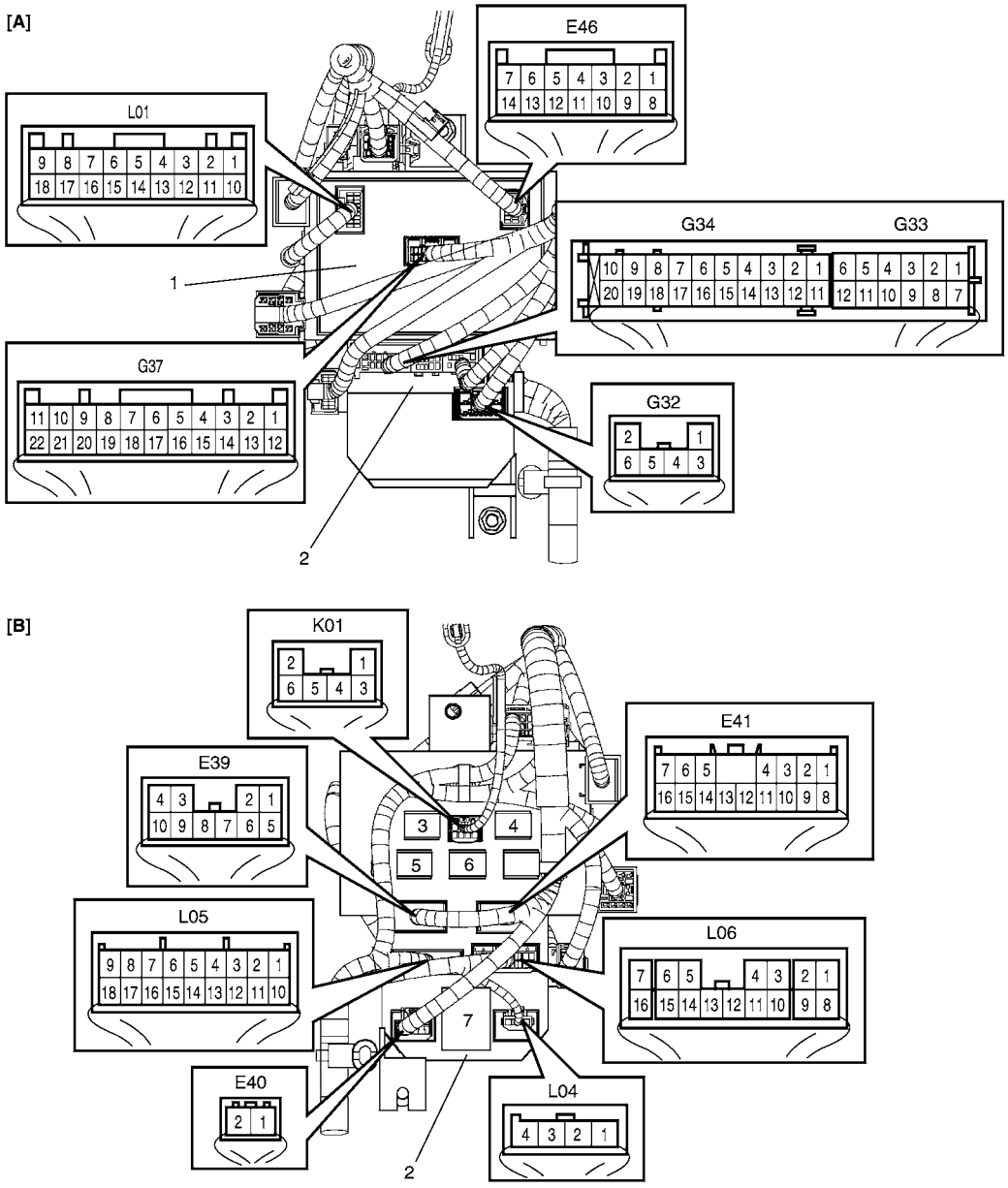
I4RS0AA20002-

1. BCM (included in junction block assembly)	19. Door key cylinder switch (included in door lock actuator)	37. Turn signal and hazard warning relay
2. Rear washer motor	20. Manual door lock switch	38. Hazard warning switch
3. Rear wiper motor	21. Rear end door window defogger switch	39. Interior light
4. Rear wiper relay	22. Rear end door opener switch	40. Air bag control module
5. Rear wiper and washer switch	23. “3” position switch	41. Rear window defogger relay
6. Outside air temperature sensor	24. A/C switch	42. Rear window defogger
7. Ignition key switch	25. Rear end door opener relay	43. Rear window defogger indicator lamp
8. Alarm indicator light	26. Rear end door opener actuator	44. Horn relay
9. Oil pressure switch	27. TCM	45. Horn switch
10. Generator	28. ECM	46. Horn
11. Information display	29. Combination meter	47. Lighting switch
12. Keyless entry receiver	30. Data link connector (DLC)	48. Ignition switch
13. Driver side door switch	31. To ECM	49. Battery
14. Other than driver side door switch	32. To SDM	50. To turn signal light
15. Rear end door switch	33. Door lock motor relay	51. Body ground
16. Driver side seat belt switch	34. Driver side door lock actuator	52. Engine ground
17. Brake fluid level switch	35. Passenger side door lock actuator	
18. Parking brake switch	36. Rear door lock actuator	

Connector Layout Diagram of BCM and Junction Block Assembly

S4RS0AA202002

BCM and junction block assembly connectors (viewed from harness side)



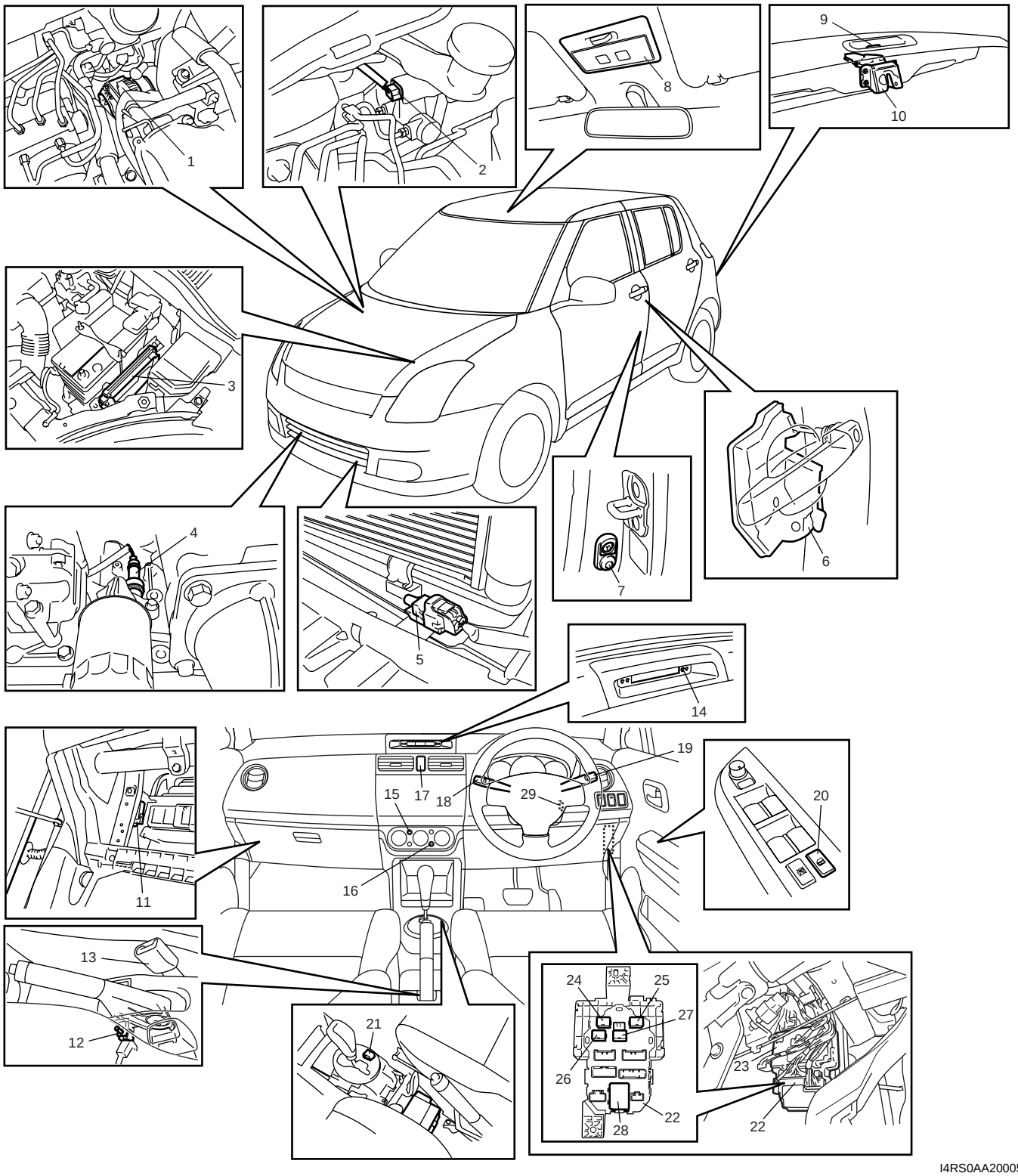
I4RS0AA20004-

[A]: Junction block assembly (viewed from BCM side)	4. Horn relay
[B]: Junction block assembly (viewed from relay side)	5. Rear wiper relay
1. BCM	6. Rear end door window defogger relay
2. Junction block assembly	7. Turn signal and hazard warning relay
3. Heater relay	

Component Location

BCM and Related System Component Location

S4RS0AA203001



I4RS0AA20005-

1. Generator	11. Keyless entry receiver	21. “3” position switch
2. Brake fluid level switch	12. Parking brake switch	22. Junction block switch
3. ECM	13. Seat belt buckle switch	23. BCM
4. Oil pressure switch	14. Alarm indicator lamp	24. Heater relay
5. Outside air temperature sensor	15. Rear end door window defogger switch	25. Horn relay

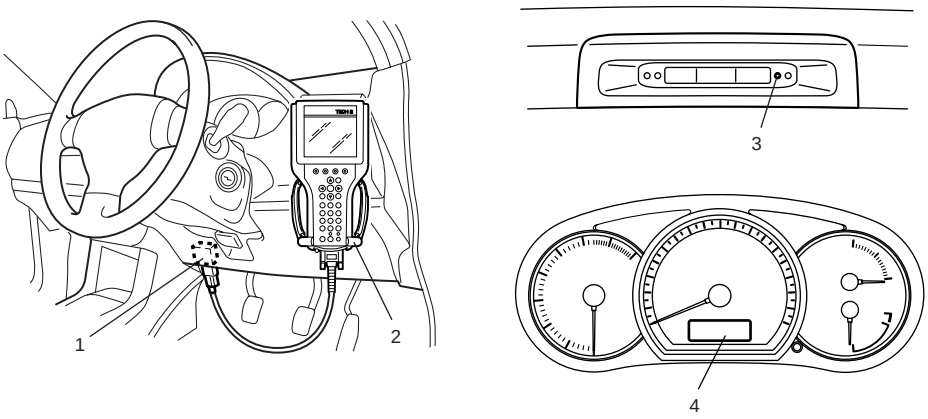
6. Door lock actuator (incorporated in key cylinder switch)	16. A/C switch	26. Rear wiper relay
7. Door switch	17. Hazard warning switch	27. Rear end door window defogger relay
8. Interior light	18. Rear wiper switch	28. Turn signal and hazard warning relay
9. Rear end door opener switch	19. Lighting switch	29. Key reminder switch (included in ignition switch)
10. Rear end door lock actuator (incorporated in door switch)	20. Manual door lock switch	

Diagnostic Information and Procedures

BCM Self-Diagnosis Function

S4RS0AA204001

- BCM monitors conditions of the system components and its circuit with ignition switch turned to ON position. When an abnormality in the system occurs, the area where that abnormality lies is stored in the memory of EEPROM in BCM.
- DTC can be checked in either one of following ways.
  - DTC can be checked by SUZUKI scan tool (2) connected to DTC (1).
  - DTC can be read from flashing pattern of alarm indicator lamp (3). Also, DTC is displayed on combinations meter (4) at the same time.



I4RS0AA20006-

BCM input / output table

Control	Input	Output
Power door lock system	• Key cylinder switch • Manual door lock switch	• Driver side door lock actuator • Other than driver side door lock actuator
Keyless entry system	• Key reminder switch • Keyless entry receiver • Driver side door switch	• Driver side door lock actuator • Other than driver side door lock actuator • Turn signal and hazard warning relay • Interior light
Rear wiper	• Rear wiper INT switch • Rear wiper LO switch	• Rear wiper relay

Control	Input	Output
Combination meter	• Tail light switch • Oil pressure switch • Parking brake switch • Driver side seat belt switch • Brake fluid level switch • Generator • ECM (engine speed signal, vehicle speed signal, engine coolant temperature signal) • TCM (transmission range sensor signal) (for A/T vehicle only)	• Combination meter
Interior light	• Each door switch • Key reminder switch	• Interior light
Warning buzzer	• Key reminder switch • Tail light switch • Driver side door switch	• Warning buzzer (located in BCM)
Rear end door window defogger	• Rear end door window defogger switch • Generator	• Rear end door window defogger relay
Rear end door opener	• Manual door lock switch (unlock signal) • Key cylinder switch (unlock signal) • Keyless entry transmitter (unlock signal) • Rear end door switch	• Rear end door opener relay
Alarm indicator lamp	• Key reminder switch	• Alarm indicator lamp (located in information display)

Body Electrical Control System Check

S4RS0AA204002

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	☞ **Problem symptom confirmation** 1) Perform problem symptom confirmation. *Does trouble recur?*	Go to Step 3.	Go to Step 7.
3	☞ **DTC check** 1) Check DTC. *Is it malfunction code?*	Go to Step 4.	Go to Step 5.
4	☞ **Troubleshooting for DTC** 1) Check and repair according to DTC diag. flow. *Are check and repair completed?*	Go to Step 7.	Check and repair malfunction part(s).
5	☞ **Body electrical control system symptom diagnosis** 1) Perform check and repair referring to “Symptom Diagnosis” of system having a trouble. *Is there faulty condition?*	Repair or replace malfunction part(s).	Go to Step 6.
6	☞ **Check for intermittent problem** 1) Check for intermittent problem. *Is there faulty condition?*	Repair or replace malfunction part(s).	Go to Step 7.

Step	Action	Yes	No
7	☞ **Final confirmation test** 1) Clear DTC referring to “DTC Clearance: ”. 2) Check DTC referring to “DTC Check: ”. *Is there any DTC?*	Go to Step 4.	End.

Customer Complaint Analysis
Record details of the problem (failure, complaint) and how it occurred as described by the customer.
For this purpose, use of such a questionnaire form as shown in the figure will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (example)

Customer’s Name:	Model:	VIN:	
Date of Issue:	Date Reg.	Date of Problem:	Mileage:
Problem Symptoms	• Power door lock system does not operate • Keyless entry system does not operate • Rearend door window defogger does not operate • Rear wiper does not operate • Rearend door opener does not operate • Warning buzzer does not sound • Interior light does not light • Alarm indicator lamp does not flash		
Frequency of Occurrence	• Continuous / Intermittent (_____ times a day, a month) / other_____		
Environmental Condition	• Weather: fair / cloudy / rain / snow / other_____ • Temperature: _____ ° F (_____ ° C)		
Diagnostic Trouble Code	• Normal code / malfunction code(_____)		

I4RS0AA20013-

Problem Symptom Confirmation
Check if what the customer claimed in “Customer Questionnaire” is accurately found in the vehicle. If that symptom is found, check whether the symptom is identified as a failure. (This step should be shared with the customer if possible.)

DTC check
Check DTC stored in BCM memory referring to “DTC Check: ”, record it and then clear it referring to “DTC Clearance: ”. DTC indicates malfunction that occurred in the system but does not indicate whether it exists now or it occurred in the past and the normal condition has been restored now. To check which case applies, clear DTC once and check whether or not any fault exists.

Troubleshooting for DTC
Based on the DTC indicated in Step 3 and referring to applicable DTC flow, locate the cause of the trouble, namely in a sensor, wire harness, connector, BCM or other part and repair or replace faulty parts.

Body Electrical Control System Symptom Diagnosis
Check the parts or system suspected as a possible cause referring to symptom diagnosis of each system.

Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection: in Section 00”.

Final Confirmation Test
Confirm that the problem symptom has gone and the body electrical control system is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, check DTC again and confirm that no DTC is indicated.

Scan Tool Data

S4RS0AA204020

Scan tool Data	Condition	Normal condition / reference value
Vehicle Speed	At stop with ignition switch turned ON	0 km/h
Outside air Temp	Reference value is relative to outside air temperature	–40 °C – 70 °C (–40 °F – 158 °F)
Battery Voltage	At specified idle speed after warming up	10 – 14 V
Coolant Temp	At specified idle speed after warming up	80 °C – 100 °C (176 °F – 212 °F)
Engine Speed	Engine idling with no load applied after warming up	Desired idle speed ± 50 rpm
Fuel Consumption	At specified idle speed after warming up	0.0 km/l
Key Reminder Sw	Ignition key inserted in ignition key cylinder	Key in
	Ignition key pulled out from ignition key cylinder	Pulled
Rear Wiper Sw	Rear wiper switch at ON position and ignition switch turned ON	ON
	Rear wiper switch at INT position and ignition switch turned ON	INT
	Rear wiper switch at OFF position and ignition switch turned ON	OFF
Door key Sw	Key cylinder switch of driver side door at lock position	LOCK
	Key cylinder switch of driver side door not turned	Neutral
	Key cylinder switch of driver side door at unlock position	Unlock
Door Lock Sw	Lock side of manual door lock switch pressed	LOCK
	Manual door lock switch not pressed	Neutral
	Unlock side of manual door lock switch pressed	Unlock
Driv Door Sw	Driver side door open	Open
	Driver side door closed	Close
Pass Door Sw	Doors other than driver side door open	Open
	Doors other than driver side door closed	Close
Brake Fluid Level	Brake fluid level at MIN level or higher	Normal
	Brake fluid level lower than MIN level	Low
Parking Brake Sw	Parking brake lever pulled	ON
	Parking brake lever released	OFF
Rear Defogger Sw	Rear end door window defogger switch turned ON with engine running	ON
	Rear end door window defogger switch turned OFF with engine running	OFF
Driv Seatbelt Sw	Driver side seat belt fastened	Fasten
	Driver side seat belt unfastened	Unfasten
Rear end door opener	Rear end door open	ON
	Rear end door closed	OFF
“3” Position Sw	A/T select lever at 2nd or 3rd position with ignition switch turned ON	ON
	A/T select lever at other than 2nd or 3rd position with ignition switch turned ON	OFF
Charge Lamp	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
Oil pressure switch	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
A/C Switch	A/C and ignition switch turned ON	ON
	A/C switch turned OFF	OFF

Scan Tool Data Definitions

Vehicle Speed (km/h, mph): It is computed based on pulse signals from vehicle speed sensor on transmission.
Outside air Temp (°C, °F): It is detected by outside air temperature sensor.
Battery Voltage (V): This parameter indicates battery positive voltage inputted to BCM.
Coolant Temp (Engine coolant temperature) (°C, °F): It is detected by engine coolant temperature sensor.
Engine Speed (RPM): It is computed by reference pulse signals from CMP sensor.
Fuel Consumption (km/l): This parameter indicates the fuel consumption computed by ECM.
Key Reminder Sw (Key remainder switch) (Pulled / Key in): This parameter indicates the state of the key reminder switch.
Rear Wiper Sw (Rear wiper switch) (ON / INT / OFF): This parameter indicates the state of the rear wiper switch.
Door key Sw (Door key cylinder switch) (Lock / Neutral / Unlock): This parameter indicates the state of the door key cylinder switch.
Door lock Sw (Manual door lock switch) (Lock / Neutral / Unlock): This parameter indicates the state of the manual door lock switch.
Driv Door Sw (Driver side door switch) (Open / Close): This parameter indicates the state of the driver side door switch.
Pass Door Sw (Other than driver side door switch) (Open / Close): This parameter indicates the state of the door switches other than driver side door switch.
Brake Fluid Level (Low / Normal): Low: Brake fluid level is lower than specified level.
Normal: Brake fluid level is higher than MIN level.
Parking Brake Sw (Parking brake switch) (ON / OFF): ON: Parking brake lever is pulled up.
OFF: Parking lever is released
Rear Defogger Sw (Rear end door window defogger switch) (ON / OFF): This parameter indicates the state of the rear end door window defogger switch.
Driv Seatbelt Sw (Driver seat belt switch) (Fasten / Unfasten): This parameter indicates the state of the driver side seat belt buckle switch.
Rear end Door Opener (Rear end door opener switch) (ON / OFF): This parameter indicates the state of the rear end door opener switch.
"3" position Sw (ON/OFF): This parameter indicates the state of the "3" position switch included in A/T manual selector assembly.
Charge lamp (ON / OFF): This parameter indicates the state of the charge system monitor switch.
Oil pressure switch (ON / OFF): This parameter indicates the state of the oil pressure switch.
A/C Switch (ON / OFF): This parameter indicates the state of the air conditioning switch.

Diagnosis Using Output Test Function of SUZUKI Scan Tool

SUZUKI scan tool has the output test function which can force operation of following actuators and relays of the system controlled by BCM. When a malfunction is found in the system controlled by BCM, execute the output test which enables easy judgment whether the malfunction is on the input side or output side of BCM. For detailed information on operation of SUZUKI scan tool, refer to "SUZUKI Scan Tool Operator's Manual".

Item	Controlled Parts
Hazard warning light	Turn signal and hazard warning relay
Interior (Dome) light	Interior (Dome) light (when interior light switch is at DOOR position)
Door	Driver side door lock actuator
Rear end door open	Rear end door opener relay (when all doors are unlocked)
Warning buzzer	Warning buzzer (in BCM)
Rear wiper	Rear wiper relay
Alarm indicator	Alarm indicator light (in information display)
Rear defogger	Rear end door window defogger relay

DTC Table

S4RS0AA204004

DTC (displayed on SUZUKI scan tool)	DTC (indicated by alarm indicator lamp)	DTC (displayed on odometer in combination meter)	Detected item	Detecting condition
NO DTC	0000	0000	—	No DTC detected
☞ B1133	1133	b1133	Battery voltage too high	Battery voltage too high
☞ B1141	1141	b1141	Outside air temperature (ambient temperature) sensor circuit open	Sensor output voltage too high
☞ B1142	1142	b1142	Outside air temperature (ambient temperature) sensor circuit short to ground	Sensor output voltage too low
☞ B1143	1143	b1143	Outside air temperature (ambient temperature) sensor malfunction	Sensor output voltage out of specification
☞ B1150	1150	b1150	Air bag communication circuit malfunction	Air bag communication circuit open or short to ground
☞ B1157	1157	b1157	Air bag deployment signal input	Air bag deployment signal inputted
☞ B1170	1170	b1170	EEPROM access error	Memory error
☞ U1001	1001	U1001	High speed CAN communication bus	Transmitting error of BCM for specified time continuously
☞ U1073	1073	U1073	Control module communication bus off	Transmitting and receiving error of BCM for specified time continuously
☞ U1100	1100	U1100	Lost communication with ECM	Receiving error of BCM from ECM for specified time continuously
☞ U1101	1101	U1101	Lost communication with TCM	Receiving error of BCM from TCM for specified time continuously

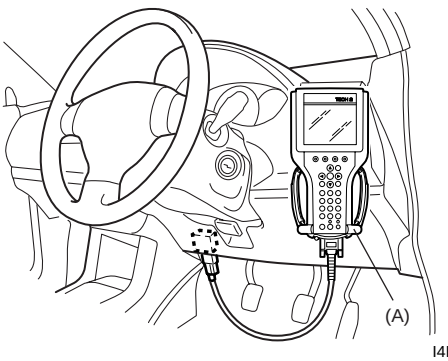
DTC Check

S4RS0AA204005

Using SUZUKI Scan Tool

1) Prepare SUZUKI scan tool.
2) With ignition switch turned OFF, connect it to data link connector (DLC) located on underside of instrument panel of driver's side.

Special tool
(A): SUZUKI scan tool



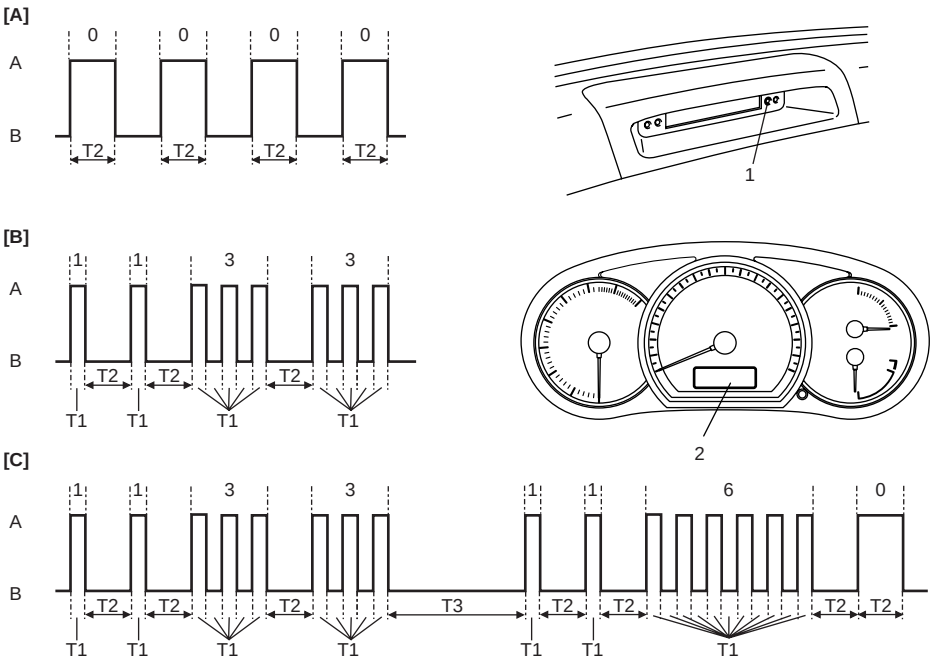
I4RS0AA20003-

3) Turn ignition switch ON.

4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down.
   Refer to SUZUKI scan tool operator's manual for further details.
   If communication between SUZUKI scan tool and BCM is not possible, check if SUZUKI scan tool is communicable by connecting it to BCM in another vehicle. If communication is possible in this case, SUZUKI scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from data link connector.

Without Using SUZUKI Scan Tool

1) Turn ignition switch to OFF position.
2) Perform following Steps a) to d) within 10 seconds after ignition switch is turned ON and engine stops.
   a) Turn headlight switch to "SMALL" position.
   b) Turn headlight switch to "OFF" position.
   c) Repeat Steps a) and b) 2 times.
   d) Press and release driver side door switch 3 times.
3) Check DTC displayed on odometer of combination meter or read flashing pattern of alarm indicator lamp which represents DTC as shown in the following example and write it down.
   When more than 2 DTCs are stored in memory, flashing for each DTC starts with the smallest DTC number in increasing order. Also, DTC is indicated repeatedly until the ignition switch is turned OFF.



I4RS0AA20007-

[A]: No DTC (No. 0000)	B: Indicator lamp turned OFF	1. Alarm indicator lamp
[B]: DTC B1133 (No. 1133)	T1: 0.3 seconds	2. Odometer
[C]: When 2 DTCs are detected	T2: 1.0 seconds	
A: Indicator lamp turned ON	T3: 3.0 seconds	

4) After completing the check, turn ignition switch to OFF position.

DTC Clearance

S4RS0AA204006

After repair or replace of malfunction part(s), clear all DTCs by performing the following procedure.

Using SUZUKI Scan Tool

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch ON and engine stops.
3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch off and disconnect scan tool from data link connector.

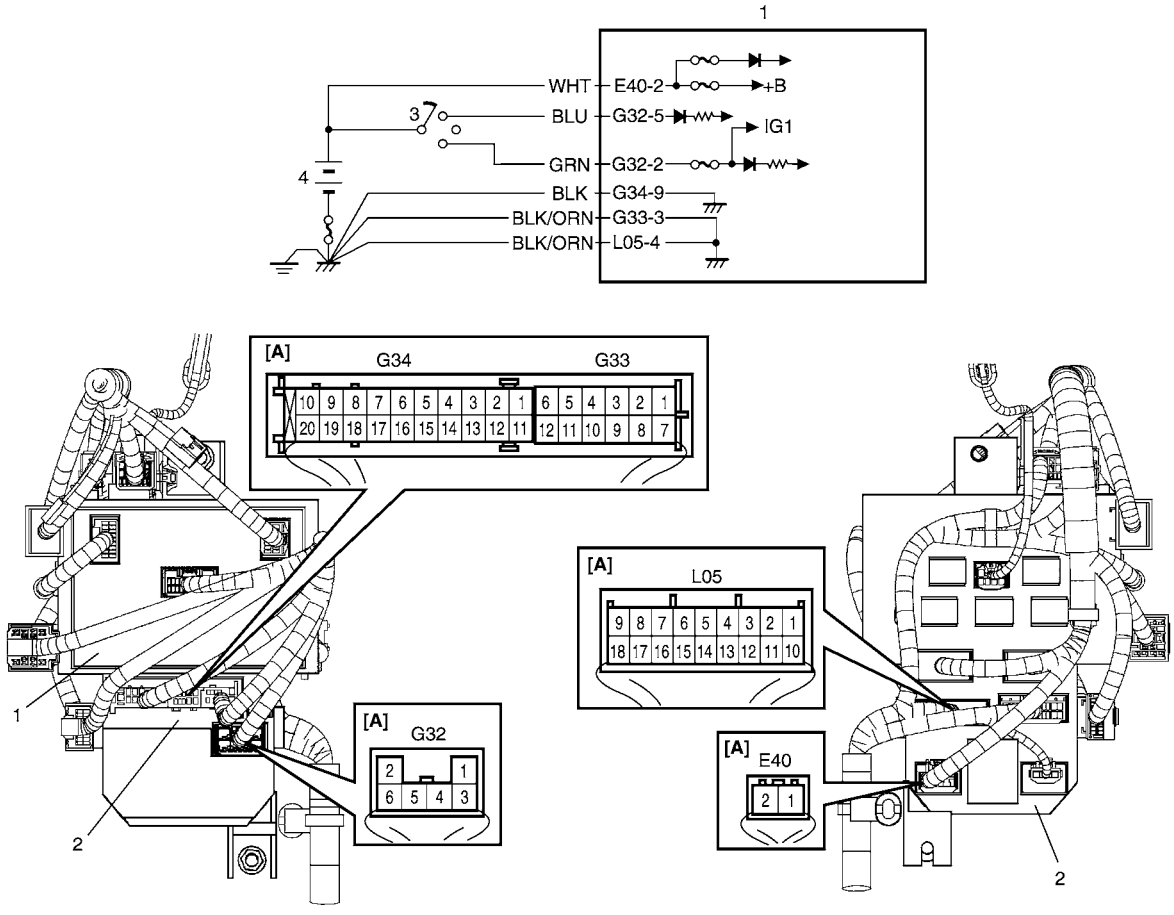
Without Using SUZUKI Scan Tool

1) Turn ignition switch to OFF position.
2) Perform following Steps a) to d) within 10 seconds after ignition switch is turned ON and engine stops.
   a) Turn headlight switch to "SMALL" position.
   b) Turn headlight switch to "OFF" position.
   c) Repeat Steps a) and b) 3 times.
   d) Press and release driver side door switch 4 times.
3) After completing above Steps, confirm that no malfunction DTC is detected.

BCM Power Circuit and Ground Circuit Check

S4RS0AA204007

Wiring Diagram



I4RS0AA20008-

[A]: Junction block assembly connector viewed from harness side	3. Ignition switch
1. BCM	4. Battery
2. Junction block assembly	

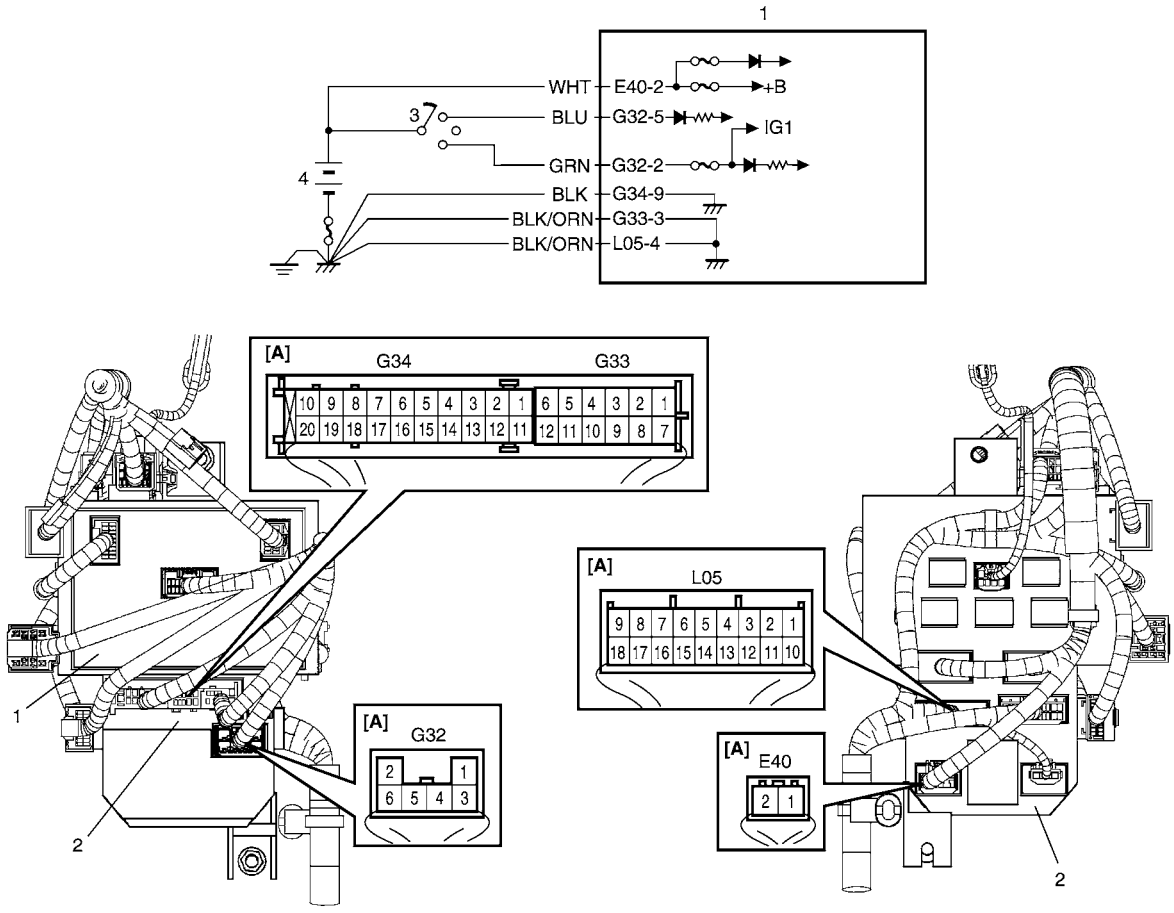
Troubleshooting

Step	Action	Yes	No
1	**Fuse check** 1) Turn ignition switch to OFF position. 2) Check circuit fuses for condition. *Are circuit fuses in good condition?*	Go to Step 2.	Replace fuse and check for short circuit to ground.
2	**Power supply circuit check** 1) Disconnect connectors from junction block assembly. 2) Check for proper connection to junction block assembly connector at terminal “E40-2”. 3) If OK, then measure voltage between “E40-2” terminal of junction block assembly connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 3.	Repair power supply circuit.
3	**Power supply circuit check** 1) Check for proper connection to junction block assembly connector at terminals “G32-2” and “G32-5”. 2) If OK, turn ignition switch ON. 3) Measure voltage between following terminals. • Between “G32-2” terminal of junction block assembly connector and vehicle body ground • Between “G32-5” terminal of junction block assembly connector and vehicle body ground *Is each voltage 10 – 14 V?*	Go to Step 4.	Repair power supply circuit.
4	**Ground circuit check** 1) Turn ignition switch to OFF position. 2) Check for proper connection to junction block assembly connector at terminals “G33-3”, “G34-9” and “L05-4”. 3) If OK, then measure resistance between following terminals. • Between “G33-3” terminal of junction block assembly connector and vehicle body ground • Between “G34-9” terminal of junction block assembly connector and vehicle body ground • Between “L05-4” terminal of junction block assembly connector and vehicle body ground *Is each resistance 2 Ω or less?*	BCM power supply circuit and ground circuit are in good condition.	Repair ground circuit.

DTC B1133 (DTC No.1133): Battery Voltage Too High

S4RS0AA204021

Wiring Diagram



I4RS0AA20008-

[A]: Junction block assembly connector viewed from harness side	3. Ignition switch
1. BCM	4. Battery
2. Junction block assembly	

DTC Detecting Condition and Possible cause

DTC detecting condition	Possible cause
Power voltage supplied from battery to BCM is higher than 16V.	• Charging system malfunction • BCM malfunction

Flow Test Description

Step 1: Check charging system

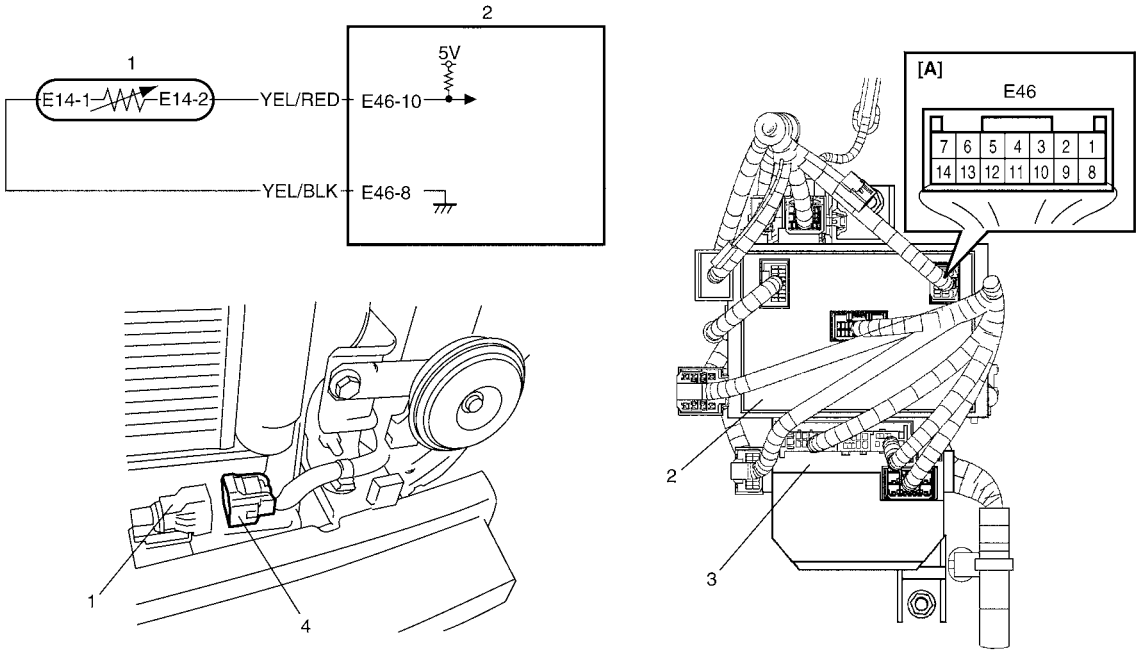
DTC troubleshooting

Step	Action	Yes	No
1	**Charging system operation check** 1) Check generator for operation referring to “Generator Test (Overcharged Battery Check): in Section 1J”. *Is it in good condition?*	Substitute a known good BCM (included in junction block assembly) and recheck.	Repair charging system.

DTC B1141 / DTC B1142 / DTC B1143 (No.1141 / No. 1142/ No. 1143) Outside Air Temperature (Ambient Temp.) Sensor Circuit Malfunction

S4RS0AA204022

Wiring Diagram



I4RS0AA20010-

[A]: BCM connector viewed from harness side	3. Junction block assembly
1. Outside air temperature sensor	4. Outside air temperature sensor connector
2. BCM	

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
DTC B1141 (DTC No. 1141): Input signal from outside air temperature sensor is higher than 4.88 V.	• Open in outside air temperature sensor circuit • Outside air temperature sensor malfunction • BCM malfunction
DTC B1142 (DTC No. 1142): Input signal from outside air temperature sensor is lower than 0.1 V.	• Short in outside air temperature sensor circuit • Outside air temperature sensor malfunction • BCM malfunction
DTC B1143 (DTC No. 1143): Input signal from outside air temperature sensor is 0.1 - 0.27 V or 4.6 - 4.88 V.	• High resistance in outside air temperature sensor circuit • Outside air temperature sensor malfunction • BCM malfunction

Flow Test Description

Step 1: Check whether malfunction is in outside air temperature sensor.
Step 2: Check outside air temperature sensor input circuit.
Step 3: Check outside air temperature sensor ground circuit (for DTC B1141 and B1143).

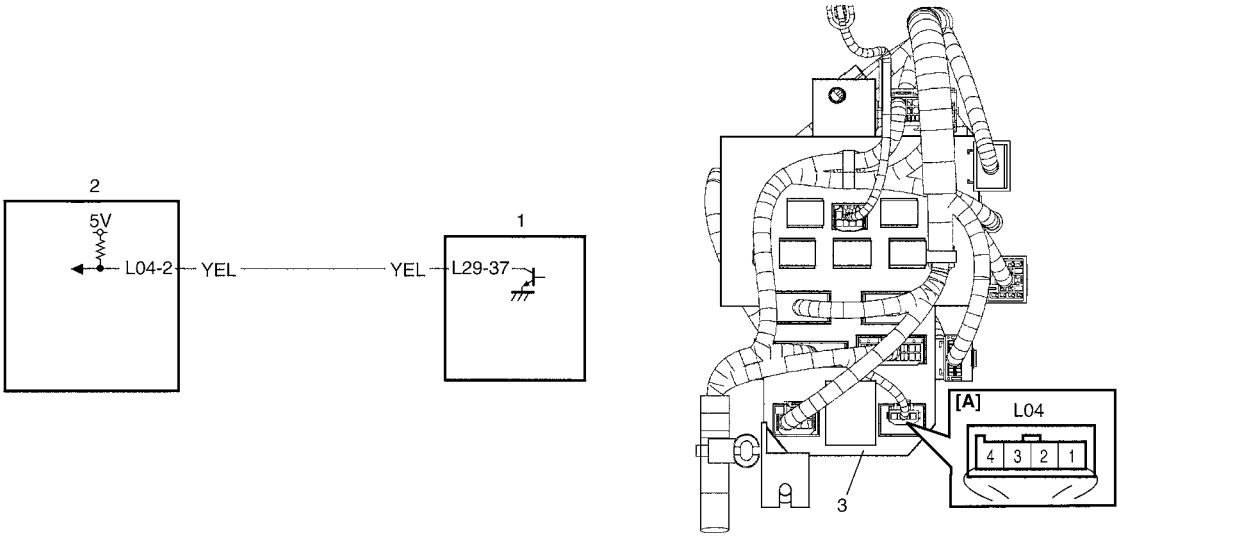
DTC troubleshooting

Step	Action	Yes	No
1	**Check outside air temperature sensor** 1) Turn ignition switch to OFF position. 2) Disconnect connector from outside air temperature sensor. 3) Check outside air temperature sensor for resistance referring to “Outside Air Temperature Sensor Inspection: in Section 9C”. *Is it in good condition?*	Go to Step 2.	Replace outside air temperature sensor.
2	**Check outside air temperature sensor circuit** 1) Turn ignition switch to ON position. 2) Measure voltage between “E14-2” terminal of outside air temperature sensor connector and vehicle body ground. *Is voltage 4 – 6 V?*	Go to Step 3.	Open or short in “YEL/RED” circuit. If OK, substitute a known-good BCM (included in junction block assembly) and recheck.
3	**Check outside air temperature sensor circuit** 1) Turn ignition switch to OFF position. 2) Check for proper connection to “E46-8” terminal of BCM connector. 3) If OK, measure resistance between “E14-1” terminal of outside air temperature sensor connector and vehicle body ground. *Is resistance 1 Ω or less?*	Substitute a known-good BCM (included in junction block assembly) and recheck.	Open or high resistance in “YEL/BLK” circuit.

DTC B1150 (No. 1150): Air Bag Communication Circuit Malfunction

S4RS0AA204014

Wiring Diagram



I4RS0AA20011-

[A]: Junction block assembly connector viewed from harness side	2. BCM
1. SDM	3. Junction block assembly

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
After ignition switch is turned on, abnormal signal is fed from SDM to BCM.	• Air bag communication circuit open or short • SDM malfunction • BCM malfunction

Flow Test Description

Step 1: Check air bag communication circuit.
Step 2: Check air bag communication circuit.
Step 3: Check air bag communication circuit.

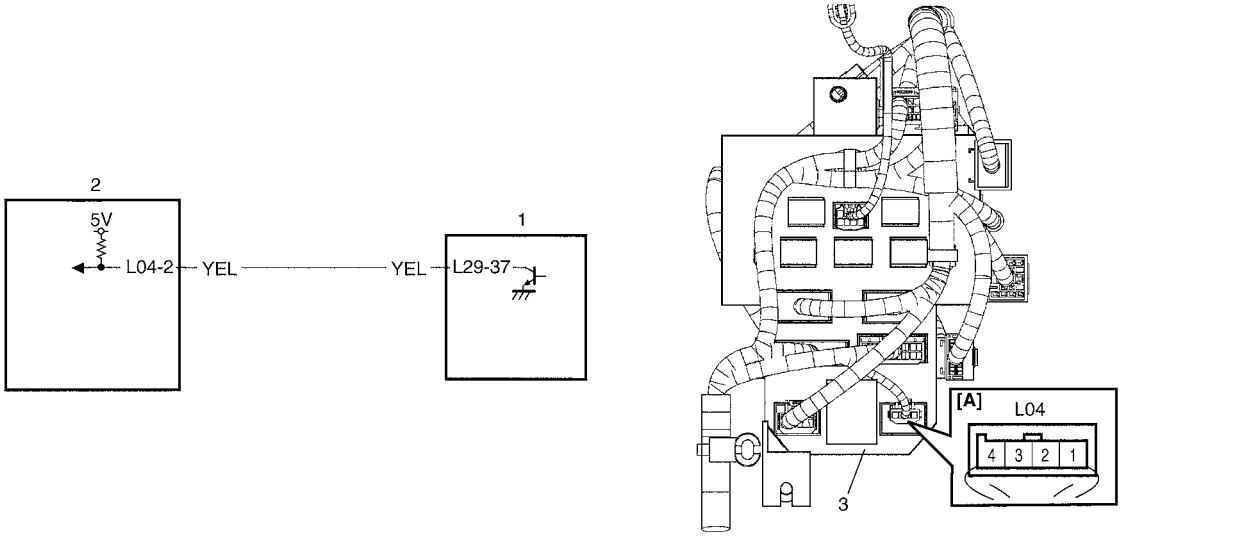
DTC Troubleshooting

Step	Action	Yes	No
1	**Check air bag communication circuit** 1) Turn ignition switch to OFF position. 2) Disconnect connector from SDM referring to “SDM Removal and Installation: in Section 8B”. 3) Disconnect connector from junction block assembly. 4) Turn ignition switch to ON position. 5) Measure voltage between “L29-37” terminal of SDM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 2.	Short to power supply in air bag communication circuit.
2	**Check air bag communication circuit** 1) Turn ignition switch to OFF position. 2) Connect connectors to junction block assembly. 3) Turn ignition switch to ON position. 4) Measure voltage between “L04-2” terminal of junction block assembly connector and vehicle body ground. *Is voltage 4 – 6 V?*	Go to Step 3.	Short to ground in air bag communication circuit. If OK, substitute a known-good BCM (included in junction block assembly) and recheck.
3	**Check air bag communication circuit** 1) Measure voltage between “L29-37” terminal of SDM connector and vehicle body ground. *Is voltage 4 – 6 V?*	Substitute a known-good SDM and recheck.	Open or high resistance in air bag communication circuit.

DTC B1157 (No.1157) Air Bag Deployment Signal Input

S4RS0AA204023

Wiring Diagram



I4RS0AA20012-

[A]: Junction block assembly connector viewed from harness side	2. BCM
1. SDM	3. Junction block assembly

DTC Detecting Condition and Possible cause

DTC detecting condition	Possible cause
Air bag deployment signal is fed from SDM to BCM.	• Air bag component parts • BCM malfunction

Flow Test Description

Step 1: Check DTC for SDM.

DTC troubleshooting

Step	Action	Yes	No
1	**Check DTC for SDM** 1) Check DTC stored in SDM referring to “DTC Check: in Section 8B”. *Is DTC B1021 detected?*	Go to “DTC B1021: Front Air Bag Module Deployed: in Section 8B”.	Substitute a known-good BCM (included in junction block assembly) and recheck.

DTC B1170 (No. 1170): EEPROM access error

S4RS0AA204012

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
Data write error or check sum error.	BCM malfunction

DTC Troubleshooting

NOTE:

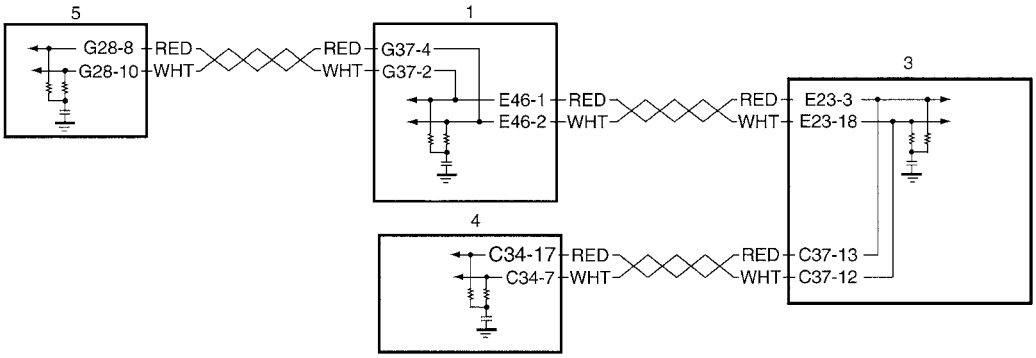
Before performing steps below, be sure to perform “Body Electrical Control System Check: ”.

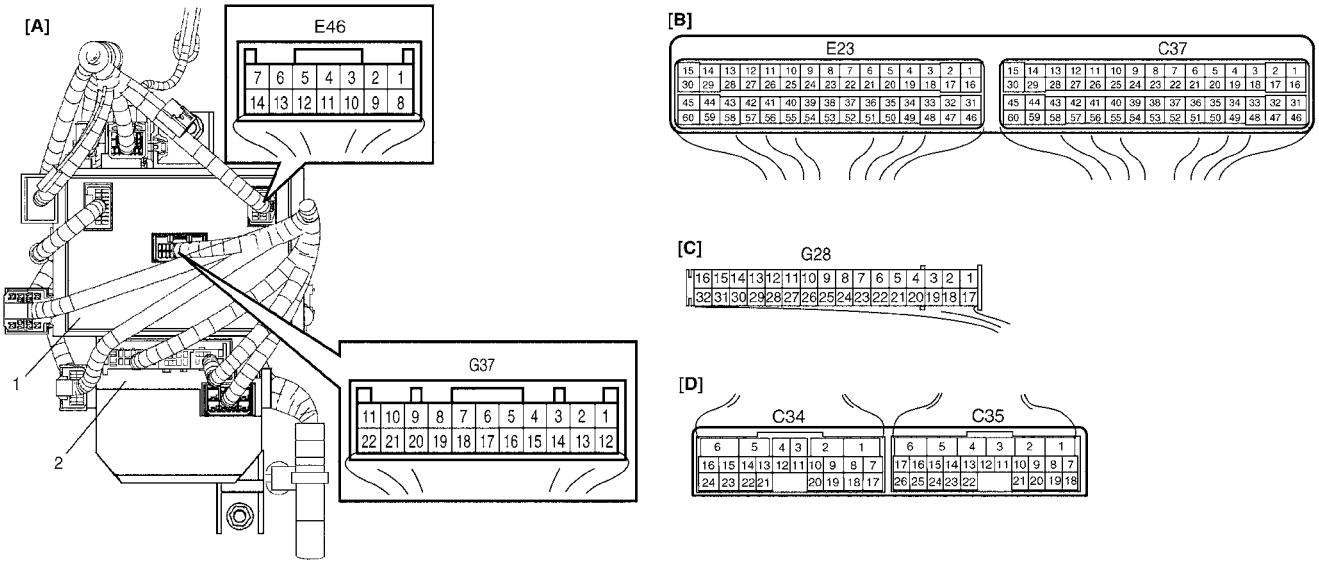
1) Ignition switch OFF.
2) Replace BCM.
3) Repeat BCM Check Flow Table.

DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)

S4RS0AA204024

Wiring Diagram





I4RS0AA20014-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (viewed from harness side)	3. ECM
[B]: ECM connector (viewed from harness side)	1. BCM	4. TCM (equipped with A/T)
[C]: Combination meter connector (viewed from terminal side)	2. Junction block assembly	5. Combination meter

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for BCM is detected for longer than specified time continuously.	• CAN communication circuit • Combination meter • BCM (included in junction block assembly) • TCM • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

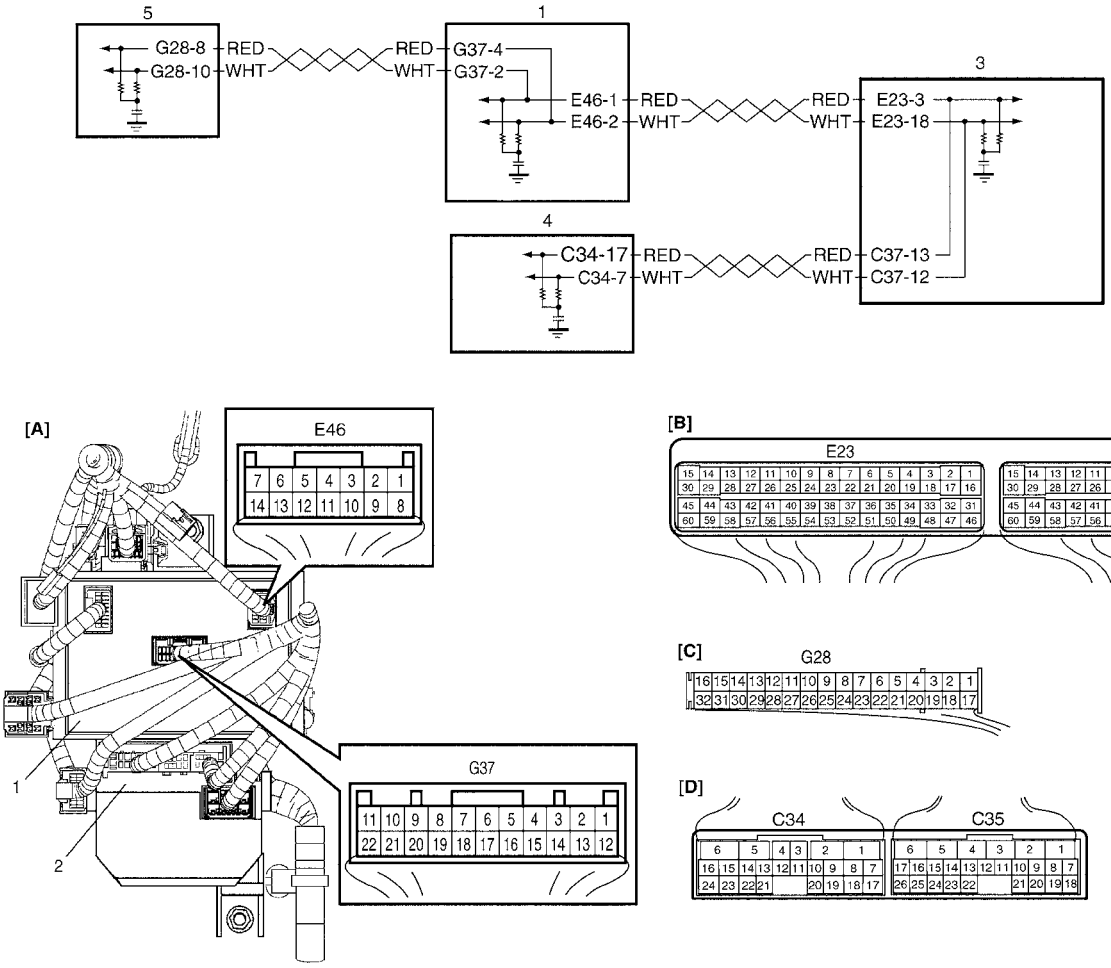
Troubleshooting

Step	Action	Yes	No
1	**Check DTC in BCM** *Is DTC U1001 (No. 1001) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: ".	Go to Step 2.
2	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U1001 (No. 1001) detected?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 4.	Repair circuit.
4	**Check DTC in ECM** 1) Connect connectors to all control modules. 2) Check ECM for DTC. *Is DTC P1676 detected?*	Go to "DTC P1676: CAN Communication (Reception Error for TCM): in Section 1A".	Go to Step 5.
5	**Check DTC in TCM** 1) Check TCM for DTC. *Is DTC P1777 detected?*	Go to "DTC P1777: TCM Lost Communication with ECM (Reception Error): in Section 5A".	Go to Step 6.
6	**Check combination meter for operation** 1) Start engine. 2) Check for operation of tachometer and A/T shift position indicator in combination meter. *Are they in good condition?*	Substitute a known-good BCM (included in junction block assembly) and recheck.	Substitute a known-good combination meter and recheck.

DTC U1073 (No. 1073): Control Module Communication Bus Off

S4RS0AA204025

Wiring Diagram



I4RS0AA20014-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. ECM
[B]: ECM connector (viewed from harness side)	1. BCM	4. TCM (equipped with A/T)
[C]: Combination meter connector (viewed from harness side)	2. Junction block assembly	5. Combination meter

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously. (1 driving detection logic)	• CAN circuit • Combination meter • BCM • TCM • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

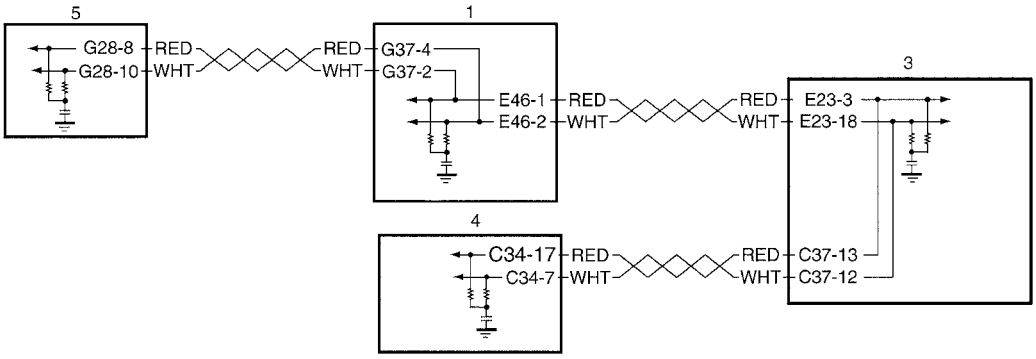
Troubleshooting

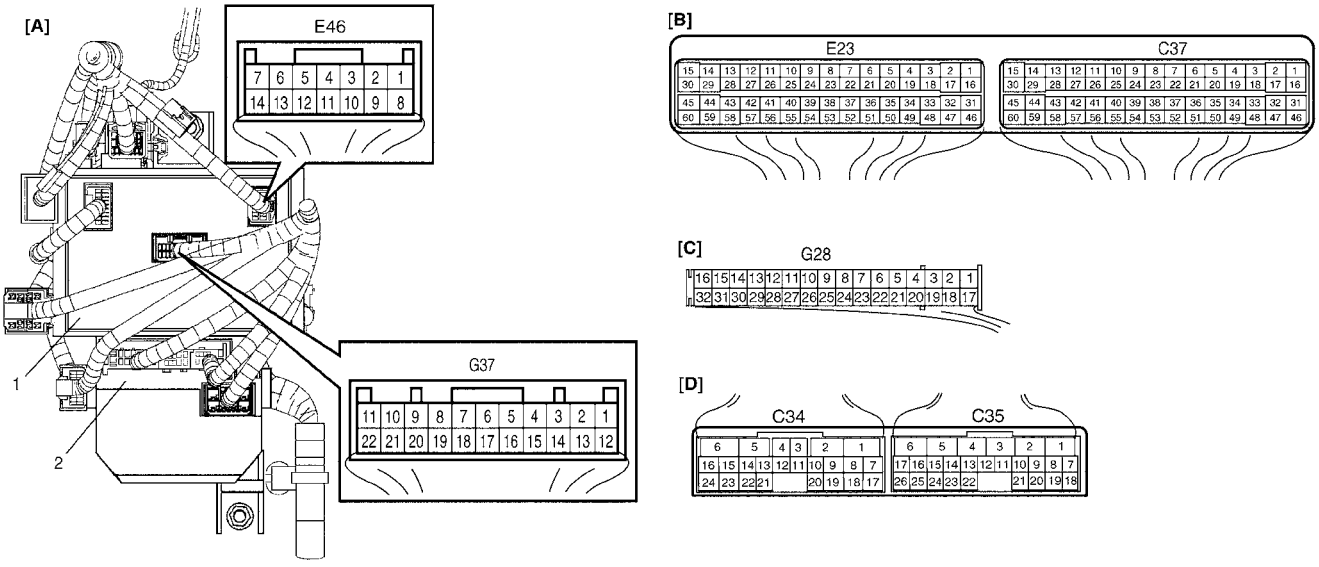
Step	Action	Yes	No
1	**Check each control unit connectors** 1) Check connection of connectors of all control modules (BCM, ECM, TCM (if equipped) and combination meter) communicating by means of CAN. 2) Recheck DTC. *Is DTC U1073 detected?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection: in Section 00”.
2	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 3.	Repair circuit.
3	**Check DTC in BCM** **NOTE:** **If vehicle equipped with M/T, go to Step 4.** 1) Turn ignition switch to OFF position. 2) Connect connectors to combination meter, BCM and ECM. 3) Recheck BCM for DTC. *Is DTC U1073 detected?*	Go to Step 4.	Check TCM power and ground circuit. If circuit is OK, substitute a known-good TCM and recheck.
4	**Check DTC in BCM** 1) Turn ignition switch to OFF position. 2) Connect connectors to combination meter and BCM. 3) Recheck BCM for DTC. *Is DTC U1073 detected?*	Go to Step 5.	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
5	**Check DTC in BCM** 1) Turn ignition switch to OFF position. 2) Disconnect connector from combination meter. 3) Recheck BCM for DTC. *Is DTC U1073 detected?*	Check BCM power and ground circuit. If circuit is OK, substitute a known-good BCM (included in junction block assembly) and recheck.	Check combination meter power and ground circuit. If circuit is OK, substitute a known-good combination meter and recheck.

DTC U1100 (No.1100): Lost communication with ECM

S4RS0AA204026

Wiring Diagram





I4RS0AA20014-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. ECM
[B]: ECM connector (viewed from harness side)	1. BCM	4. TCM (equipped with A/T)
[C]: Combination meter connector (viewed from harness side)	2. Junction block assembly	5. Combination meter

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from ECM for longer than specified time continuously.	• CAN communication circuit • BCM (included in junction block assembly) • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

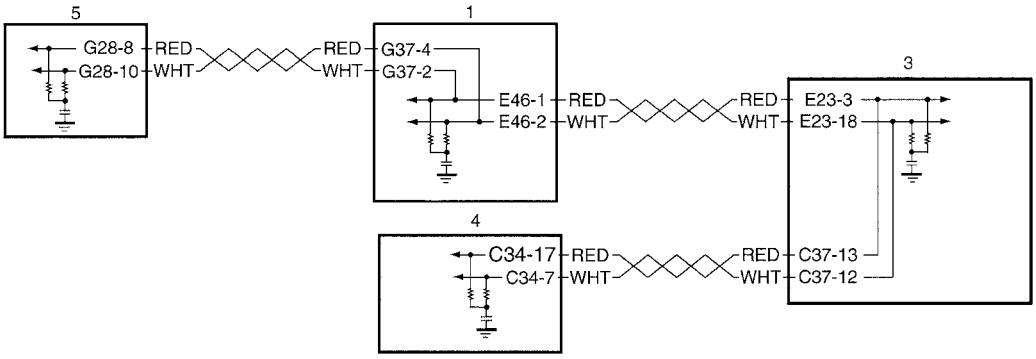
Troubleshooting

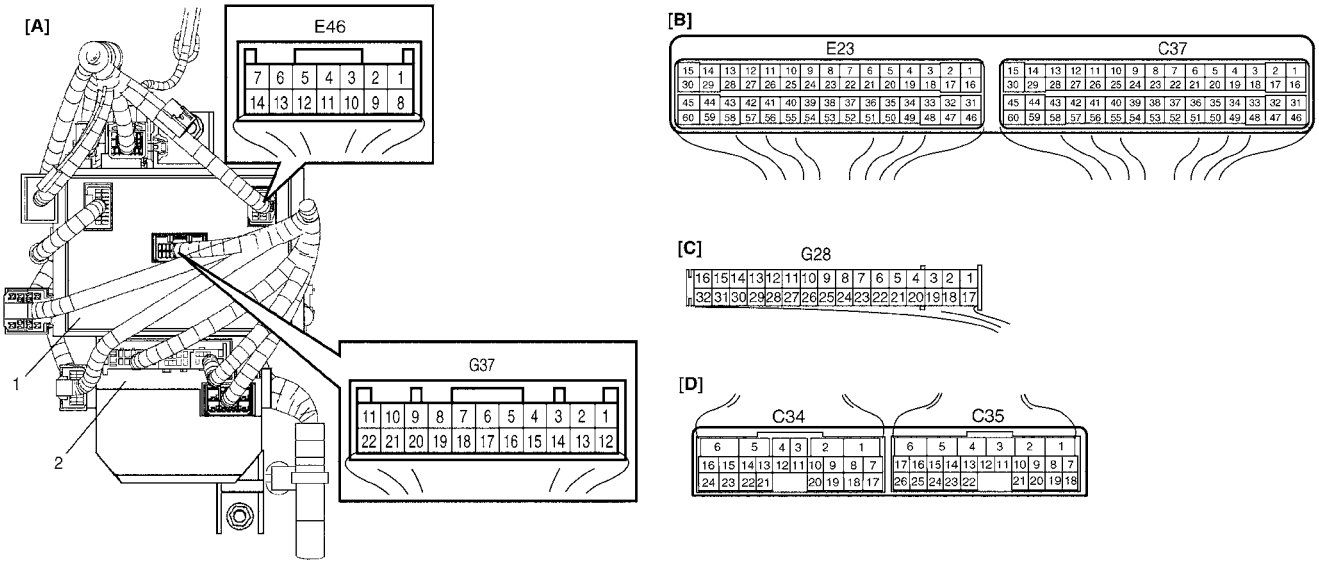
Step	Action	Yes	No
1	**Check DTC in BCM** *Is DTC U1100 (No. 1100) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: ".	Go to Step 2.
2	**Check DTC in ECM** 1) Check ECM for DTC. *Is DTC P1678 detected?*	Go to "DTC P1674: CAN Communication (Bus Off Error): in Section 1A".	Go to Step 3.
3	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U1100 (No. 1100) detected?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
4	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 5.	Repair circuit.
5	**Check DTC in TCM** 1) Connect connectors to all control modules. 2) Check TCM for DTC. *Is DTC P1777 detected?*	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly and recheck.

DTC U1101 (No.1101): Lost communication with TCM

S4RS0AA204027

Wiring Diagram





I4RS0AA20014-

[A]: BCM connector (viewed from harness side)	[D]: TCM connector (equipped with A/T) (viewed from harness side)	3. ECM
[B]: ECM connector (viewed from harness side)	1. BCM	4. TCM (equipped with A/T)
[C]: Combination meter connector (viewed from harness side)	2. Junction block assembly	5. Combination meter

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from TCM for longer than specified time continuously.	• CAN communication circuit • BCM (included in junction block assembly) • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

Troubleshooting

Step	Action	Yes	No
1	**Check DTC in BCM** *Is DTC U1101 (No. 1101) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: ".	Go to Step 2.
2	**Check DTC in TCM** 1) Check TCM for DTC. *Is DTC P1774 detected?*	Go to "DTC P1774: Control Module Communication Bus Off: in Section 5A".	Go to Step 3.
3	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U1101 (No. 1101) detected?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
4	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 5.	Repair circuit.
5	**Check DTC in ECM** 1) Connect connectors to all control modules. 2) Check ECM for DTC. *Is DTC P1676 detected?*	Check TCM power and ground circuit. If circuit is OK, substitute a known-good TCM and recheck.	Substitute a known-good BCM (included in junction block assembly and recheck.

Inspection of BCM and its Circuits

S4RS0AA204013

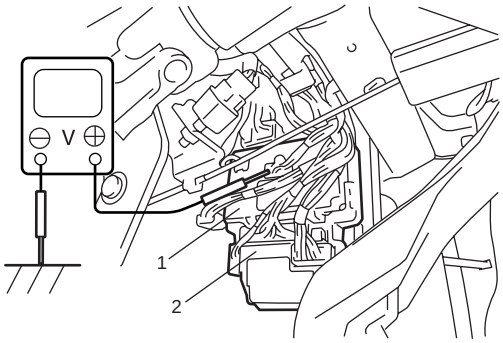
BCM and its circuits can be checked at BCM wiring couplers by measuring voltage and resistance.

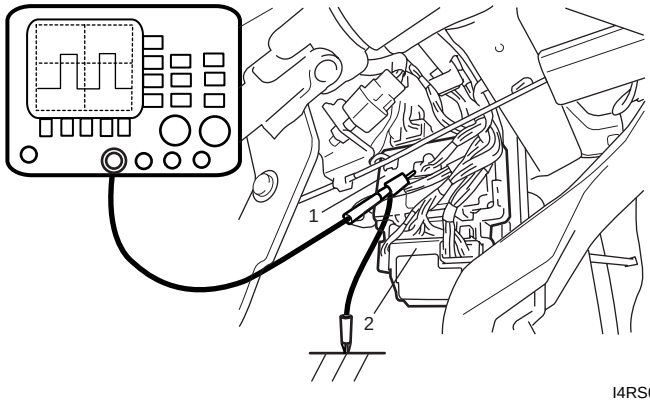
CAUTION:

BCM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to BCM with couplers disconnected from it.

Voltage Check

1) Disconnect negative cable (–) at battery.
2) Remove BCM (included in junction block assembly) referring to "BCM (Included in Junction Block Assembly) Removal and Installation: ".
3) Connect connectors to BCM (1) and junction block assembly (2).
4) Check voltage at each terminal number of couplers connected.
   For connector and terminal number, refer to "Connector Layout Diagram of BCM and Junction Block Assembly: ".





I4RS0AA20030-

NOTE:

- **As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Voltage with asterisk (*) can not be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.**

BCM connector "L01"

Terminal	Wire color	Circuit	Normal voltage	Condition
L01-1	GRN	Passenger side door lock actuator control	10 – 14 V	Unlock signal is output for doorlock actuators other than driver side door lock actuator.
			0 V	Unlock signal is not output for doorlock actuators other than driver side door lock actuator.
L01-2	—	—	—	—
L01-3	BLK/YEL	Rear end door switch	4 – 6 V	Rear end door is closed
			0 V	Rear end door is opened
L01-4	WHT	Rear end door opener switch	4 – 6 V	Rear end door switch is not pushed
			0 V	Rear end door switch is pushed
L01-5	GRY	Manual door lock switch (Unlock)	4 – 6 V	Manual door lock switch is at any position other than unlock position
			0 V	Manual door lock switch is at unlock position
L01-6	RED/BLK	Parking brake switch	*0 – 3 V ↑↓ 10 – 14 V ("Reference waveform No. 1: ")	Ignition switch is at ON position and parking brake lever is released
			0 V	Ignition switch is at ON position and parking brake lever is pulled up
L01-7	GRY/RED	Driver side door switch	10 – 14 V	Driver side door is closed
			0 V	Driver side door is opened
L01-8	LT GRN	"3" position switch	*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No. 2: ")	Ignition switch is at ON position and A/T select lever is at any position other than "2" or "3" position
			0 V	Ignition switch is at ON position and A/T select lever is at "2" or "3" position
L01-9	—	—	—	—
L01-10	GRN/RED	Driver side door lock actuator control	10 – 14 V	Unlock signal is output for driver side door lock actuator.
			0 V	Unlock signal is not output for driver side door lock actuator.

Terminal	Wire color	Circuit	Normal voltage	Condition
L01-11	BLU/YEL	Rear end door actuator motor	0 V	Rear end door actuator motor is not in operation
			10 – 14 V	Rear end door actuator motor is in operation
L01-12	GRY/WHT	Manual door lock switch (Lock)	4 – 6 V	Manual door lock switch is at any position other than lock position
			0 V	Manual door lock switch is at lock position
L01-13	—	—	—	—
L01-14	BRN/YEL	Driver seat belt switch	*0 – 3 V ↑↓ 10 – 14 V (“Reference waveform No. 3: ”)	Ignition switch is at ON position and driver side seat belt is fastened
			0 V	Ignition switch is at ON position and driver side seat belt is unfastened
L01-15	BLK/RED	Door switch (other than driver side door and rear end door)	10 – 14 V	Rear right and left side door and passenger side door are closed
			0 V	Any one of the door is opened (except driver side door and rear end door)
L01-16	LT GRN/ BLK	Driver side door key cylinder switch (Lock)	10 – 14 V	Driver side door key cylinder switch is at any position other than lock position
			0 V	Driver side door key cylinder switch is at lock position
L01-17	BRN	Driver side door key cylinder switch (Unlock)	10 – 14 V	Driver side door key cylinder switch is at any position other than unlock position
			0 V	Driver side door key cylinder switch is at unlock position
L01-18	—	—	—	—

BCM connector “E46”

Terminal	Wire color	Circuit	Normal voltage	Condition
E46-1	RED	CAN communication line (high) for ECM	*2.5 – 3.6 V (“Reference waveform No. 4: ”)	Ignition switch is at ON position
E46-2	WHT	CAN communication line (low) for ECM	*1.6 – 2.5 V (“Reference waveform No. 4: ”)	Ignition switch is at ON position
E46-3	—	—	—	—
E46-4	WHT/BLU	Generator “L” terminal	10 – 14 V	Engine is running
			0 V	Ignition switch is at ON position
E46-5	RED/BLK	Brake fluid level switch	*0 – 3 V ↑↓ 10 – 14 V (“Reference waveform No. 1: ”)	Ignition switch is at ON position, parking brake lever is released and brake fluid level is at specified level
			0 V	Ignition switch is at ON position, parking brake lever is released and brake fluid level is lower than MIN level
E46-6	—	—	—	—
E46-7	—	—	—	—
E46-8	YEL/BLK	Sensor ground for outside air temperature sensor	0 V	—
E46-9	PPL/WHT	Serial communication line of data link connector	10 – 14 V	Ignition switch is at ON position
E46-10	YEL/RED	Outside air temperature sensor	About 1.5 V	Ignition switch is at ON position and outside air temperature approx. 20 °C (68 °F)

Terminal	Wire color	Circuit	Normal voltage	Condition
E46-11	GRY	Oil pressure switch	*3 – 14 V (“Reference waveform No. 5: ”)	Engine is running and oil pressure is in normal condition
			0 V	Ignition switch is at ON position and engine is at stop
E46-12	—	—	—	—
E46-13	—	—	—	—
E46-14	—	—	—	—

BCM connector “G37”

Terminal	Wire color	Circuit	Normal voltage	Condition
G37-1	WHT/BLK	CAN communication line (low) for DLC	*1.6 – 2.5 V (“Reference waveform No. 6: ”)	Ignition switch is at ON position
G37-2	WHT	CAN communication line (low) for combination meter	*1.6 – 2.5 V (“Reference waveform No. 7: ”)	Ignition switch is at ON position
G37-3	RED/BLK	CAN communication line (high) for DLC	*2.5 – 3.6 V (“Reference waveform No. 6: ”)	Ignition switch is at ON position
G37-4	RED	CAN communication line (high) for combination meter	*2.5 – 3.6 V (“Reference waveform No. 7: ”)	Ignition switch is at ON position
G37-5	PPL/WHT	Serial communication line of data link connector for SDM	10 – 14 V	Ignition switch is at ON position
G37-6	—	—	—	—
G37-7	—	—	—	—
G37-8	GRY	Alarm indicator light	10 – 14 V	Alarm indicator light is not lit up
			0 V	Alarm indicator light is lit up
G37-9	—	—	—	—
G37-10	—	—	—	—
G37-11	YEL	Serial communication line for information display	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No. 8: ”)	Ignition switch is at ON position
G37-12	BRN/WHT	Ground for keyless receiver	0 V	—
G37-13	LT GRN	Power supply for keyless receiver	4 – 6 V	Ignition switch is at all positions
G37-14	PNK	Signal for keyless receiver	*0 – 1 V ↑↓ 4 – 6 V (“Reference waveform No. 9: ”)	When pushing lock or unlock button of keyless entry transmitter
G37-15	—	—	—	—
G37-16	BLU/YEL	Key reminder switch	10 – 14 V	Ignition key is inserted to ignition key cylinder
			0 V	Ignition key is pulled out from ignition key cylinder
G37-17	BRN	Rear end door window defogger switch	0 V	Ignition switch is at ON position and rear end door window defogger switch is at ON position
			4 – 6 V	Ignition switch is at ON position and rear end door window defogger switch is at any position other than ON position

Terminal	Wire color	Circuit	Normal voltage	Condition
G37-18	GRY/WHT	A/C switch	*3 – 14 V (“Reference waveform No. 10: ”)	Ignition switch is at ON position and A/C switch is at OFF position
			0 V	Ignition switch is at ON position, blower speed selector is at any position other than OFF position and A/C switch is at ON position
G37-19	—	—	—	—
G37-20	—	—	—	—
G37-21	BLU/BLK	Rear wiper INT switch	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No. 11: ”)	Ignition switch is at ON position and rear wiper switch is at any position other than INT position
			0 V	Ignition switch is at ON position and rear wiper switch is at INT position
G37-22	GRN	Rear wiper low switch	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No. 12: ”)	Ignition switch is at ON position and rear wiper switch is at any position other than LOW position
			0 V	Ignition switch is at ON position and rear wiper switch is at LOW position

Junction block connector “E40”

Terminal	Wire color	Circuit	Normal voltage	Condition
E40-2	WHT	Backup power source	10 – 14 V	Ignition switch is at all positions

Junction block connector “E41”

Terminal	Wire color	Circuit	Normal voltage	Condition
E41-3	GRN	Horn	10 – 14 V	Horn switch is at ON position
			0 V	Horn switch is at OFF position

Junction block connector “G32”

Terminal	Wire color	Circuit	Normal voltage	Condition
G32-2	GRN	Power source (IG)	10 – 14 V	Ignition switch is at ON position
			0 V	Ignition switch is at any position other than ON position
G32-5	BLU	Power source (ACC)	10 – 14 V	Ignition switch is at ACC or ON position
			0 V	Ignition switch is at any position other than ACC or ON position

Junction block connector “G33”

Terminal	Wire color	Circuit	Normal voltage	Condition
G33-3	BLK/ORN	Ground for body electrical controller	0 V	Ignition switch is at all positions
G33-7	BLK/RED	Rear end door window defogger switch indication	10 – 14 V	Engine is running and defogger switch indication is lit up
			0 V	Engine is running and defogger switch indication is not lit up

Junction block connector “G34”

Terminal	Wire color	Circuit	Normal voltage	Condition
G34-3	BLU	Horn switch	10 – 14 V	Horn switch is not pushed
			0 V	Horn switch is pushed
G34-7	RED/YEL	Lighting switch	10 – 14 V	Lighting switch is at any position other than OFF position
			0 V	Lighting switch is at OFF position
G34-9	BLK	Ground for body electrical controller	0 V	Ignition switch is at all positions

Terminal	Wire color	Circuit	Normal voltage	Condition
G34-11	WHT	Hazard switch	10 – 14 V	Hazard switch is at ON position or lock or unlock button of key less entry transmitter (answer back control) is pushed
			0 V	Hazard switch is at OFF position

Junction block connector “K01”

Terminal	Wire color	Circuit	Normal voltage	Condition
K01-5	WHT	Interior light	10 – 14 V	Interior light switch is at DOOR position and interior light is not lit up
			0 V	Interior light switch is at DOOR position and interior light is lit up

Junction block connector “L04”

Terminal	Wire color	Circuit	Normal voltage	Condition
L04-2	YEL	Air bag communication line	*0 – 1 V ↑↓ 4 – 6 V (“Reference waveform No. 13: ”)	Ignition switch is at ON position
L04-3	PPL/WHT	Serial communication line of data link connector for ECM	10 – 14 V	Ignition switch is at ON position

Junction block connector “L05”

Terminal	Wire color	Circuit	Normal voltage	Condition
L05-4	BLK/ORN	Ground for body electrical controller	0 V	Ignition switch is at all positions
L05-5	YEL	Power supply for rear wiper motor	10 – 14 V	Ignition switch is at ON position and rear wiper motor is not in operation
			0 V	Ignition switch is at ON position and rear wiper motor is in operation
L05-8	BLK/RED	Rear end door window defogger wire	10 – 14 V	Engine is running and rear end door window defogger is in operation
			0 V	Engine is running and rear end door window defogger is not in operation
L05-9	ORN	Rear wiper control	10 – 14 V	Ignition switch is at ON position and rear wiper is not in operation
			0 V	Ignition switch is at ON position and rear wiper is in operation

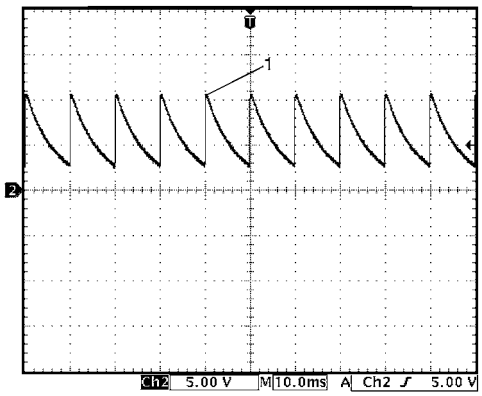
Junction block connector “L06”

Terminal	Wire color	Circuit	Normal voltage	Condition
L06-9	GRN	Rear right and left door lock actuator motor (Unlock)	10 – 14 V	Rear right and left door lock actuator motor is operated (Unlock)
			0 V	Rear right and left door lock actuator motor is not operated
L06-10	RED/BLU	Door lock actuator motor control (Lock)	10 – 14 V	Manual door lock switch is at LOCK position or driver side door key cylinder switch is at LOCK position
			0 V	Manual door lock switch is at any position other than LOCK position or driver side door key cylinder switch is at any position other than LOCK position

Reference waveform No. 1

Parking brake or brake fluid level switch signal (1)

Measurement terminal	Parking brake switch CH2: “L01-6” to “G33-3” Brake fluid level switch CH2: “E46-5” to “G33-3”
Oscilloscope setting	CH1: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Parking brake switch: • Ignition switch is at ON position, parking brake lever is released Brake fluid level switch • Ignition switch is at ON position, brake fluid lever is in normal

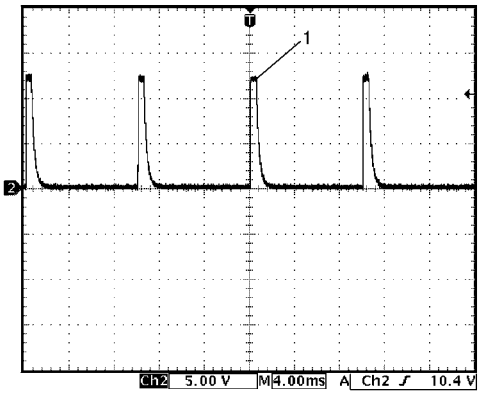


I4RS0AA20018-

Reference waveform No. 2

“3” position switch signal (1) for TCM

Measurement terminal	CH2: “L01-8” to “G33-3”
Oscilloscope setting	CH2: 5 V/DIV TIME: 400 ms/DIV
Measurement condition	Ignition switch is at ON position and A/T selector lever is at any position other than “2” or “3” position

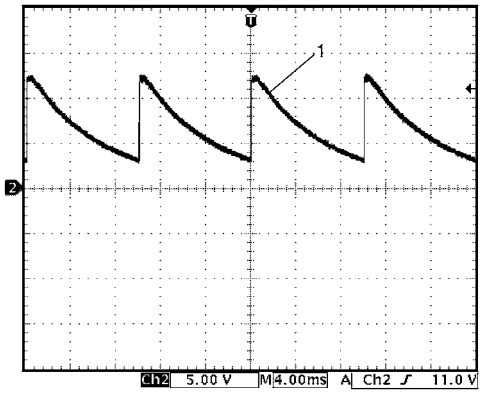


I4RS0AA20015-

Reference waveform No. 3

Driver seat belt switch signal (1)

Measurement terminal	CH2: “L01-14” to “G33-3”
Oscilloscope setting	CH2: 5 V/DIV TIME: 400 ms/DIV
Measurement condition	Ignition switch is at ON position and driver side seat belt is fastened

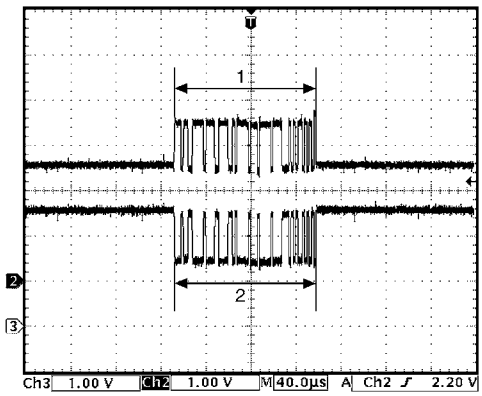


I4RS0AA20016-

Reference waveform No. 4

BCM – ECM CAN communication signal

Measurement terminal	CH2: “E46-1” to “G33-3” CH3: “E46-2” to “G33-3”
Oscilloscope setting	CH2: 1 V/DIV CH3: 1 V/DIV TIME: 40 μs/ DIV
Measurement condition	Ignition switch is at ON position



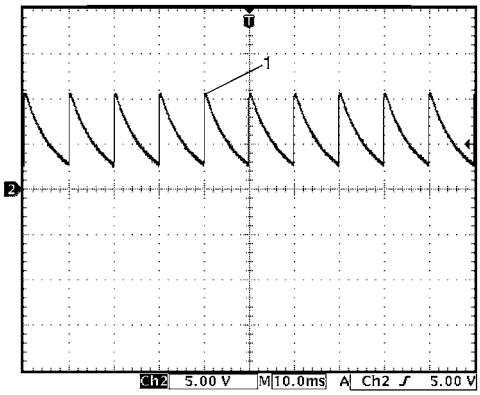
I4RS0AA20017-

1. CAN communication line signal (High)
2. CAN communication line signal (Low)

Reference waveform No. 5

Oil pressure switch signal (1)

Measurement terminal	CH2: “GE46-11” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Engine is running and oil pressure is in normal condition

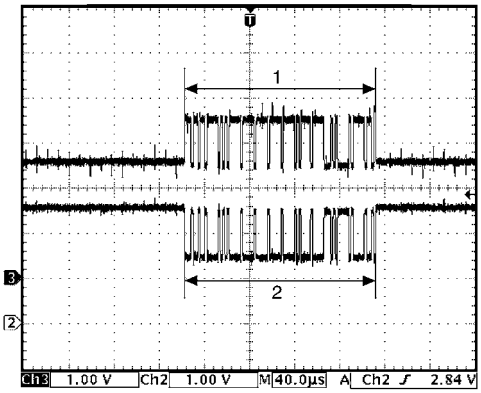


I4RS0AA20018-

Reference waveform No. 6

BCM – DLC CAN communication signal

Measurement terminal	CH2: “G37-1” to “G33-3” CH3: “G37-3” to “G33-3”
Oscilloscope setting	CH2: 1 V / DIV CH3: 1 V / DIV TIME: 40 μs / DIV
Measurement condition	Ignition switch is at ON position



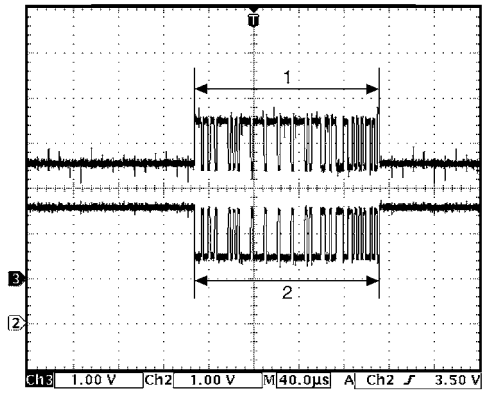
I4RS0AA20019-

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

Reference waveform No. 7

BCM – combination meter CAN communication signal

Measurement terminal	CH2: “G37-2” to “G33-3” CH3: “G37-4” to “G33-3”
Oscilloscope setting	CH2: 1 V / DIV CH3: 1 V / DIV TIME: 40 μs / DIV
Measurement condition	Ignition switch is at ON position



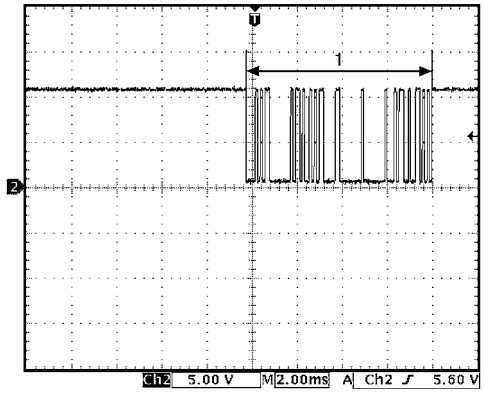
I4RS0AA20020-

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

Reference waveform No. 8

Information display serial communication signal (1)

Measurement terminal	CH2: “G37-11” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position

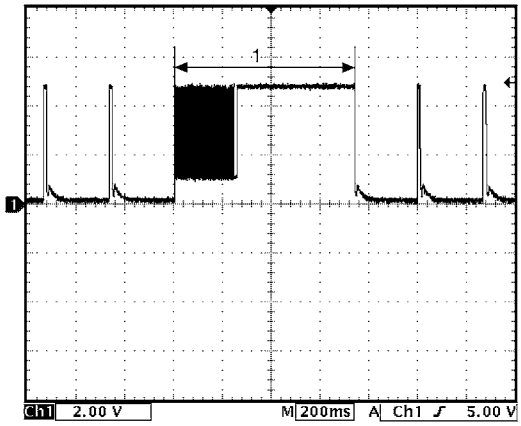


I4RS0AA20021-

Reference waveform No. 9

Keyless entry receiver signal (1)

Measurement terminal	CH2: “G37-14” to “G33-3”
Oscilloscope setting	CH2: 2 V / DIV TIME: 200 ms / DIV
Measurement condition	Lock or unlock button of key less entry transmitter is pushed

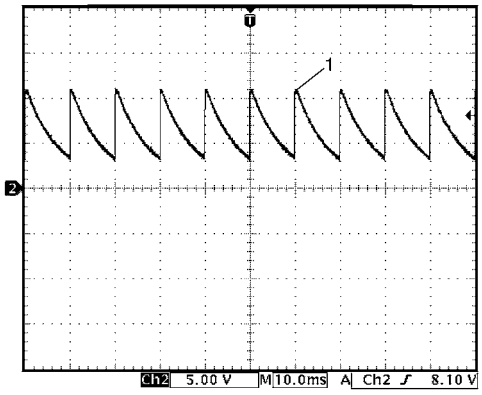


I4RS0AA20022-

Reference waveform No. 10

A/C switch signal (1)

Measurement terminal	CH2: “G37-18” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position and A/C switch is at ON position

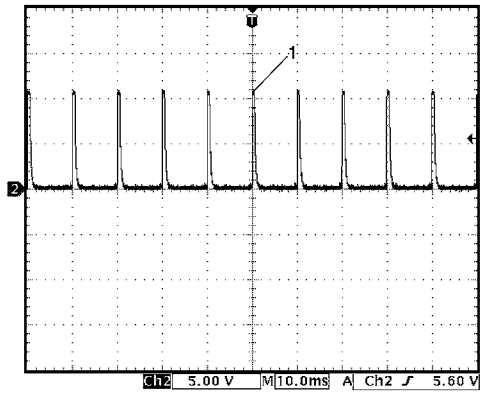


I4RS0AA20023-

Reference waveform No. 11

Rear wiper INT signal (1)

Measurement terminal	CH2: “G37-21” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position and rear wiper switch is at any position other than INT position

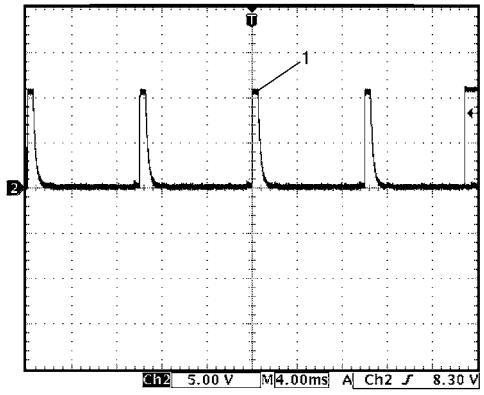


I4RS0AA20024-

Reference waveform No. 12

Rear wiper LOW signal (1)

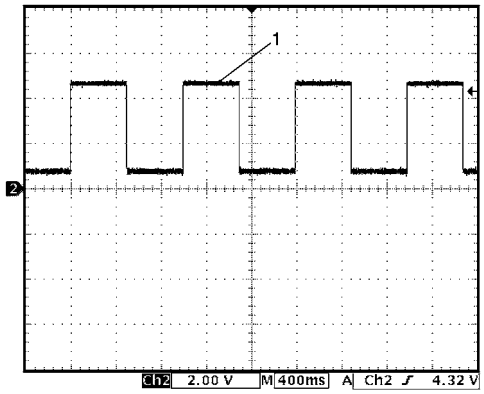
Measurement terminal	CH2: “G37-22” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position and rear wiper switch is at any position other than LOW position



I4RS0AA20025-

Reference waveform No. 13
SDM communication signal (1)

Measurement terminal	CH2: “G37-18” to “G33-3”
Oscilloscope setting	CH2: 2 V / DIV TIME: 400 ms / DIV
Measurement condition	Ignition switch is at ON position



I4RS0AA20026-

Repair Instructions

BCM (Included in Junction Block Assembly) Removal and Installation

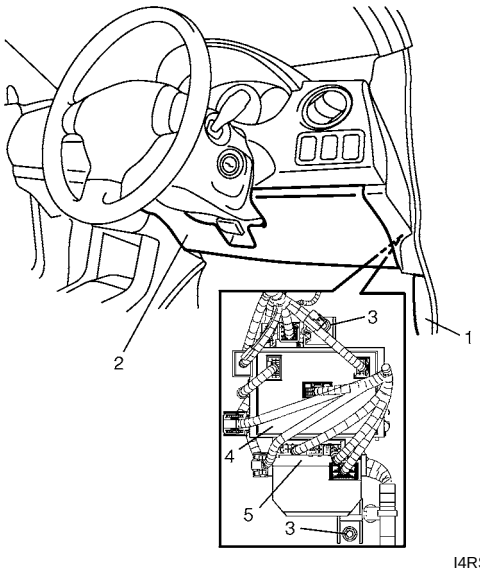
S4RS0AA206001

CAUTION:

Do not attempt removal of BCM from junction block assembly as it may cause contact failure.
If there is faulty condition in BCM, replace junction block assembly.

Removal

1) Disconnect negative cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove dash side trim (1) and steering column hole cover (2).
4) Remove junction block assembly mounting nuts (3).



I4RS0AA20027-

4. BCM
5. Junction block assembly

5) Disconnect connectors from BCM and junction block assembly.
6) Detach wiring harness clamp from junction block assembly.

Installation

Reverse removal procedure for installation, noting following points.

- Connect connectors securely.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.
- If BCM (included in junction block assembly) is replaced with a new one, program transmitter code(s) of keyless entry system, referring to “Programming Transmitter Code: in Section 9F”

Outside Air Temperature Sensor Removal and Installation

S4RS0AA206003

For removal and installation, refer to “Outside Air Temperature Sensor Removal and Installation: in Section 9C”.

Outside Air Temperature Sensor Inspection

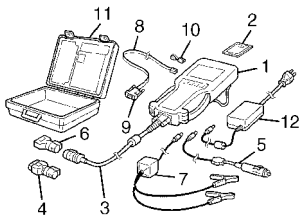
S4RS0AA206002

For inspection, refer to “Outside Air Temperature Sensor Inspection: in Section 9C”.

Special Tools and Equipment

Special Tool

S4RS0AA208001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞		

Immobilizer Control System

Precautions

Precautions in Diagnosing Troubles

S4RS0AA300001

- Before confirming the diagnostic trouble code (DTC), do not disconnect connector from ECM, battery cable from battery, ground wire harness, or main fuse. Such disconnection will erase DTC stored in ECM.
- DTC stored in ECM memory can be checked as well as cleared by using SUZUKI scan tool. Before using SUZUKI scan tool, read its operator's manual carefully to know how to use it and what functions are available.
- Be sure to read "Precautions for Electrical Circuit Service: in Section 00" before inspection.
- Communication of ECM, BCM, and combination meter is established by CAN (Computer Area Network). Therefore, handle CAN communication lines with care referring to "Precaution for CAN Communication System: in Section 00".

Precaution in Replacing ECM

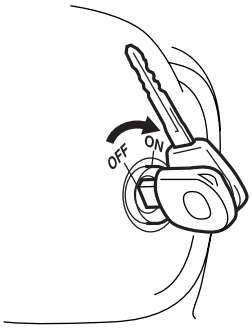
S4RS0AA300003

After ECM is replaced with new one, the transponder code in the transponder built in the ignition key has to be registered with ECM. Or, the engine cannot be started up. For the registration procedure, refer to "Procedure after ECM Replacement: ".

Precautions in Handling Immobilizer Control System

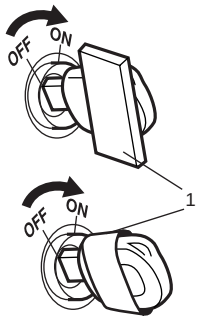
S4RS0AA300002

- Do not turn ON ignition switch with ignition key in contact with another one or quite close to another one. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



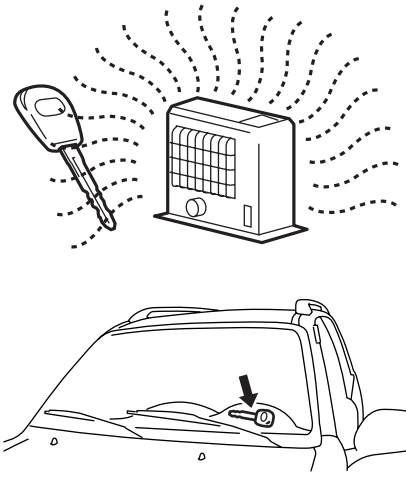
I3RH0AA30001-

- Do not turn ON ignition switch by using ignition key with any type of metal (1) wrapped its grip or in contact with it. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



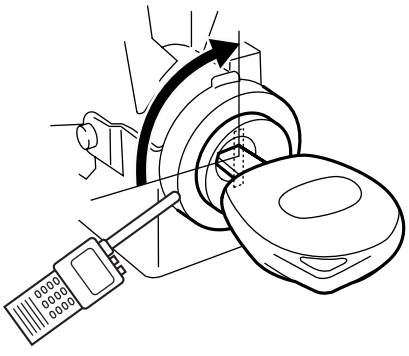
I3RH0AA30002-

- Do not leave ignition key in a place where temperature is high. High temperature may cause damage to the transponder built in the ignition key.



I3RH0AA30003-

- Do not turn ignition switch to ON position by bringing radio antenna close to coil antenna. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



I3RH0AA30004-

General Description

Immobilizer Control System Introduction

S4RS0AA301001

The immobilizer control system is an anti-theft device that immobilizes the vehicle. It stops the engine from working and prevents the vehicle from being stolen. It mainly consists of the following components.

- Engine Control Module (ECM)
- Immobilizer control module with the built-in coil antenna
- Ignition key with the built-in transponder

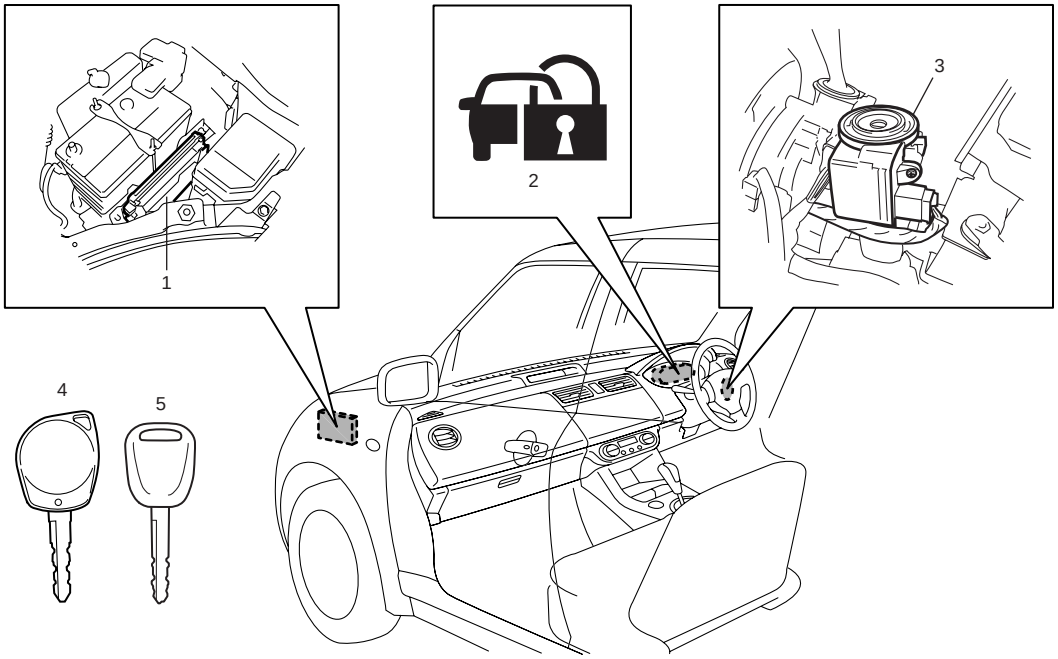
A code called the transponder code is memorized in the transponder. And, the code is registered with ECM. Basically, when the ignition switch is turned ON, ECM reads the code by the coil antenna. Then, if the code in transponder in the ignition key does not match with the one registered with ECM, ECM stops the operation of the fuel injection so as not to start up the engine and turns the immobilizer indicator lamp ON and OFF using CAN communication lines.

NOTE:

The authentication process mentioned above is only a part of the entire authentication process. For security reasons, the detailed explanation is left out.

Immobilizer Control System Components Location

S4RS0AA301004



I4RS0AA30001-

1. ECM	4. Ignition key with keyless entry system
2. Immobilizer indicator lamp	5. Ignition key without keyless entry system
3. Immobilizer control module	

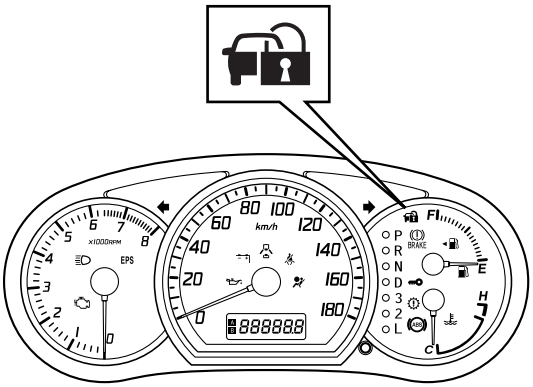
On-Board Diagnostic System Description (Self-diagnosis Function)

S4RS0AA301002

ECM diagnoses if there is any trouble with the immobilizer control system. The diagnostic information is stored as the diagnostic trouble code (DTC) in ECM. To read the diagnostic information, use SUZUKI scan tool referring to “Diagnostic Trouble Code (DTC) Check: ”. With the ignition switch turned ON (but the engine at stop) regardless of the condition of the engine and emission control system, ECM indicates whether there is any trouble with the immobilizer control system or not by either lighting ON or flashing ON and OFF the immobilizer indicator lamp.

Immobilizer indicator lamp lights ON:
No trouble exists in the immobilizer control system. (After starting up the engine, the lamp turns OFF.)

Immobilizer indicator lamp flashes ON and OFF:
There is some trouble with the immobilizer control system. Its diagnostic information is stored in ECM.



I4RS0AA30002-

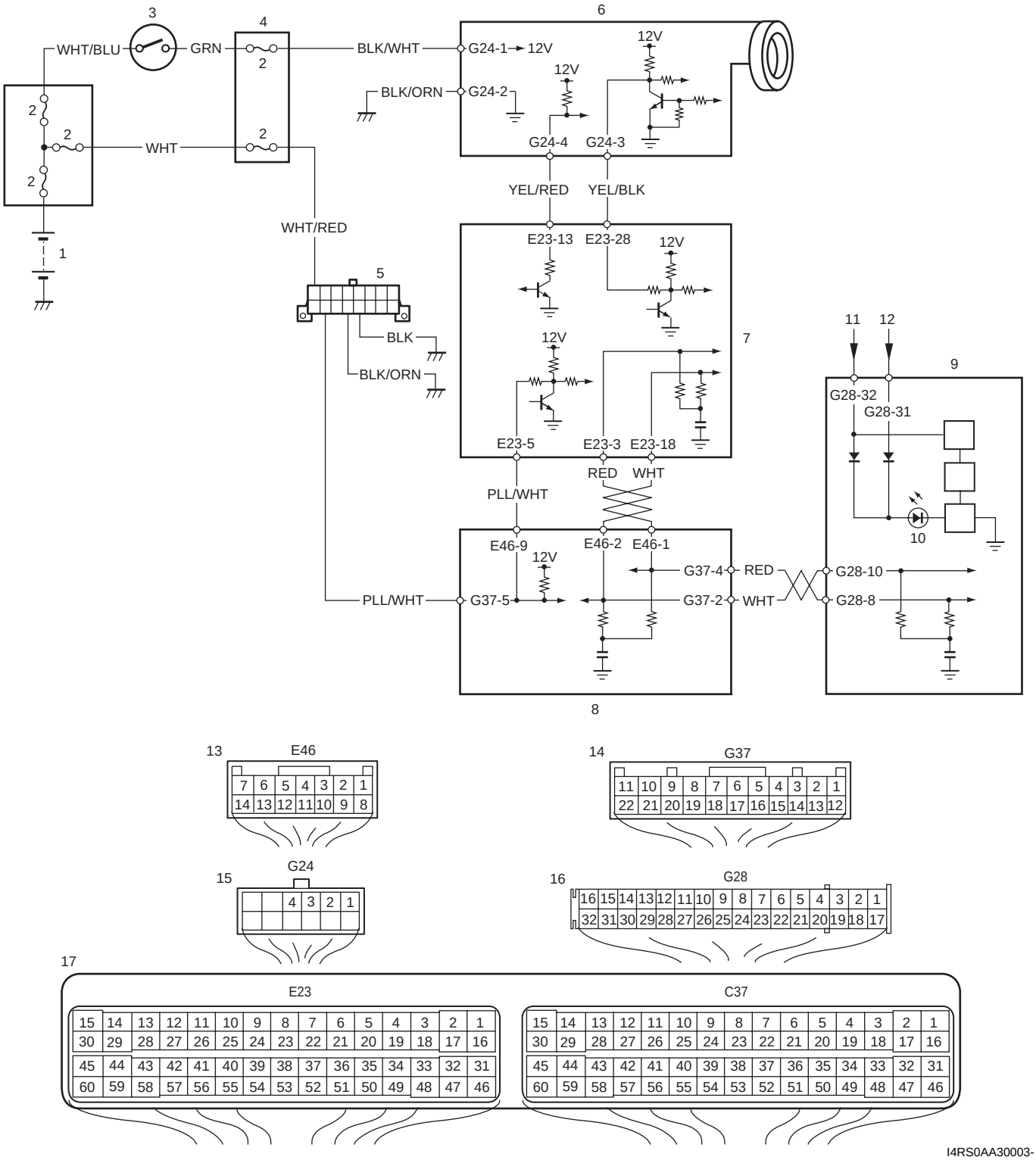
Schematic and Routing Diagram

Immobilizer Control System Wiring Circuit Diagram

S4RS0AA302001

NOTE:

For more details about power supply and ground circuits for ECM, BCM, and combination meter, refer to “System Circuit Diagram: in Section 9A”.



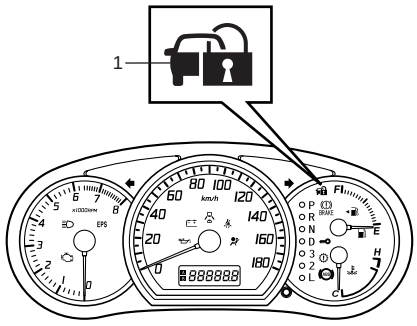
I4RS0AA30003-

1. Battery	7. ECM	13. BCM connector “E46” (harness side view)
2. Fuse	8. BCM	14. BCM connector “G37” (harness side view)
3. Ignition switch	9. Combination meter	15. Immobilizer control module connector “G24” (harness side view)
4. Junction block assembly	10. Immobilizer indicator lamp	16. Combination meter connector “G28” (harness side view)
5. Data link connector (DLC)	11. From “RADIO” fuse	17. ECM connectors “E23” and “C37” (harness side view)
6. Immobilizer control module	12. From “METER” fuse	

Diagnostic Information and Procedures

Immobilizer Control System Check

S4RS0AA304001

Step	Action	Yes	No
1	1) Start the engine. *Is it possible to start the engine?*	Immobilizer control system is in good condition.	Go to Step 2.
2	1) Check behavior of immobilizer indicator lamp (1) by turning the ignition switch to ON position.  I4RS0AA30004- *Does it flash ON and OFF continuously?*	Check what diagnostic trouble code (DTC) is detected by ECM referring to "Diagnostic Trouble Code (DTC) Check: ". Then, perform the troubleshooting referring to the corresponding flowchart in this section.	Perform "Engine and Emission Control System Check: in Section 1A".

Diagnostic Trouble Code (DTC) Check

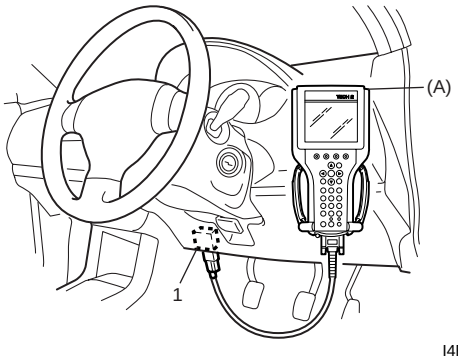
S4RS0AA304002

NOTE:

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

1) Turn the ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0AA30005-

3) Turn the ignition switch to ON position.
4) Check if any DTC is stored in ECM according to the instructions displayed on SUZUKI scan tool.
5) After completing the check, turn ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Diagnostic Trouble Code (DTC) Clearance

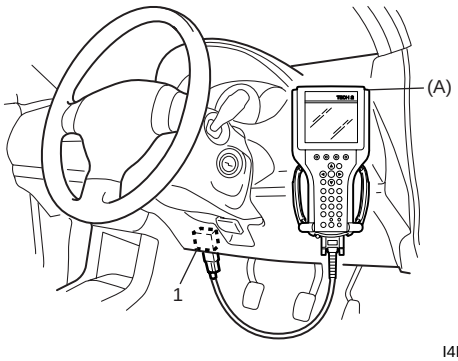
S4RS0AA304027

NOTE:

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

1) Turn the ignition switch to OFF position,
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0AA30005-

1) Turn the ignition switch to ON position.
2) Clear DTC(s) according to the instructions displayed on SUZUKI scan tool.
3) After completing the clearance, turn the ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Diagnostic Trouble Code (DTC) Table

S4RS0AA304003

ECM

DTC No.	Description	Detecting Condition
P1614	Transponder response error	Transponder code in the transponder built in the ignition key cannot be read through immobilizer control module.
P1621	Immobilizer communication line error	Communication error between immobilizer control module and ECM is detected by ECM.
P1622	EEPROM error	EEPROM in ECM is corrupted.
P1623	Unregistered transponder	Transponder code in the transponder built in the ignition key is invalid.
P1625	Immobilizer antenna error	Immobilizer control module is faulty.

NOTE:

If any DTC other than the above DTCs is detected, refer to "DTC Table: in Section 1A".

Scan Tool Data

S4RS0AA304016

The data listed below is the standard data obtained from the normal vehicle by using SUZUKI scan tool. Those are output from ECM. Use them as reference.

Scan Tool Data	Vehicle Condition	Normal Data
NUMBER OF LEARNT KEY	Ignition switch at ON position	2 PCS
INPUT YEAR	Ignition switch at ON position	2004
INPUT MONTH	Ignition switch at ON position	7

NOTE:

The normal data shown above is just an example. Keep in mind that the data varies for each vehicle.

Scan Tool Data Definitions

NUMBER OF LEARNT KEY

0 - 4 PCS: The number of the transponder code in the transponder built in the ignition key that is registered with ECM

NOTE:

A maximum of four transponder codes can be registered with ECM. Therefore, the maximal value should be 4.

INPUT YEAR

20:** The year in which the transponder code in the transponder built in the ignition key is registered with ECM

INPUT MONTH

1 – 12: The month in which the transponder code in the transponder built in the ignition key is registered with ECM

DTC P1614 Transponder Response Error

S4RS0AA304028

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error	• Communication among each component
• Use of the ignition key without the transponder	• Ignition key
• Corruption of the transponder in the ignition key	• Transponder
• Immobilizer control module faulty	• Immobilizer control module
• ECM faulty	• ECM

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) confirmation:** 1) Clear DTC(s) referring to “Diagnostic Trouble Code (DTC) Clearance: ”. 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to “Diagnostic Trouble Code (DTC) Check: ”. *Is DTC P1614 still detected?*	Go to Step 2.	The troubleshooting is completed.
2	**Diagnostic Trouble Code (DTC) check:** 1) Check if any DTC other than P1614 is detected referring to “Diagnostic Trouble Code (DTC) Check: ”. *Is any DTC other than P1614 is detected?*	Perform troubleshooting referring to the corresponding flowchart in this section, and then go to Step 3.	Go to Step 3.
3	**Registration of the new ignition key with ECM and Diagnostic Trouble Code (DTC) check:** 1) The transponder in the ignition key is corrupted or the ignition key without the transponder is used. Therefore, prepare the new ignition key. 2) Register the transponder code in the transponder in the new ignition key with ECM referring to “Registration of the Ignition Key: ”. 3) Make sure that DTC P1614 is not detected referring to “Diagnostic Trouble Code (DTC) Check: ”. *Is DTC P1614 still detected?*	Go to Step 4.	The troubleshooting is completed.
4	**Check for fault of immobilizer control module:** 1) Check immobilizer control module referring to “Inspection of Immobilizer Control Module and Its Circuit: ”. *Is immobilizer control module normal?*	Replace ECM with new one referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”, and then perform “Procedure after ECM Replacement: ”.	Replace immobilizer control module with new one referring to “Immobilizer Control Module Removal and Installation: ”.

DTC P1621 Immobilizer Communication Line Error

S4RS0AA304029

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error • Related fuse(s) blown • Poor connection at immobilizer control module connector • "BLK/WHT" wire open • "BLK/ORN" wire open • "YEL/BLK" wire open, short to ground circuit, short to power circuit, or shorted to "YEL/RED" wire • "YEL/RED" wire open, short to ground circuit, short to power circuit, or shorted to "YEL/BLK" wire • Immobilizer control module faulty • ECM faulty	• Related fuse(s) • Connection at immobilizer control module • "BLK/WHT" wire • "BLK/ORN" wire • "YEL/BLK" wire • "YEL/RED" wire • Immobilizer control module • ECM

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) confirmation:** 1) Clear DTC(s) referring to "Diagnostic Trouble Code (DTC) Clearance: ". 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1621 still detected?*	Go to Step 2.	The troubleshooting is completed.
2	**Fuse check:** 1) Check if any related fuse is blown. *Is any fuse blown?*	Replace blown fuse(s) with new one (s).	Go to Step 3.
3	**Check for poor connection at immobilizer control module:** 1) Disconnect immobilizer control module connector "G24" referring to "Immobilizer Control Module Removal and Installation: ". 2) Check if wire connections are normal at immobilizer assembly connector "G24". *Is each wire connection normal?*	Go to Step 4.	Repair poor connection(s).
4	**Check for poor connection at ECM:** 1) Disconnect ECM connector "E23" referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C". 2) Check if wire connections at "E23-13" and "E23-28" wire terminals are normal. *Is each wire connection normal?*	Go to Step 5.	Repair poor connection(s).
5	**Check for open in "BLK/WHT" wire:** 1) Connect immobilizer control module connector "G24" referring to "Immobilizer Control Module Removal and Installation: ". 2) With the ignition switch at ON position, check voltage between "G24-1" wire terminal at immobilizer control module and body ground. *Is voltage about 12 V?*	Go to Step 6.	Repair open in "BLK/WHT" wire.

Step	Action	Yes	No
6	**Check for open in "BLK/ORN" wire:** 1) With the ignition switch at ON position, check voltage between "G24-2" wire terminal at immobilizer control module and body ground. *Is voltage 0?*	Go to Step 7.	Repair open in "BLK/ ORN" wire.
7	**Check for open in "YEL/BLK" wire:** 1) Disconnect immobilizer control module connector "G24" referring to "Immobilizer Control Module Removal and Installation: ". 2) Disconnect ECM connector "E23" referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C". 3) Check resistance between "G24-3" wire terminal at immobilizer control module connector and "E23-28" wire terminal at ECM connector. *Is resistance infinite?*	Repair open in "YEL/ BLK" wire.	Go to Step 8.
8	**Check for short to ground circuit in "YEL/BLK" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, check resistance between "G24-3" wire terminal at immobilizer control module connector and body ground. *Is resistance infinite?*	Go to Step 9.	Repair short to ground circuit in "YEL/BLK" wire.
9	**Check for short to power circuit in "YEL/BLK" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, turn the ignition switch to ON position. 2) Check voltage between "G24-3" wire terminal at immobilizer control module connector and body ground. *Is voltage 0 V?*	Go to Step 10.	Repair short to power circuit in "YEL/BLK" wire.
10	**Check for open in "YEL/RED" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, check resistance between "G24-4" wire terminal at immobilizer control module connector and "E23-13" wire terminal at ECM connector. *Is resistance infinite?*	Repair open in "YEL/ RED" wire.	Go to Step 11.
11	**Check for short to ground circuit in "YEL/RED" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, check resistance between "G24-4" wire terminal at immobilizer control module connector and body ground. *Is resistance infinite?*	Go to Step 12.	Repair short to ground circuit in "YEL/RED" wire.
12	**Check for short to power circuit in "YEL/RED" wire:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, turn the ignition switch to ON position. 2) Check voltage between "G24-4" wire terminal at immobilizer control module connector and body ground. *Is voltage 0 V?*	Go to Step 13.	Repair short to power circuit in "YEL/RED" wire.

Step	Action	Yes	No
13	**Check for short of "YEL/BLK" and "YEL/RED" wires:** 1) With immobilizer control module connector "G24" and ECM connector "E23" disconnected, check resistance between "G24-3" wire terminal and "G24-4" wire terminal at immobilizer control module connector. *Is resistance infinite?*	Go to Step 14.	Repair short of "YEL/BLK" and "YEL/RED" wires.
14	**Check for fault of immobilizer control module:** 1) Check immobilizer control module referring to "Inspection of Immobilizer Control Module and Its Circuit: ". *Is immobilizer control module normal?*	Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C", and then perform "Procedure after ECM Replacement: ".	Replace immobilizer control module with new one referring to "Immobilizer Control Module Removal and Installation: ".

DTC P1622 EEPROM Error

S4RS0AA304030

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error • Internal failure (EEPROM corruption) of ECM	ECM

Troubleshooting

1) Clear DTC(s) referring to "Diagnostic Trouble Code (DTC) Clearance: ".
2) Turn the ignition switch to OFF position.
3) Check if DTC P1622 is still detected referring to "Diagnostic Trouble Code (DTC) Check: ". If still detected, go to the next step. If not, the troubleshooting is completed.
4) Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C".
5) Perform "Procedure after ECM Replacement: ".

DTC P1623 Unregistered Transponder

S4RS0AA304031

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error • Use of the unregistered ignition key • Immobilizer control module faulty • ECM faulty	• Transponder in the ignition key • Immobilizer control module • ECM

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) confirmation:** 1) Clear DTC(s) referring to "Diagnostic Trouble Code (DTC) Clearance: ". 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1623 still detected?*	Go to Step 2.	The troubleshooting is completed.
2	**Diagnostic Trouble Code (DTC) check:** 1) Check if any DTC other than P1623 is detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is any DTC other than P1623 is detected?*	Perform troubleshooting referring to the corresponding flowchart in this section, and then go to Step 3.	Go to Step 3.

Step	Action	Yes	No
3	**Registration of the unregistered ignition key with ECM and Diagnostic Trouble Code (DTC) check:** 1) Register the transponder code in the transponder in the unregistered ignition key with ECM referring to "Registration of the Ignition Key: ". 2) Make sure that DTC P1623 is not detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1623 still detected?*	Go to Step 4.	The troubleshooting is completed.
4	**Check for fault of immobilizer control module:** 1) Check immobilizer control module referring to "Inspection of Immobilizer Control Module and Its Circuit: ". *Is immobilizer control module normal?*	Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C", and then perform "Procedure after ECM Replacement: ".	Replace immobilizer control module with new one referring to "Immobilizer Control Module Removal and Installation: ".

DTC P1625 Immobilizer Antenna Error

S4RS0AA304032

Possible Cause and Trouble Area

Possible Cause	Trouble Area
• Temporary error	• Immobilizer control module
• Immobilizer control module faulty	• ECM
• ECM faulty	

Troubleshooting

Step	Action	Yes	No
1	**Diagnostic Trouble Code (DTC) confirmation:** 1) Clear DTC(s) referring to "Diagnostic Trouble Code (DTC) Clearance: ". 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1625 still detected?*	Go to Step 2.	The troubleshooting is completed.
2	**Immobilizer control module replacement and Diagnostic Trouble Code (DTC) check:** 1) Replace immobilizer control module referring to "Immobilizer Control Module Removal and Installation: ". 2) Check if DTC P1625 is still detected referring to "Diagnostic Trouble Code (DTC) Check: ". *Is DTC P1625 still detected?*	Replace ECM with new one referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C", and then perform "Procedure after ECM Replacement: ".	The troubleshooting is completed.

Inspection of Immobilizer Control Module and Its Circuit

S4RS0AA304015

Immobilizer control module and its circuit can be checked at immobilizer control module wiring connector by measuring voltage.

CAUTION:

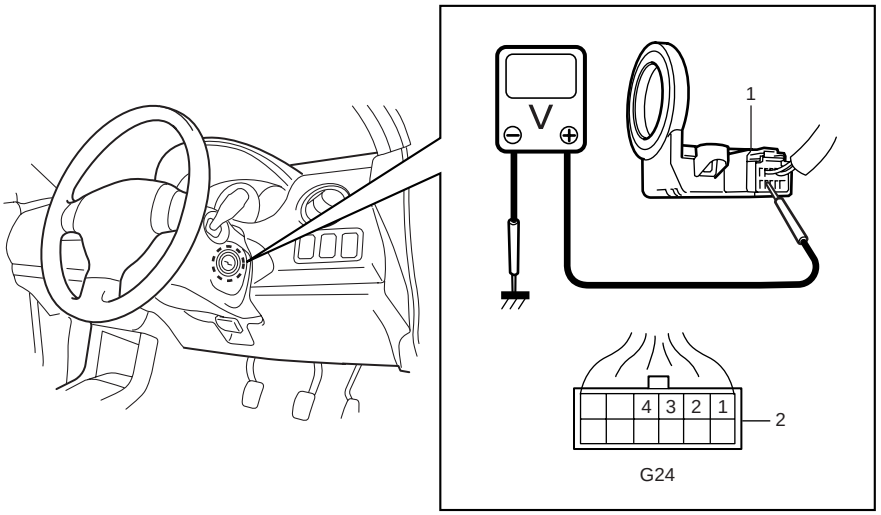
Immobilizer control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to immobilizer control module with connector disconnected from it.

Voltage Check

1) Remove immobilizer control module (1) from steering lock assembly referring to “Immobilizer Control Module Removal and Installation: ”.
2) Connect immobilizer control module wiring connector (2) to immobilizer control module.
3) Check voltage at each terminal.

NOTE:

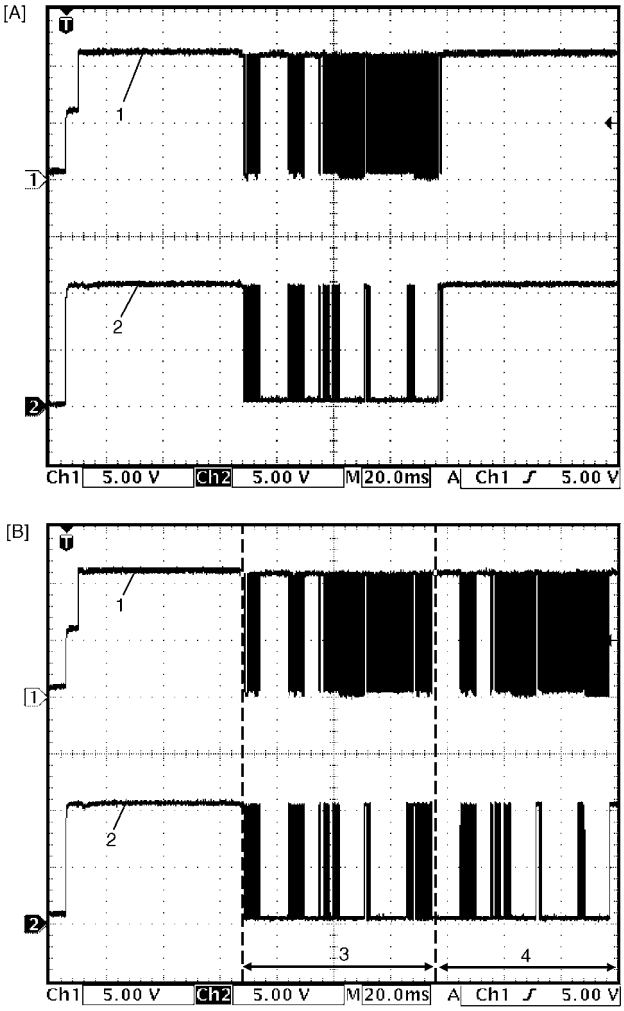
As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when the ignition switch is turned to ON position.



I4RS0AA30006-

Connector	Terminal		Circuit	Normal Voltage	Condition
G24	1	BLK/ WHT	Power supply	About 12.0 V	Ignition switch at ON position
				0.0 V	Ignition switch at OFF position
	2	BLK/ ORG	Ground	0.0 V	Ignition switch at ON position
				0.0 V	Ignition switch at OFF position
	3	YEL/ BLK	Serial communication line	See the reference waveform.	—
				0.0 V	Ignition switch at OFF position
	4	YEL/ RED	Clock line	See the reference waveform.	—
				0.0 V	Ignition switch at OFF position

Reference waveform



I4RS0AA30007-

[A]:	The transponder code read successfully at the first try.
[B]:	The transponder code read successfully at the second try.
1.	Serial communication line
2.	Clock line
3.	First try
4.	Second try

NOTE:

When ECM cannot read the transponder code at the first try, ECM tries to read the transponder code repeatedly up to 8 times. The second waveform is the example showing that ECM read the transponder code successfully at the second try.

Measurement terminals	CH1: G24-3 to G24-2 CH2: G24-4 to G24-2
Oscilloscope settings	CH1: 5 V/DIV CH2: 5 V/DIV TIME: 20 ms
Measurement condition	Right after the ignition switch is turned ON, the waveform can be read.

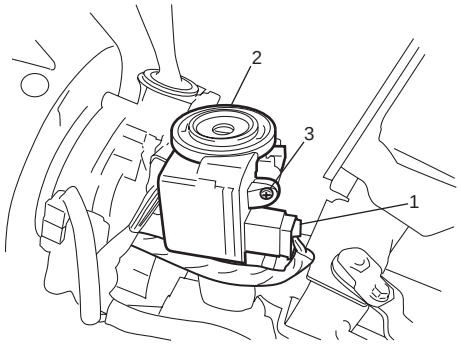
Repair Instructions

Immobilizer Control Module Removal and Installation

S4RS0AA306005

Removal

1) Disconnect negative (-) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
3) Remove driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
4) Remove steering wheel referring to “Steering Wheel Removal and Installation: in Section 6B”.
5) Remove steering column lower and upper covers.
6) Disconnect connector (1) from immobilizer control module (2).
7) Remove a screw (3) from immobilizer control module.



I4RS0AA30008-

8) Remove immobilizer control module from steering lock assembly.

Installation

Reverse the removal procedure.

Registration of the Ignition Key

S4RS0AA306002

To finish the registration of the ignition key, the transponder code memorized in the transponder built in the ignition key has to be registered with ECM. To register the transponder code with ECM, perform “Register Ig Key” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator’s Manual”.

NOTE:

- **A maximum of four transponder codes can be registered with ECM.**
- **At an early part of the registration process, all transponder codes of the ignition keys in use already registered with ECM are cleared. Therefore, before starting the registration, prepare all ignition keys in use in addition to the new ignition key(s) to be registered with ECM.**

Procedure after ECM Replacement

S4RS0AA306004

After ECM is replaced with new one, the transponder code in the transponder built in the ignition key has to be registered with ECM. To register transponder code in the ignition key with ECM, perform “Replace New ECM” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator’s Manual”.

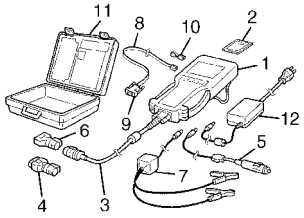
NOTE:

A maximum of four transponder codes can be registered with ECM.

Special Tools and Equipment

Special Tool

S4RS0AA308001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12. Power supply ☞ / ☞		

Prepared by

SUZUKI MOTOR CORPORATION

1st Ed. Dec., 2004

21 mm

SUZUKI SWIFT

SUZUKI

SUZUKI MOTOR CORPORATION

SWIFT

VOL.

SERVICE MANUAL

99500-63J00-24E

SERVICE MANUAL

RS415

VOLUME 1 OF 2

SUZUKI
Caring for Customers

99500-63J00-24E
（英）

29 mm

SUZUKI SWIFT

SUZUKI

SUZUKI MOTOR CORPORATION

VOL.

SWIFT

2 OF 2

SERVICE MANUAL

99500-63J00-24E

SERVICE MANUAL

RS415

VOLUME 2 OF 2

SUZUKI
Caring for Customers

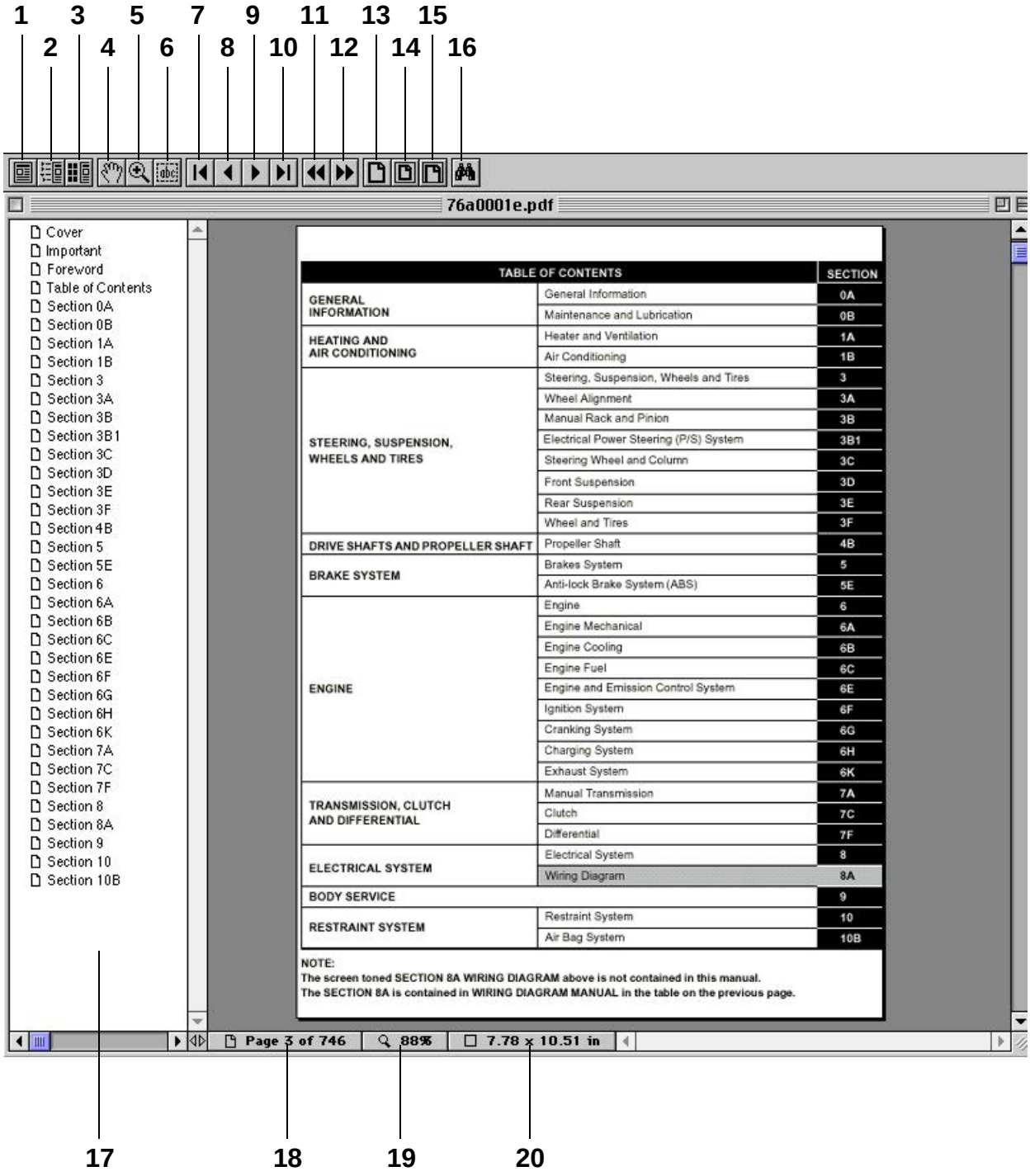
99500-63J00-24E
（英）

OPERATING INSTRUCTION

CONTENTS

ACROBAT READER SCREEN DISPLAY
HOW TO READ MANUAL DATA

ACROBAT READER SCREEN DISPLAY

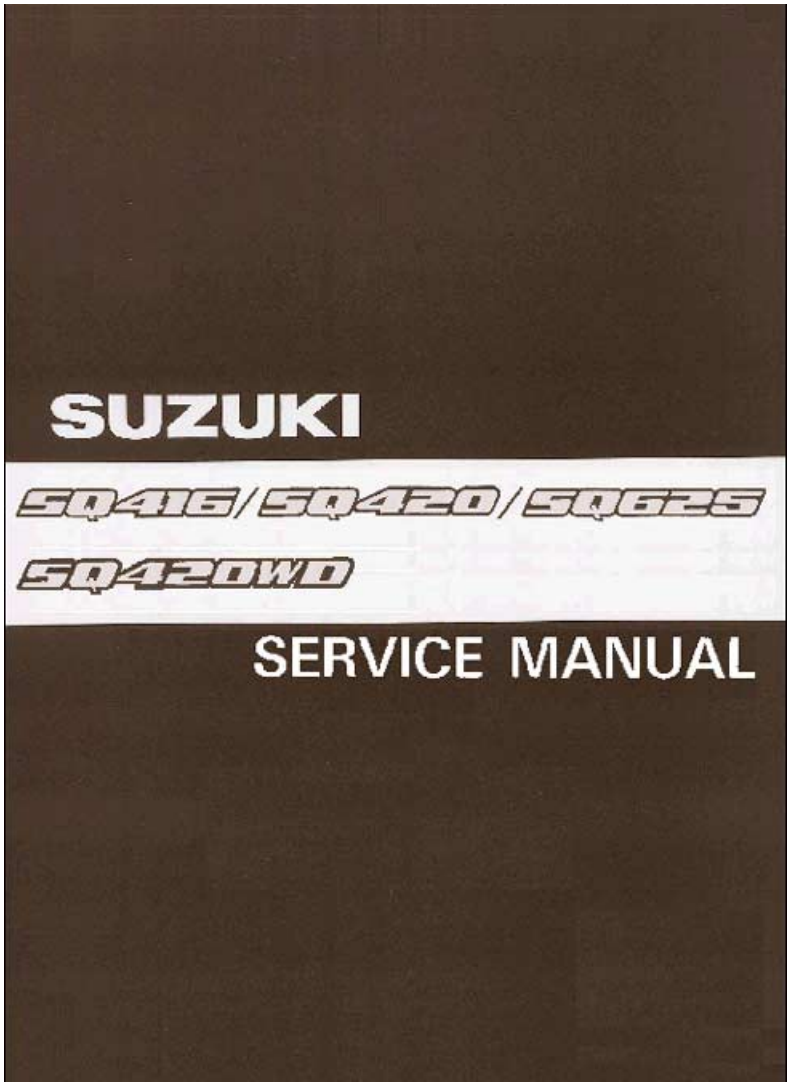


1	Page only display	Only a page is displayed on the entire screen.
2	Bookmark and page display	A bookmark is displayed in the left of the screen and a page in the right.
3	Thumbnails and page display	Thumbnails are displayed in the left of the screen and a page in the right.
4	Hand	With the button clicked in advance, move the pointer to the position where the link can be used, and the pointer will change. Clicking there will make the page to be linked be displayed.
5	Zoom In / Zoom Out	Click where you want to have magnified. For size reduction, click while pressing the “Option” for Mac-intosh and “Ctrl” for Windows.
6	Select Text	You can select the text. (The text can be selected on the other application program by using the copy & paste functions. If you want to use graphics, select “Select Graphics” in the “Tools” menu. It enables you to edit easily on the other application program by specifying the range for movement and using copy and paste functions.)
7	First page display	The first page is displayed.
8	Previous page display	The page immediately before is displayed. The [↑] and [←] key has the same function.
9	Next page display	The page immediately after is displayed. The [↓] and [→] key has the same function.
10	Last page display	The last page is displayed.
11	Go Back	The page which was on display before the current one is displayed.
12	Go Forward	The pages after the one displayed by “Go Back” are displayed.
13	Actual size display	The display scale is set at 100%.
14	Fit page	The scale is set so that the entire screen is used for display.
15	Fit width	The scale is set so that the width of the screen is used fully for display.
16	Find	Enter the word you want to retrieve in “Find What: ” and click on the “Find” button. Then the retrieved character will be highlighted. To repeat the retrieve function, press “Command” and “G” keys for Macin-tosh and “Ctrl” and “G” for Windows.
17	Bookmark	Clicking on the header will make the corresponding page (section) be displayed.
18	Page specify	You can specify the page you want an display.
19	Display scale	You can change the display scale.
20	Paper direction and paper size	The direction of the paper and its longitudinal and lateral dimensions are displayed.

HOW TO READ MANUAL DATA

1. **By opening (i.e. double-click the icon) the "TOP.pdf" file on CD-ROM, the Acrobat Reader is automaticaly booted and the title screen shown below.**

   Example:



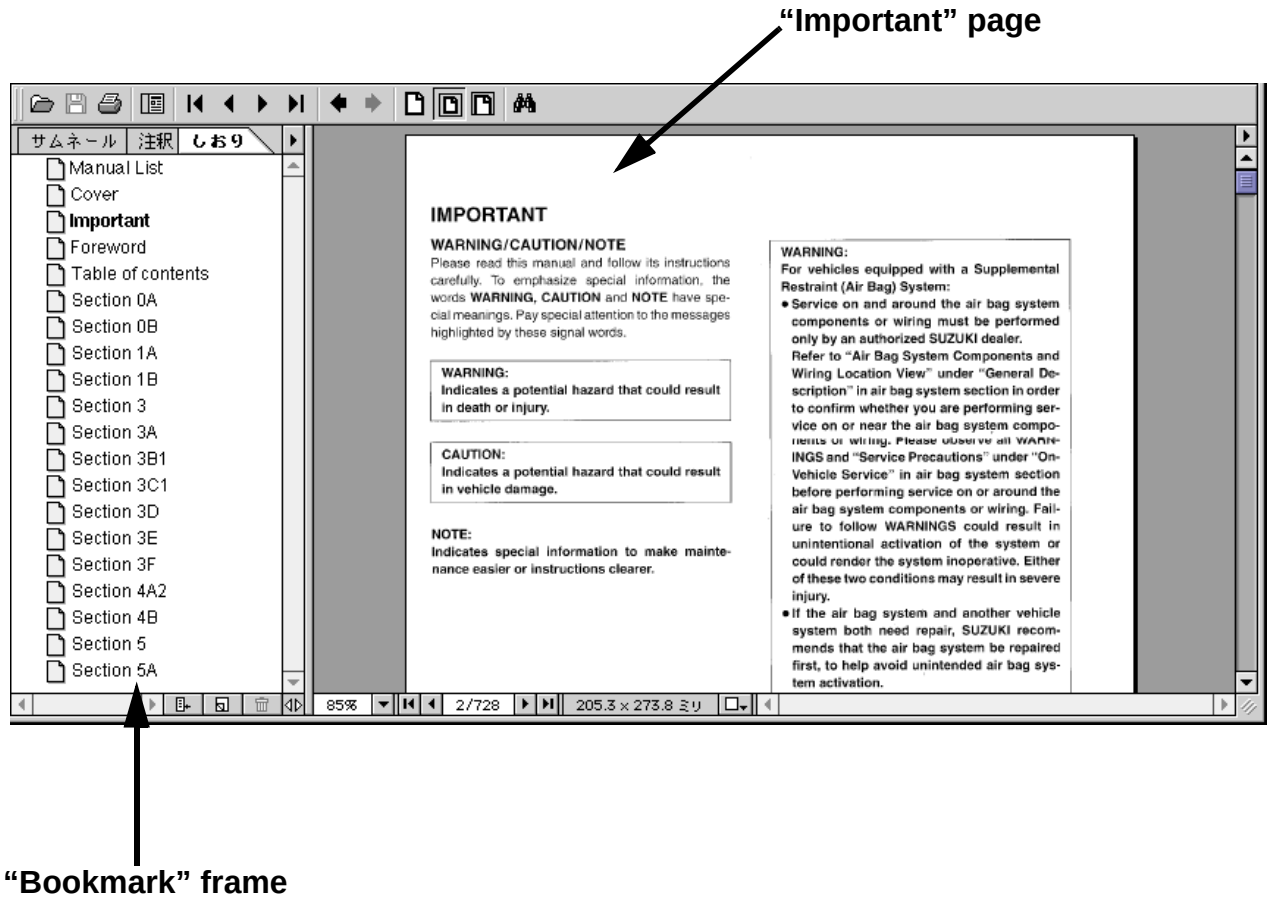
2. **Click on the title screen then, the Manual List displays below. From the list, select the number assigned to the manual to be displayed and click the part number.**

   Example:

Part Number	Language	Manual Name
99500-65D00-01E	E	SQ416/420/625 Service Manual
99500-65D00-01F	F	
99500-65D00-01G	G	
99500-65D00-01S	S	

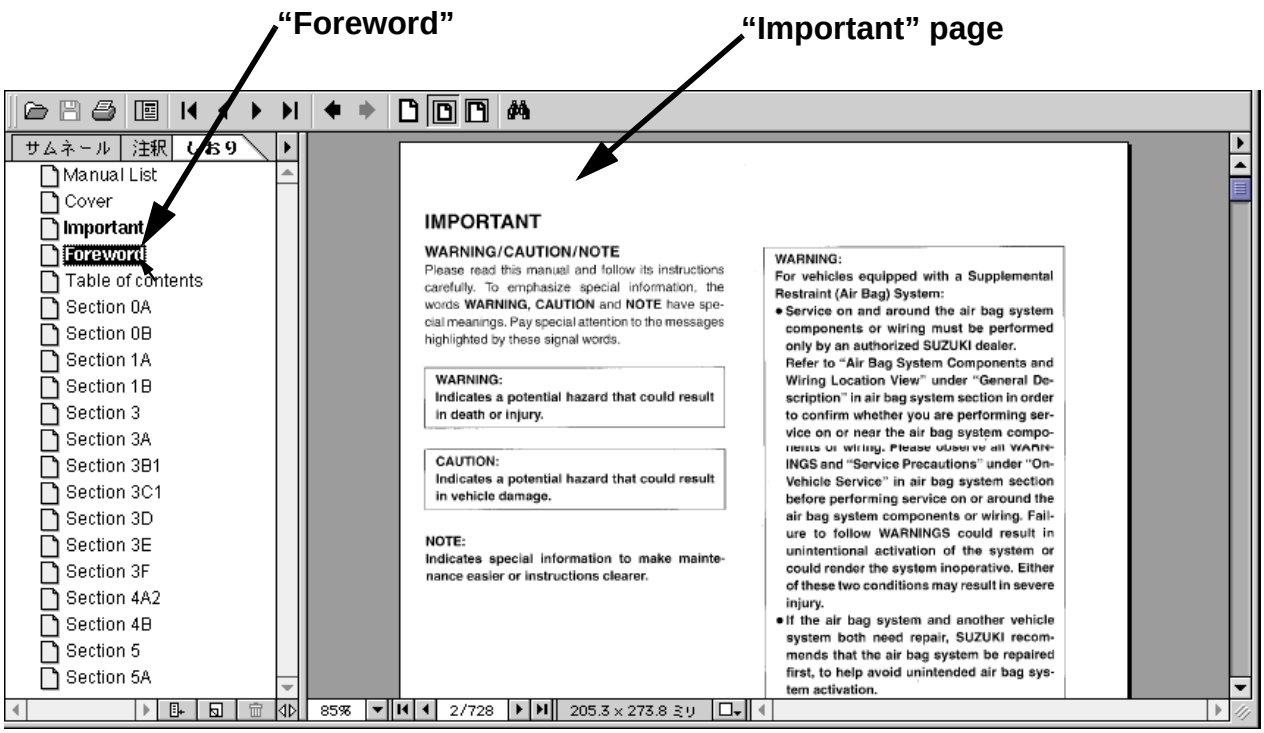
3. **Then, the “Important” page of each manual displays. At the same time, a “Bookmark” frame also displays on the left side of the screen.**

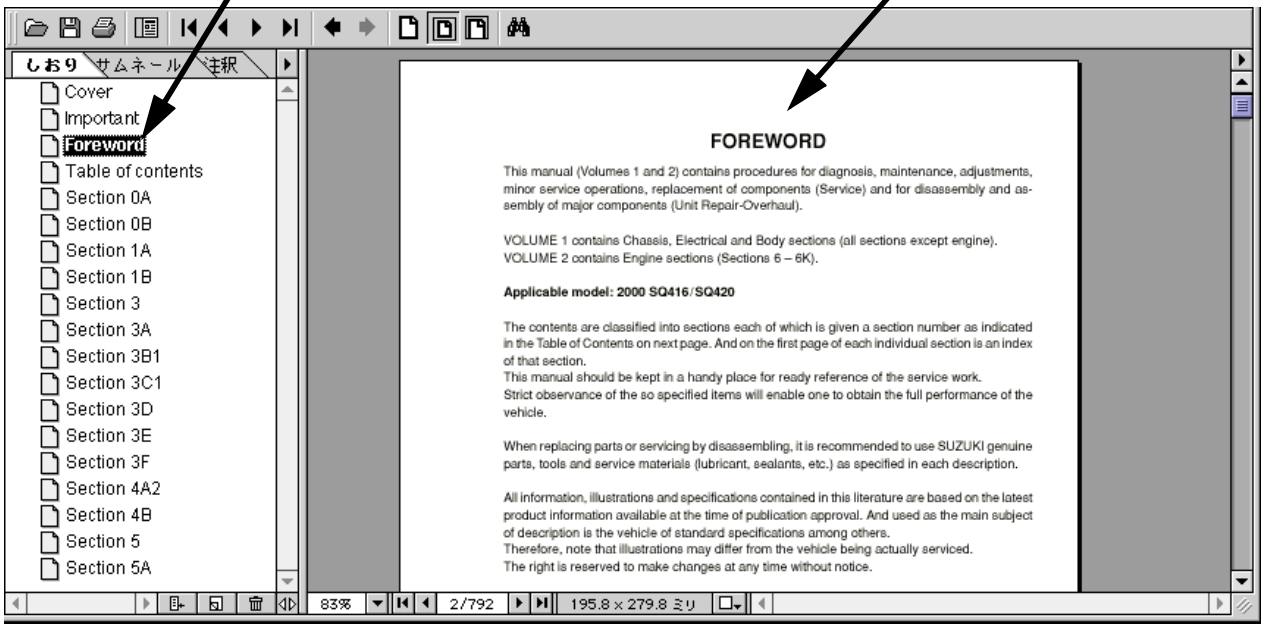
   Example:



4. **Click (left-button) “Foreword” in the Bookmark and “Foreword” page displays.**

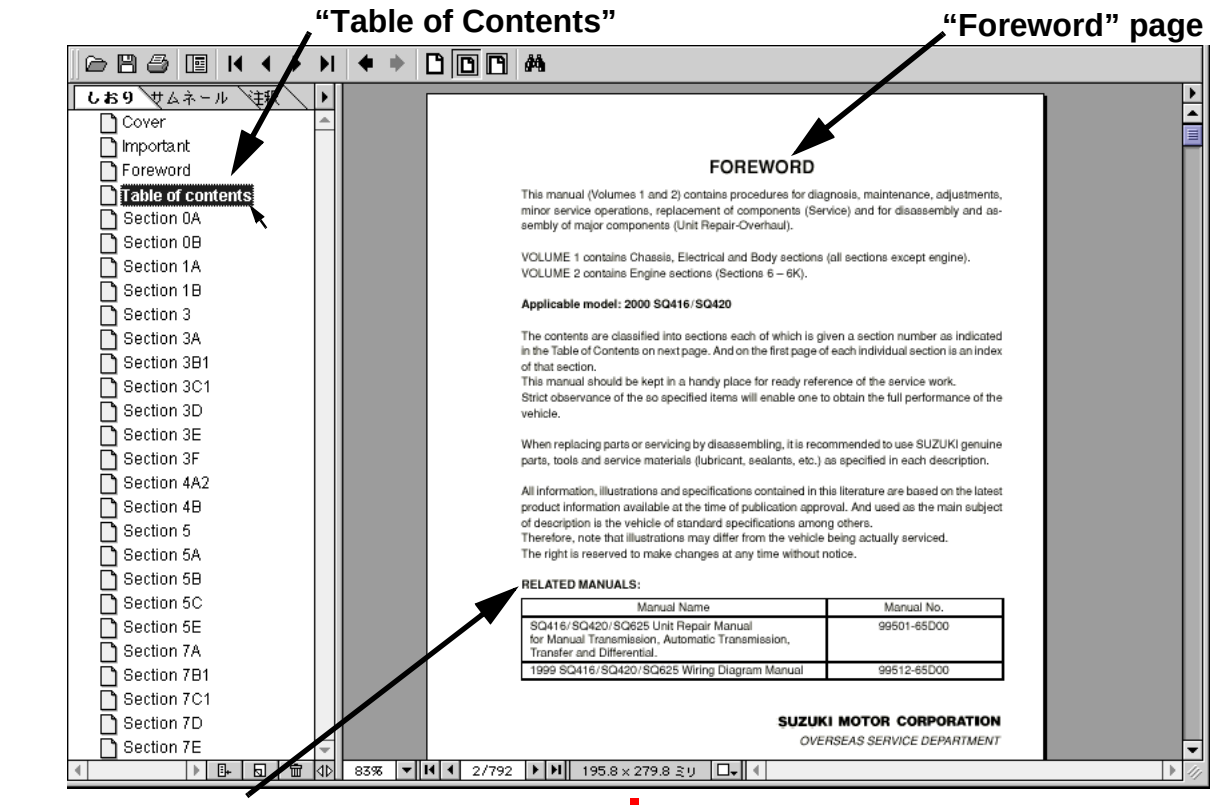
Example:





5. **Click (left-button) “Table of Contents” in the Bookmark, “Table of Contents” page displays.**

Example:



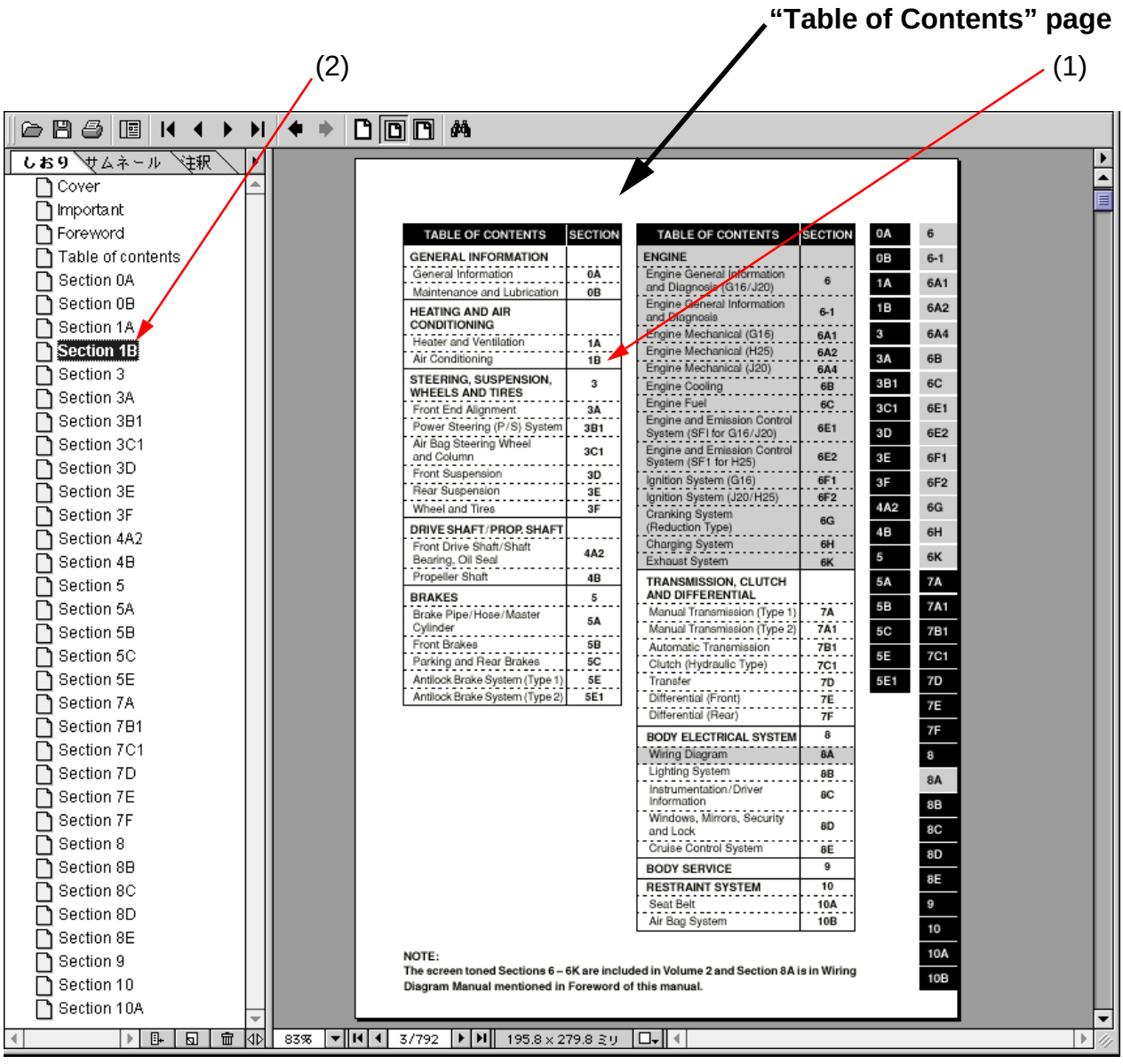
- **To jump to a reference manual**
  On the “Foreword” page, the link is pasted from manual name and manual part number of the “Related Manuals”. Click (left-button) in the appropriate link jump to that related Service Manual.
  (Linked at the location, at which the pointer “ ” , “ ” or “ ” changes to “ ”.)

6. Perform the following procedure ((1) or (2)) to jump from "Table of Contents" page to first page contents of a section.

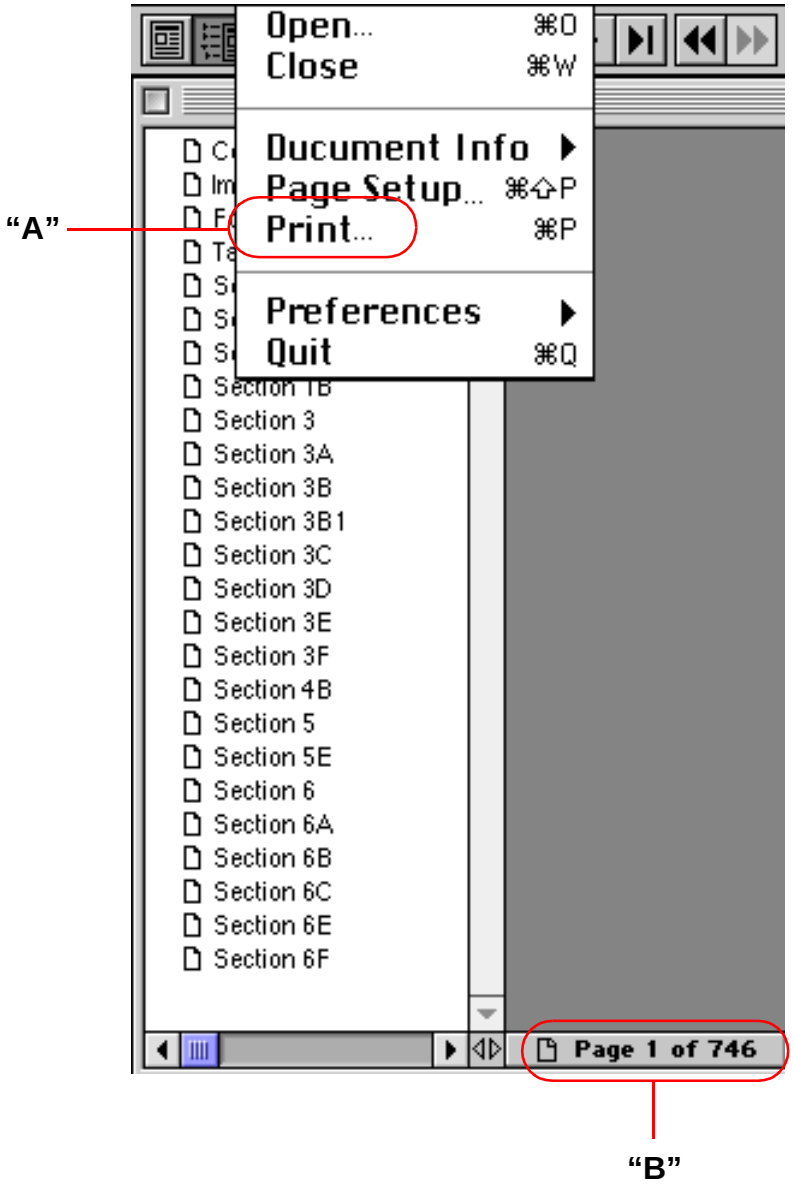
(1) Click (Left-button) in the appropriate link jumps to that section (Linked at the location, at which the pointer " ↖ ", " 🔍 " or " ✋ " changes to " ☝ ".)

(2) Clicking the section name or page name inside the "Bookmark" frame jumps to that section.

Example:



7. **From here on, the following operations can be executed. Select the appropriate operation according to your needs.**

- **To jump to a page that contains a title**
  Jump to the first page of each section, on which linked to the page that contains each title. Click (left-button) in the appropriate link jumps to that page that contains the title. (Linked at the location, at which the pointer " " , " " or " " changes to " ".)
- **To go back to the previous screen status**
  Click the " " button on the menu bar of the Acrobat Reader to the display status that was shown before the currently display.
- **To jump to the next page**
  Click the " " button on the menu bar of Acrobat Reader.
- **To jump to the previous page**
  Click the " " button on the menu bar of Acrobat Reader.
- **To enlarge the text on the screen as characters are too small to read**
  Select the " " button (zoom tool) and then click in the area in which the pointer " " changes to " " (within the page display area).
- **To decrease the size of the screen**
  Select the " " button (zoom tool) and then move the pointer to the area in which the pointer " " changes to " " (within the page display area).
  Holding down the [Ctrl] key (or [Option] key) on the keyboard (in which case, the pointer " " changes to " "), Click (left-button).
- **To display the contents of one full page**
  Click the " " button on the menu bar of Acrobat Reader.

- **To print the data**
  (1) On a specific page or pages:
  Refer to the page number (“B”) given on the bottom of the screen and take note of it. Select “Print” (“A”) in the File menu and specify the page number(s) to be printed.
  (2) On all pages:
  Select “Print” (“A”) in the File menu and select “All” for the page range.